



An innovative urban policy: The Payment for Insufficient Density (PID)

Vincent Viguié (CIRED)

Paolo AVNER (CIRED)

Stéphane Hallegatte (World Bank)

- *Avner, Viguié, and Hallegatte. 2013. "Modélisation de l'effet d'une taxe sur la construction." Revue de l'OFCE N° 128 (2): 341–64.*
- *Avner, Viguié, and Hallegatte. 2014. "When taxing construction leads to more construction: modelling the impact of a land value tax on low density". To be published*

C.I.R.E.D. UNITÉ MIXTE DE RECHERCHE
EHESS ET CNRS - UMR 8568

JARDIN TROPICAL

45 BIS AVENUE DE LA BELLE GABRIELLE

94736 NOGENT-SUR-MARNE CEDEX - FRANCE

3/25/2014

Payment for Insufficient Density (from mid 2012 onwards in France)

■ Part of French law (introduced in 2010 budget)

- Objective: Limit urban sprawl and promote a less extensive usage of land
- Each mayor can tax new developments with insufficient density
- define Minimum Density Thresholds (MDT): housing surface / land lot surface
- It applies to construction permit holders

■ PID is calculated as:
$$PID = \frac{\text{Land Value}}{2} \times \frac{S_{MDT} - S}{S_{MDT}}$$

- Half the m² ground land value x the missing housing surface so that the building reaches the Minimum Density Threshold
- Cannot exceed 25% of the land's value

Implementation example

$$PID = \frac{\text{Land Value}}{2} \times \frac{S_{MDT} - S}{S_{MDT}}$$

Cannot exceed 25% of the land's value

- **Project: construction of a house of 160m²**
 - Land lot: 800m², value 140 000€
 - MDT= 0.6
 - **MDT= 0.6 corresponds of housing surface area 480m² (S_{MDT})**
 - PID= 140000/2 * (480m²-160m²)/480m² = 46 666€
 - **However the PID cannot exceed 25% of the land's value which amounts to 35 000€**
- ➔ **Therefore, the building permit holder will have to pay 35,000€ in PID**

Implementation example

$$PID = \frac{\text{Land Value}}{S} \times S_{MDT} - S$$

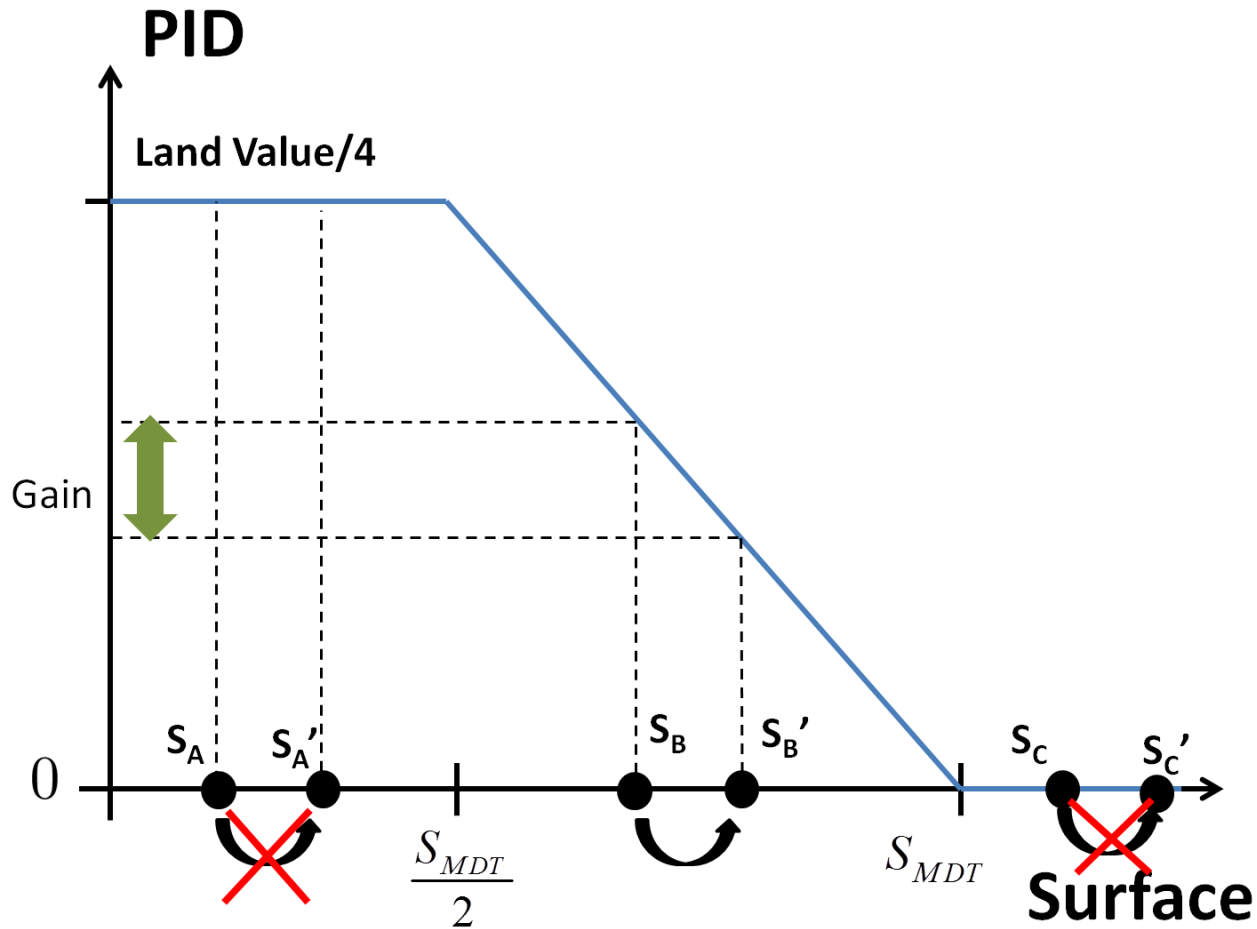
Cannot exceed 25% of the land's value

- Proj
-
-
- MD
-
- How
- amc

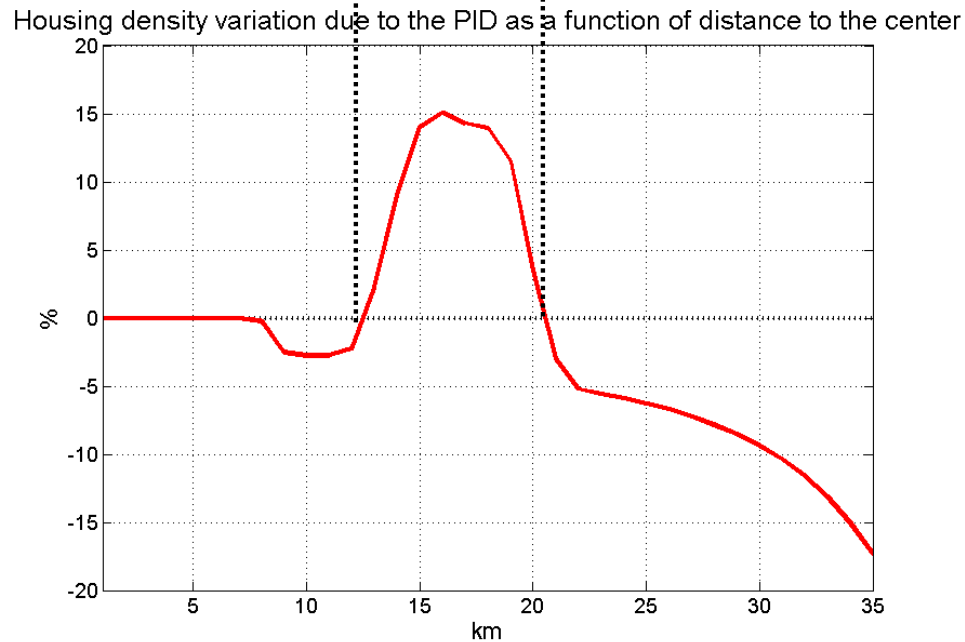
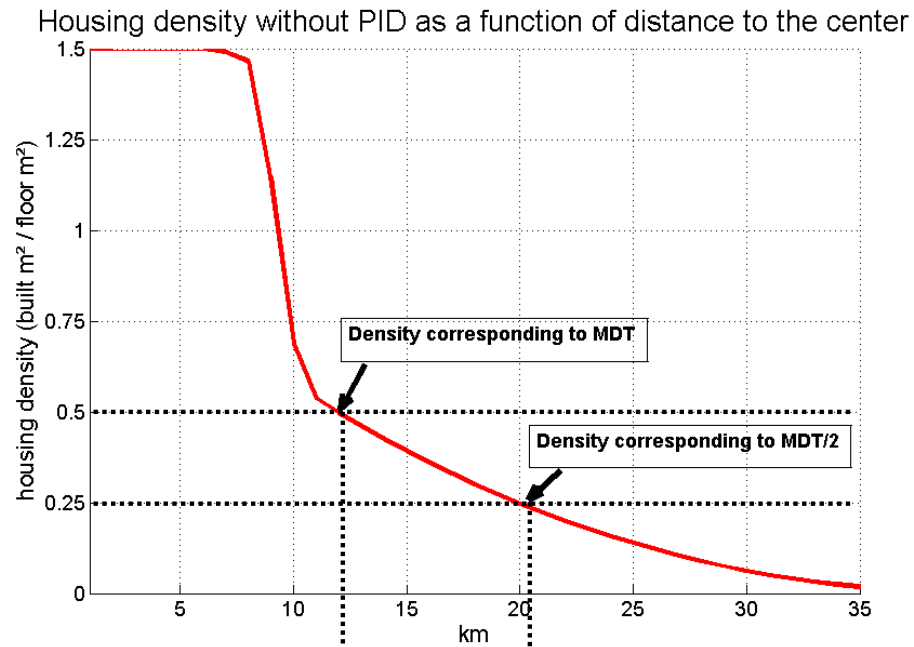
- What are the impacts of PID on urban sprawl?
- We want more accommodation but we tax construction, is it reasonable?
- How to choose the MDT?

