Loosing green open space in urban areas: a dynamic hedonic approach in Dijon, France

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Research question

How the loss of green open spaces affects the subjective value of housing in the surrounding urban fabric?

Objective

In this paper, we analyse how the land artificialization have changed the spatial organization in Dijon (France), through the housing market as a measure of intrinsic value of green spaces. More specifically, looking back at housing transactions allows us to observe a) tendencies in prices for each neighbourhood, b) change in population density and c) the use of each piece of land. A staggered difference-in-difference approach is used to evaluate how proximity to an artificialized parcel has an effect in a dwelling's market price. A GIS is built to exploit the relationship across the temporality of transactions in even years (from 2011 to 2021) and the land use change information provided by CORINE Land Cover (A 2D/3D database containing elements at 5m aerial scale). Population density is used as a secondary response variable to provide complementary information about the results.

Research design

Following (Towe & A., 2010), we aimed to measure the treatment effect of being exposed to a neighbour parcel that switched from green to urbanized land during the period of study. If the variation of the market value of that parcel is correlated to the market value of its neighbours, and the probability of that parcel to be urbanized affect the population density of its neighbours, then we have an interaction effect (those units of interest). Therefore, control groups are parcels outside a 300m buffer of Euclidean distance after land conversion, and not-yet-treated transactions across the city. Treatment effects are calculated at 1, 3, 5, 7, 9 and years after the land conversion (or 6 time periods given that the dataset comes in even years). Staggered difference-in-difference with heterogeneity in treatment status at multiple time periods was firstly suggested by Chaisemartin and D'Haultfœuille (2020), whose shows that several regressions comparing observations switching from untreated to treated produce unbiased DID estimators across t (p.14). With that in mind, the empirical equation is

$$\log(P_{it}) = \sum_{l=1}^{6} \boldsymbol{\gamma}_{li,t-T\geq 0\,\in J_T} + M_{it}\beta + \delta_t + \vartheta_J + \varepsilon_t$$

Where P is our first response variable *price*, i is the individual identifier, and t is the period of transaction. J_T is the set of all surrounding areas of a converted parcel (using a 300m buffer). T is the time at which parcel was converted (time of treatment) and t is the time of transaction, so $\boldsymbol{\gamma}_{li,t-T\geq 0\,\in J_T}$ is a dummy variable either equals 1 if the transaction took place after having a new artificialized neighbour and 0 otherwise. M_{it} is a set of control variables, including dwelling characteristics, neighbourhood features, and centrality measures. Finally, δ_t is a time fixed effect and ϑ_l is the surrounding areas fixed effect.

Data

Housing