➔ Therefore, the building permit holder will have to pay 35,000€ in PID

When do we build more?



Impact of



Schem
linear

e

Modelling urban form ?

- **Standard urban economics modelling** (*Alonso 1964, Mills 1967, Muth 1969*)

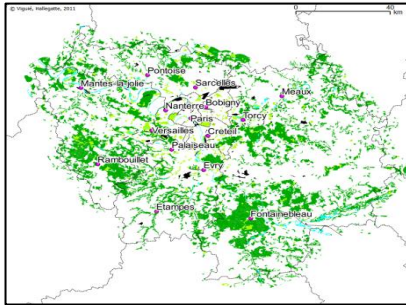
- **3 mechanisms :**
 1. Households' tradeoff:
 - Lower transportation costs and shorter commuting time when living close to the city center, and
 - Larger dwellings and lower rent in remote areas

 2. Investors optimize the housing density as a function of rents and construction costs

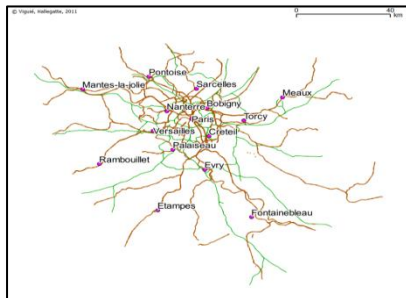
 3. Different evolution timescales for rents, population density, buildings etc.

- **Simplifying hypotheses :**
 - All households have the same income.
 - One trip per day towards the city center.
 - One city center

NEDUM-2D model

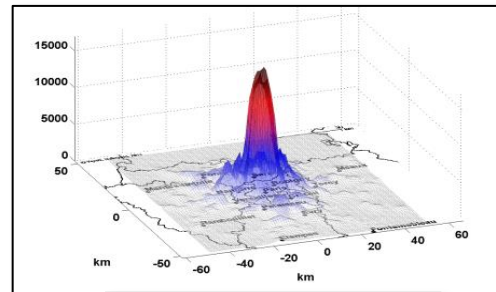


Land-use constraints

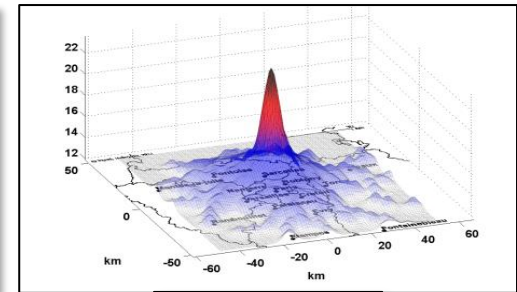


Transport times and costs

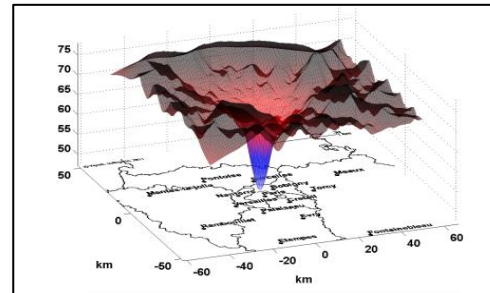
- Total population
- Construction costs
- Average households income



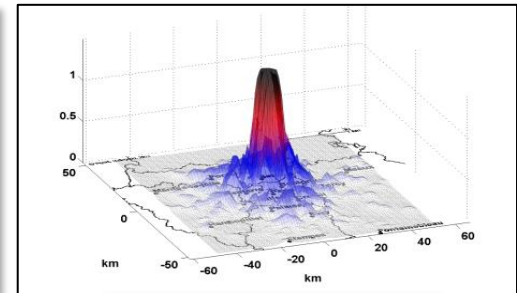
population density



Rents



average dwelling size



floor-area ratio

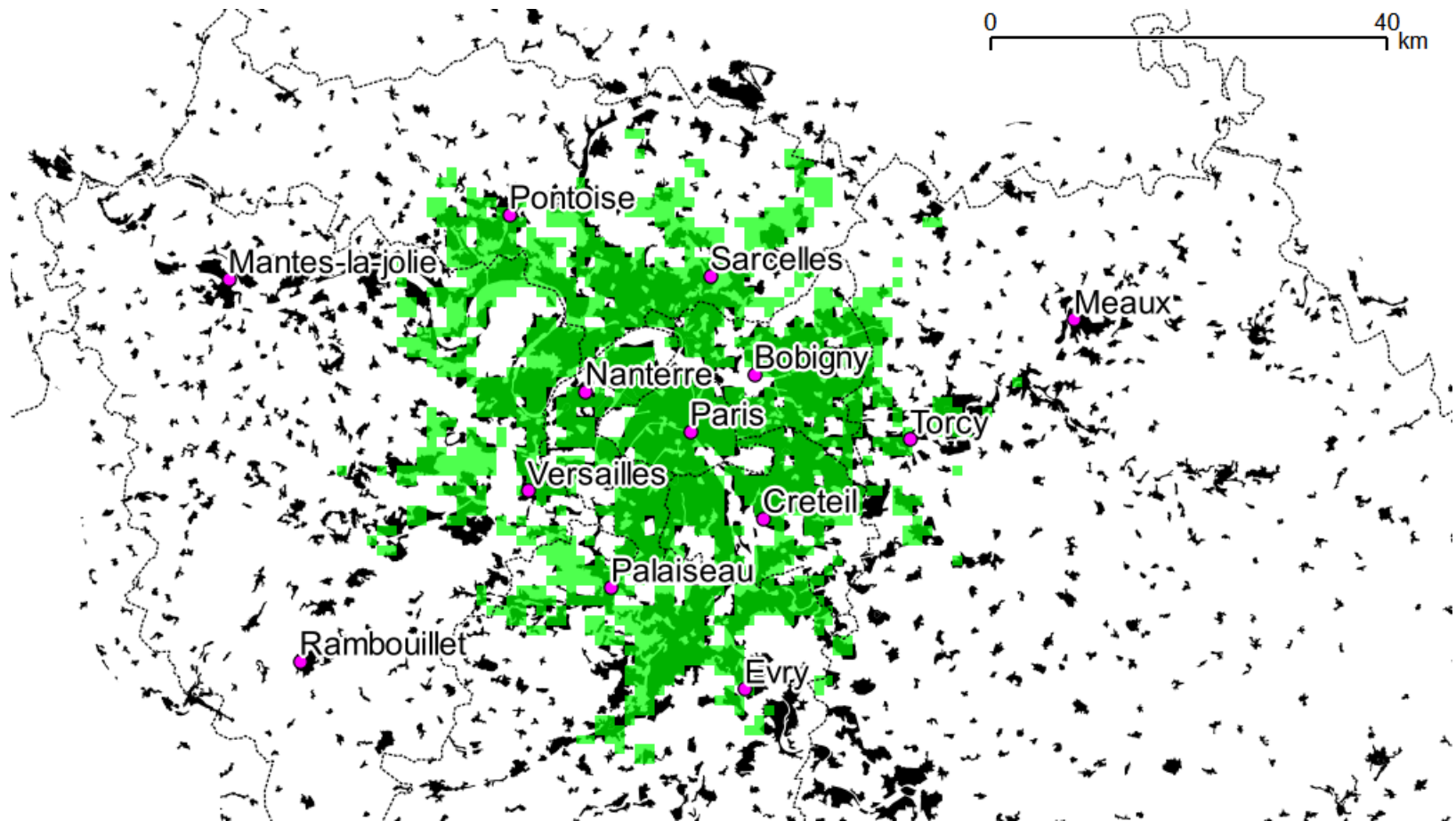


Validation process

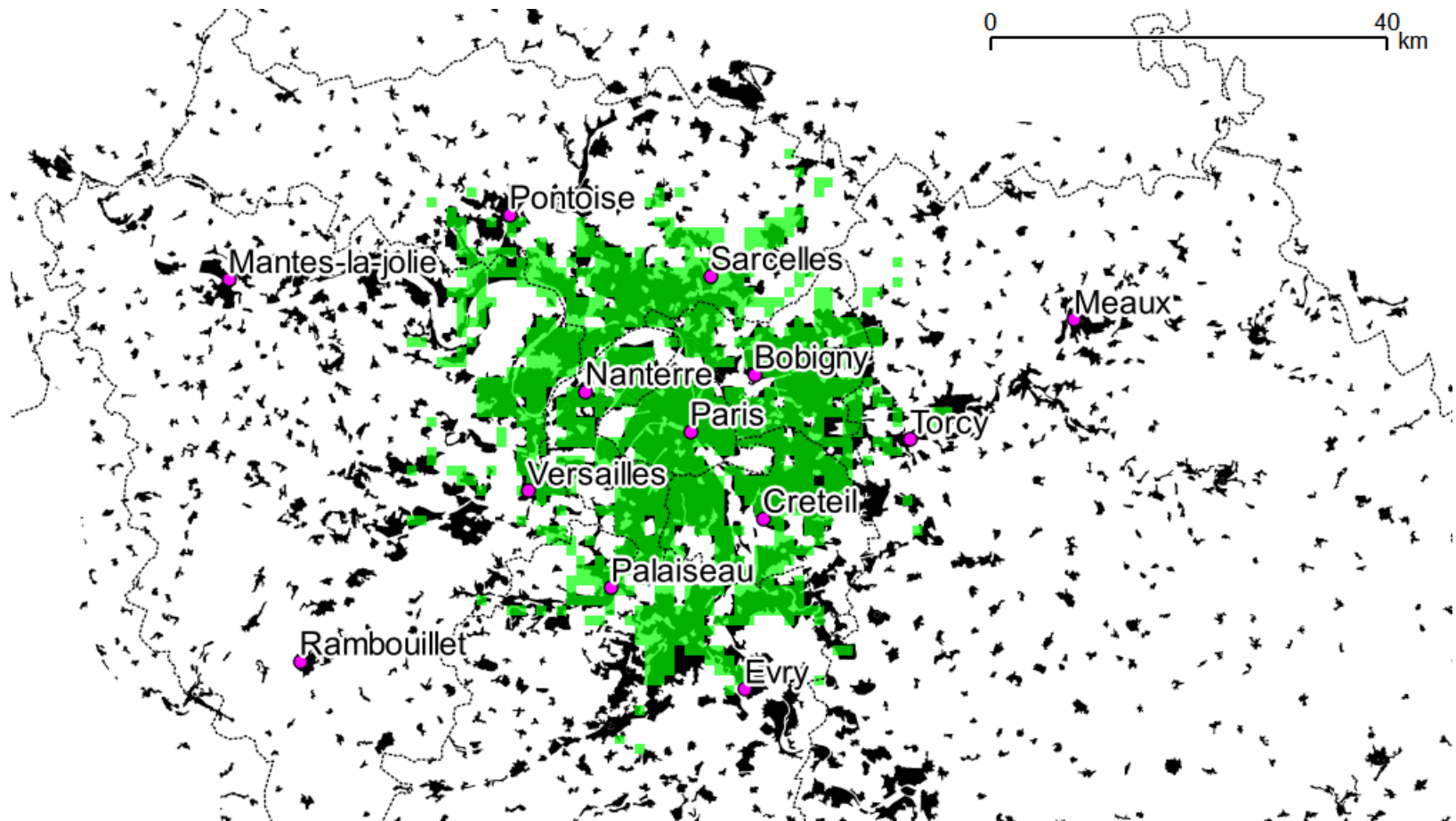
We run the model from 1900 to 2010 using:

- Data on population;
- Data on average income;
- Data on transportation cost, speed, and localization;
- Construction costs change like income.

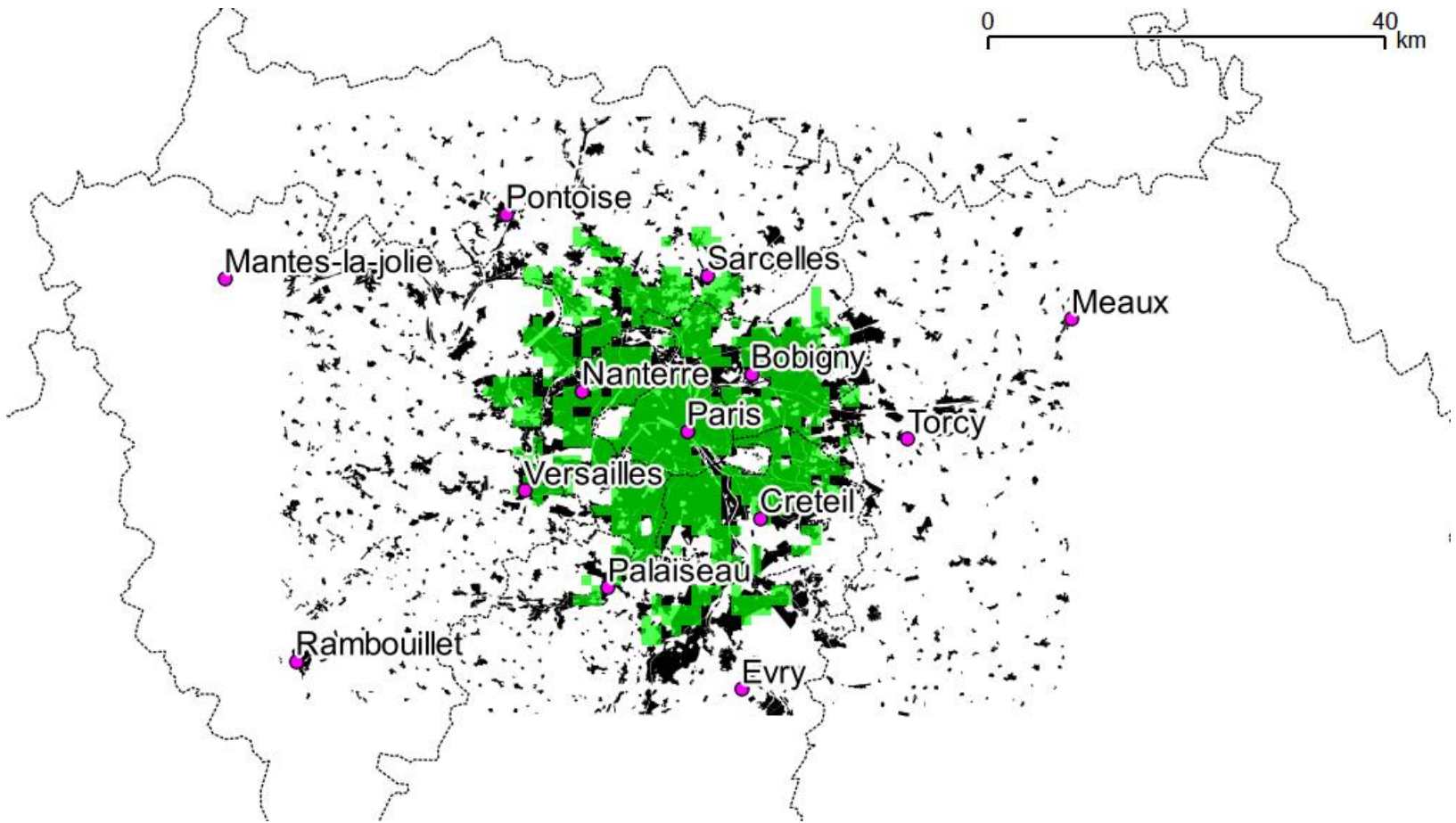
Paris, 2006



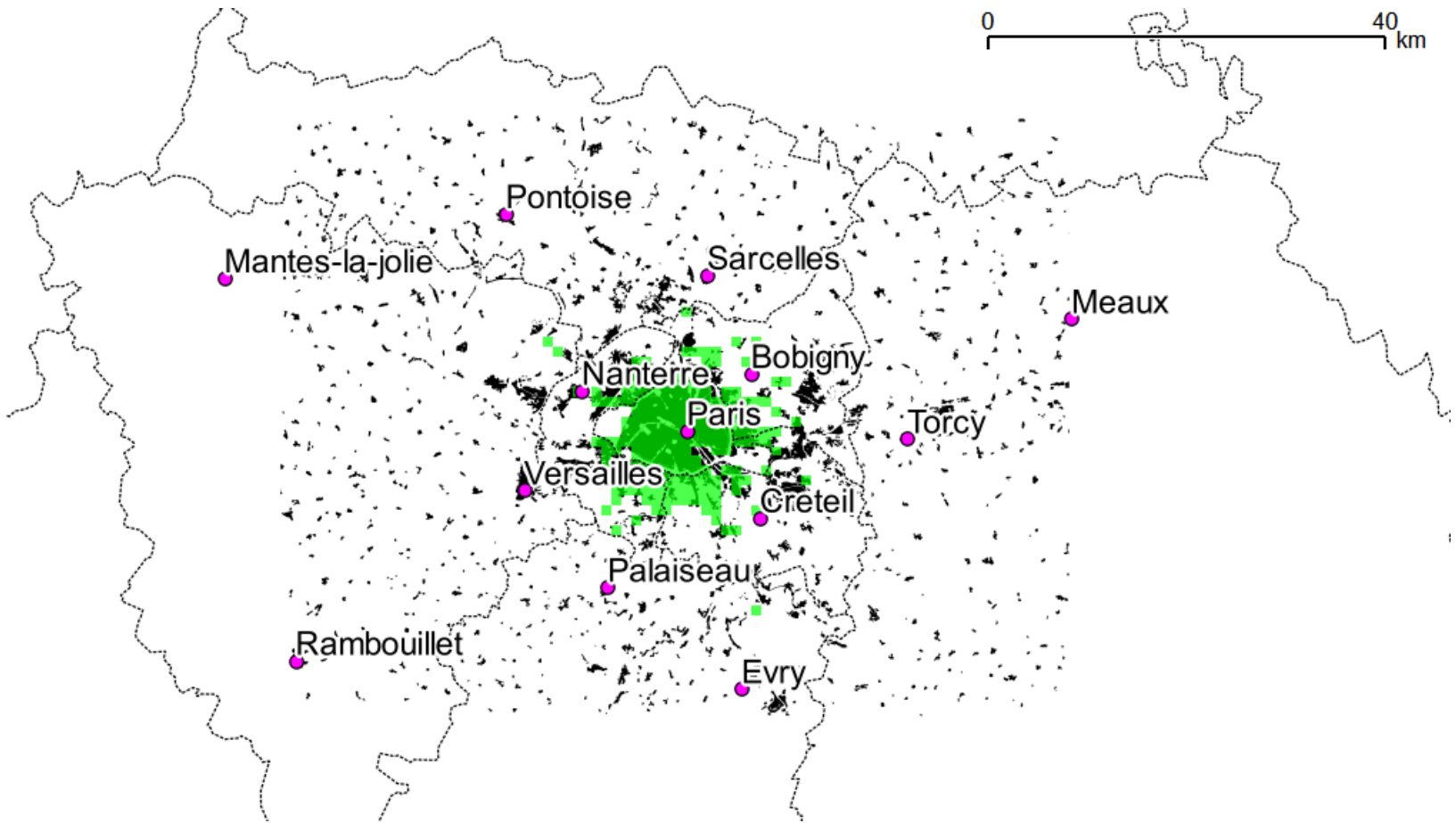
Paris, 1990



Paris, 1960

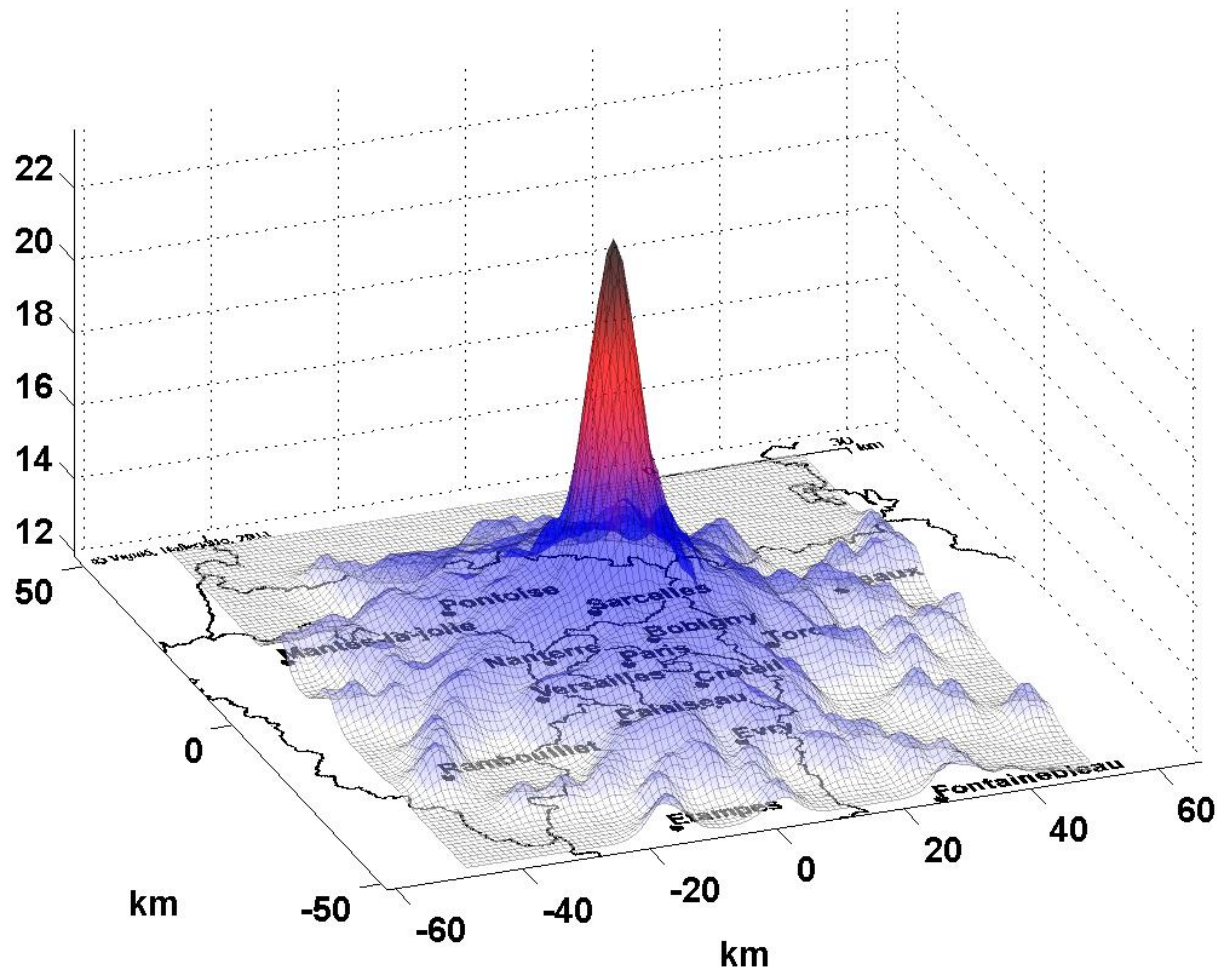


Paris, 1900

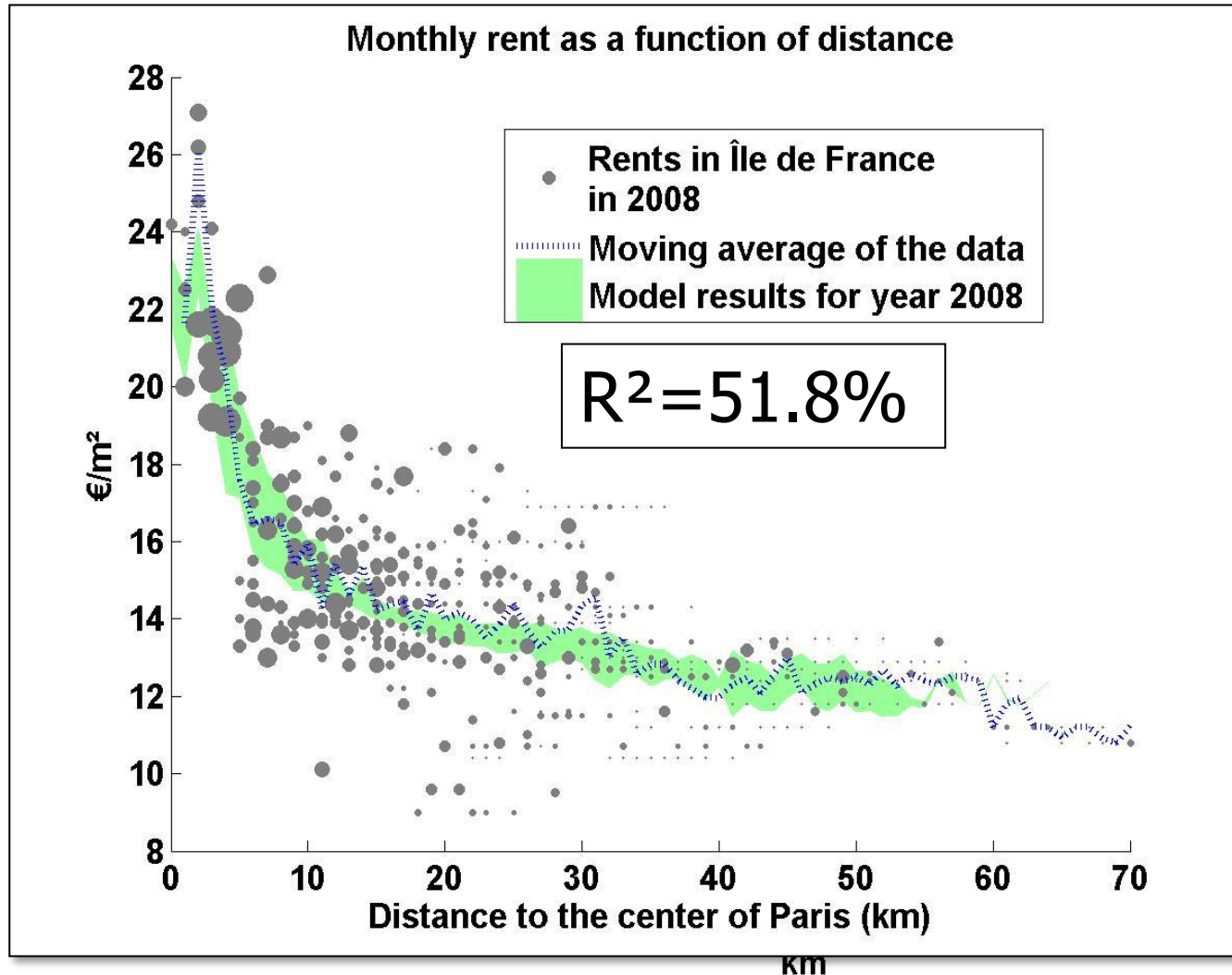


Model results: Rents (2008)

Average rent (€/m²/mois)

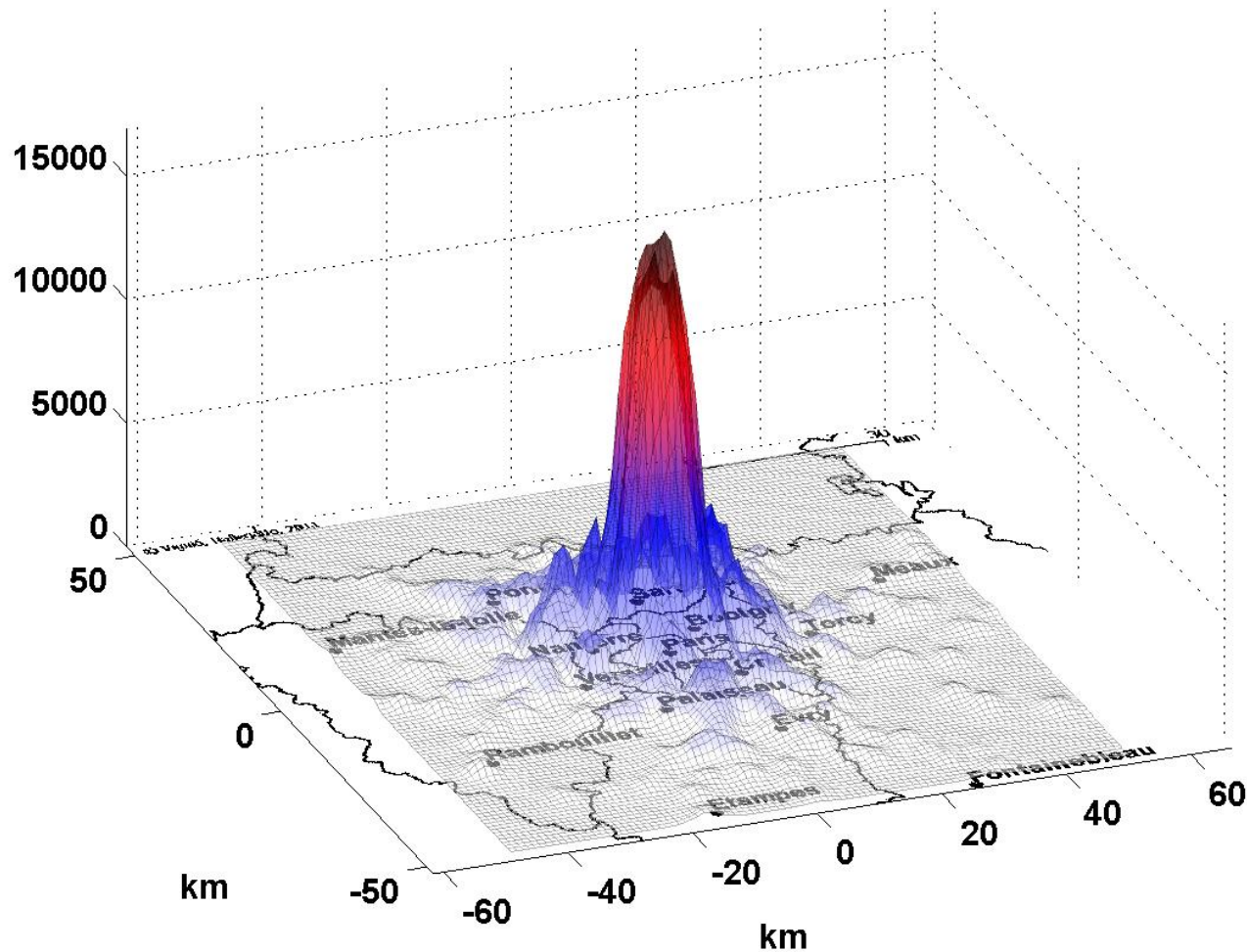


Model results: Rents (2008)

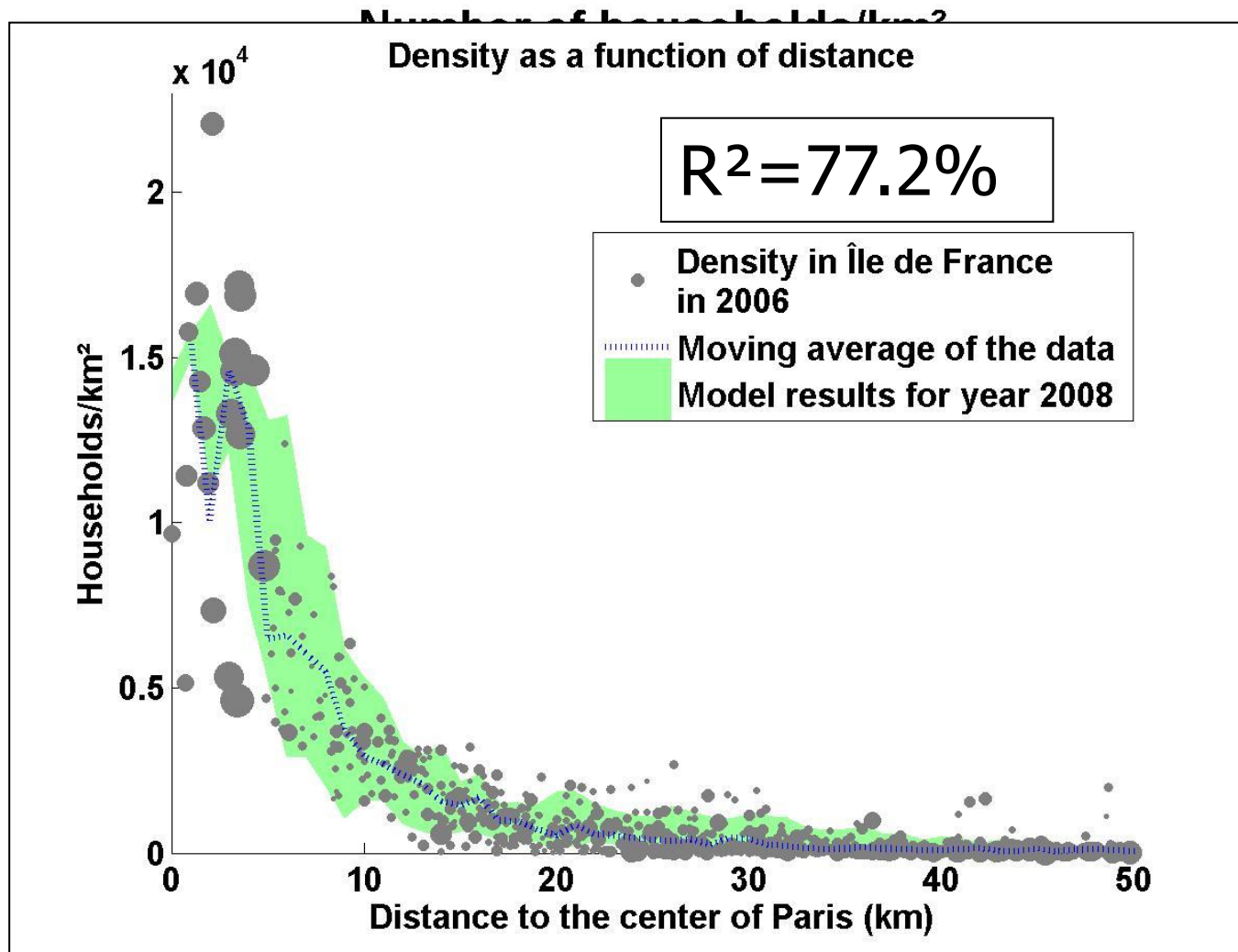


Model results: Population density (2006)

Number of households/km²



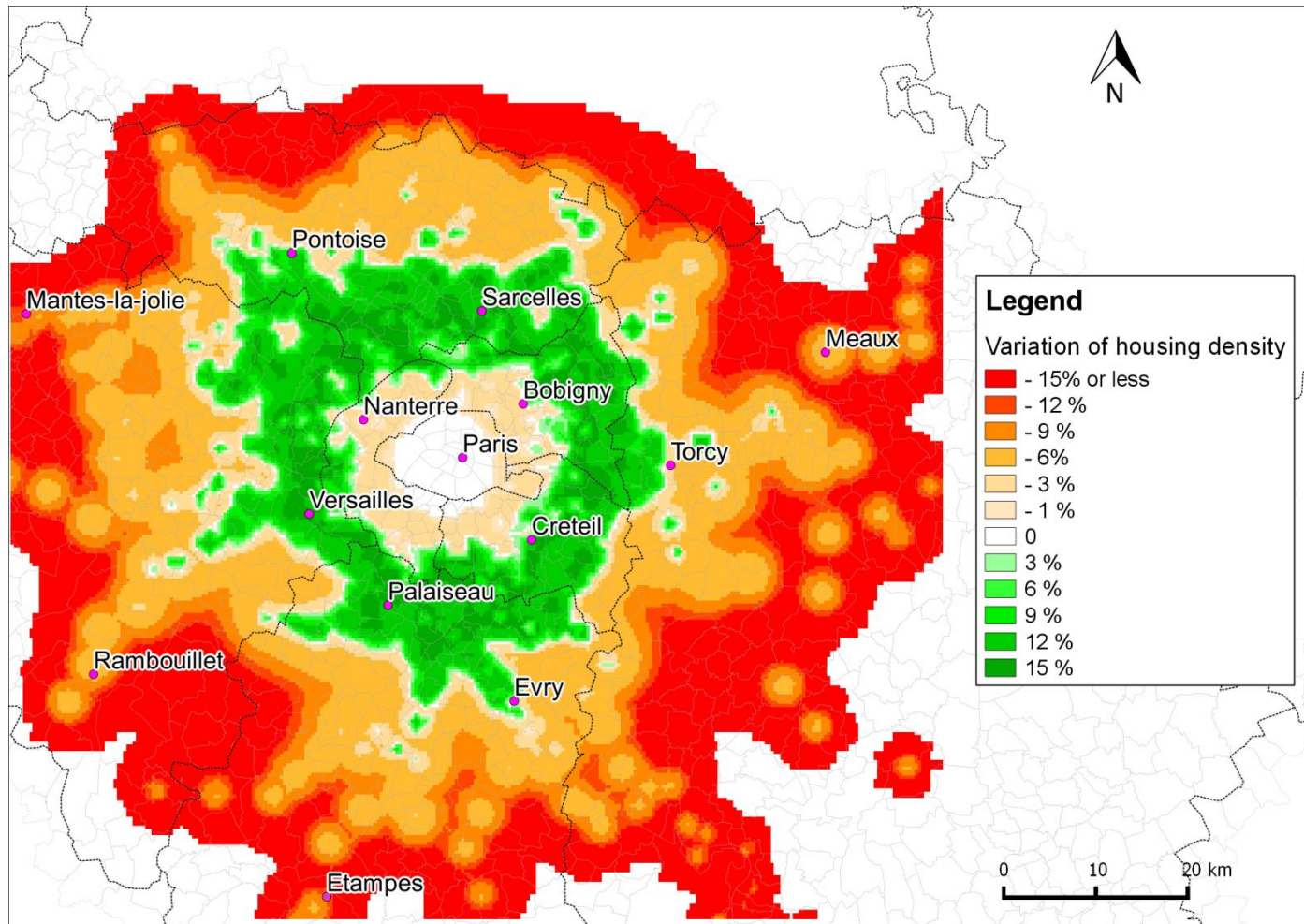
Model results: Population density (2006)



The exercise we conducted

- **Prospective simulation of the evolution of the urban area of Paris from 2000 to 2040**
- **Introduction of the PID in 2012**
 - Definition of a unique MDT...
 - That is applied in a homogeneous manner to the whole of the urban area
- **Comparison of the results with and without PID**

Variation of housing density (MDT: 0.5)



Impacts of the PID: a few numbers (MDT: 0.5)

	Initial (2012)	Base (2040)	PID (2040)	Variation
mean monthly rent in the urban area (€/m ²)	17,19	28,94	28,81	-0,46%
mean distance to the city center (km)	15,12	16,95	16,71	-1,44%
mean annual distance travelled by car (km/year)	6416	7429	7335	-1,26%
mean flat size (m ²)	74,7	75,6	76,0	0,59%
urbanized area (km ²)	1573	1950	1866	-4,32%
built floor space surface (km ²)	590	695	703	1,21%
percentage of access to public transport (%)	66,1%	61,8%	62,6%	1,32%
mean density in the urban area (hab/km ²)	3416	3242	3388	4,51%

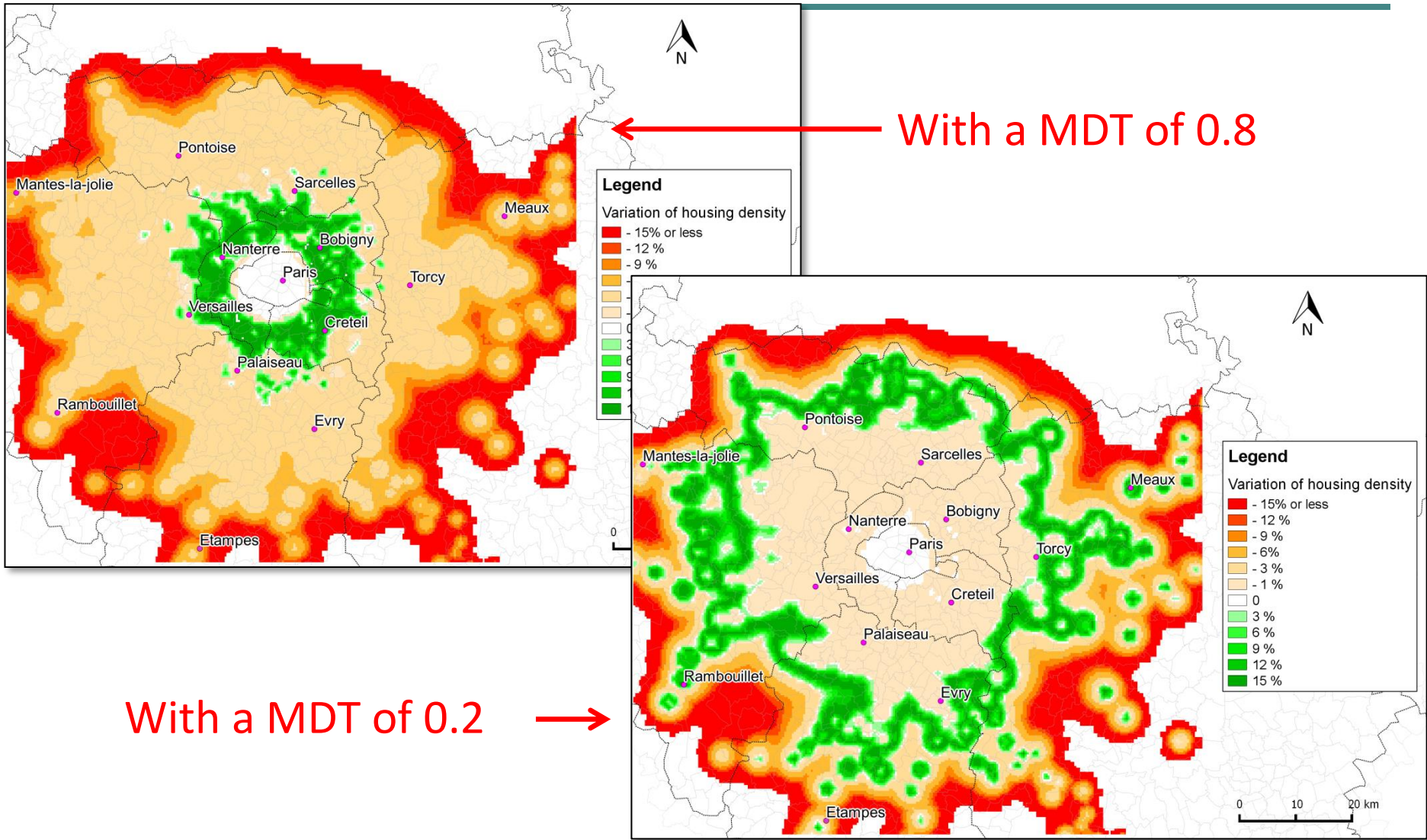
The PID seems to contribute non marginally to limiting urban sprawl

Impacts of the PID: a few numbers (MDT: 0.5)

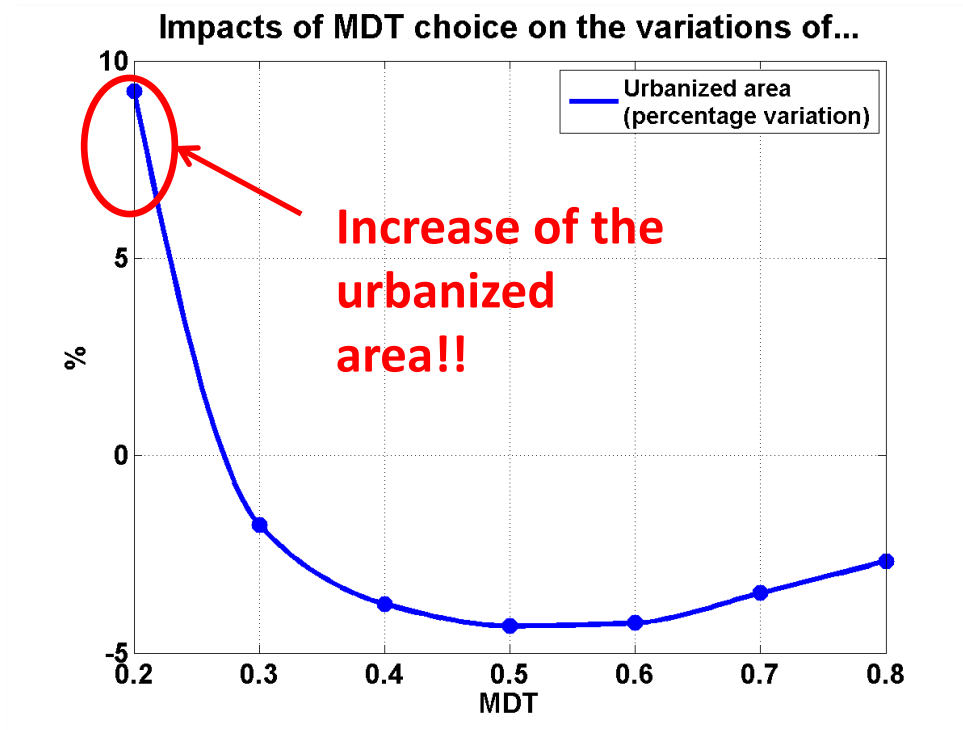
	Initial (2012)	Base (2040)	PID (2040)	Variation
mean monthly rent in the urban area (€/m ²)	17,19	28,94	28,81	-0,46%
mean distance to the city center (km)	15,12	16,95	16,71	-1,44%
mean annual distance travelled by car (km/year)	6416	7429	7335	-1,26%
mean flat size (m ²)	74,7	75,6	76,0	0,59%
urbanized area (km ²)	1573	1950	1866	-4,32%
built floor space surface (km ²)	590	695	703	1,21%
percentage of access to public transport (%)	66,1%	61,8%	62,6%	1,32%
mean density in the urban area (hab/km ²)	3416	3242	3388	4,51%

The implementation of this tax on construction results in an increase of built m² and thus reduces the rents (or real estate prices) relative to a situation with no PID.

The importance of the Minimum Density Threshold choice

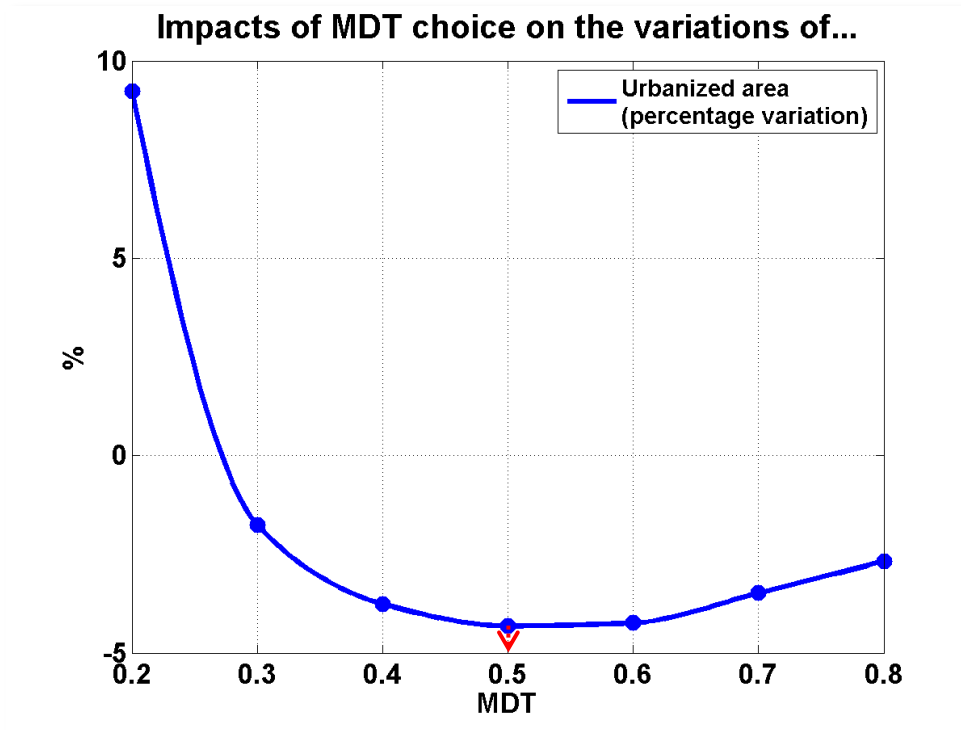


Choice of the minimum density threshold (MDT)



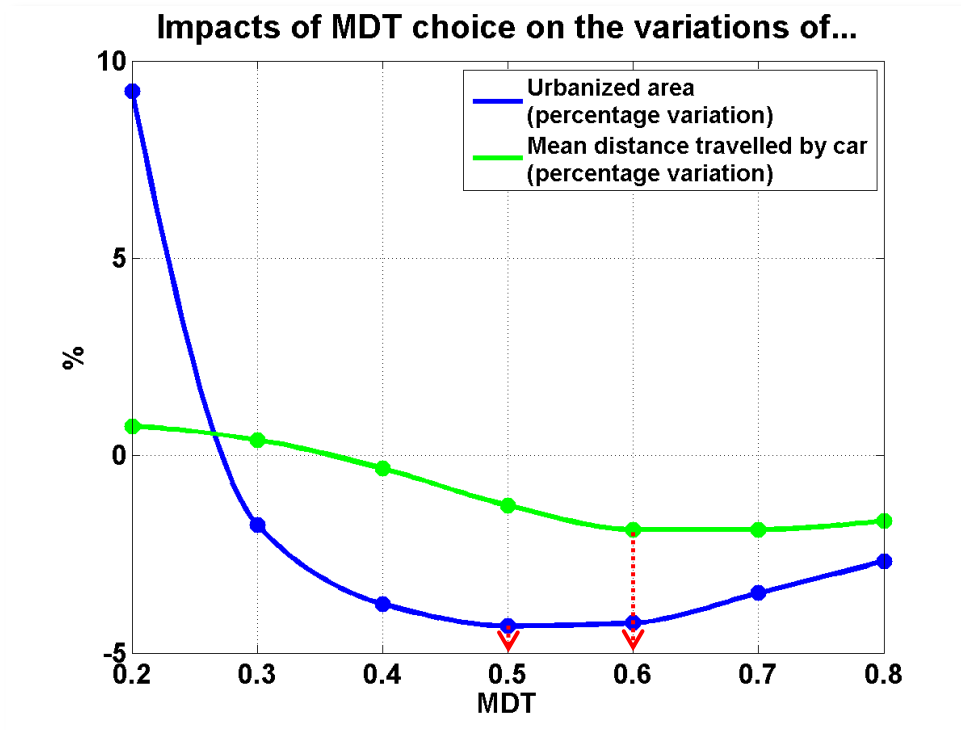
- For MDTs that are too low, the implementation of a PID can prove counter-productive

Choice of the minimum density threshold (MDT)



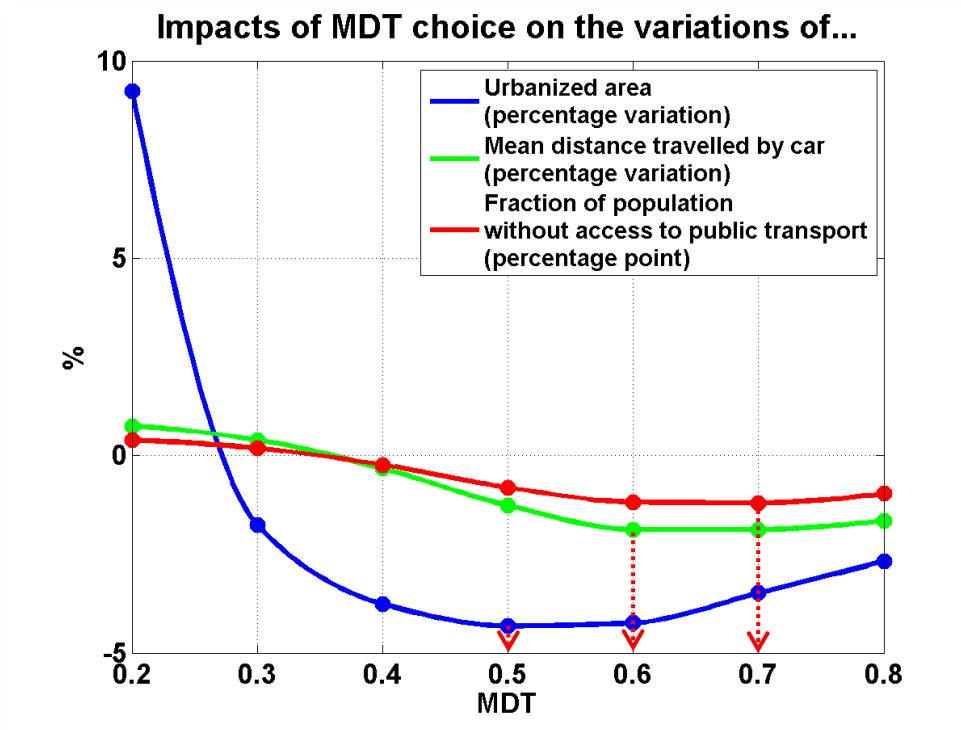
- For MDTs that are too low, the implementation of a PID can prove counter-productive

Choice of the minimum density threshold (MDT)



- For MDTs that are too low, the implementation of a PID can prove counter-productive

Choice of the minimum density threshold (MDT)



- For MDTs that are too low, the implementation of a PID can prove counter-productive
- Depending on the criteria retained, the optimal MDT differs

Revenues expected from PID (temporary results)

MDT	0.2	0.3	0.4	0.5	0.6	0.7	0.8
Annual mean revenues of the PID (billion €)	0,13	0,88	1,58	2,08	2,50	2,83	3,01

- The annualised revenues vary from several hundred million euros to 3 billion depending on the MDT
- By comparison the land tax generates 4.3 billion euros for the whole of the Paris region

Conclusions

- **PID is a tax on construction that leads to:**
 - an increase in built housing surfaces
 - limiting urban sprawl
 - And does not increase rents (rather lowers them slightly)
- **The PID is a subtle tool as the MDT that should be chosen varies depending on the objective**
 - However we supposed a unique MDT that would be applied everywhere in the urban area: not very realistic
- **Perspectives:**
 - Modulate the MDT as a function of the distance to public transport stations
 - What is the impact of a modification of the PID limit (25% here)?
 - What happens when MDT are introduced with no overall coordination??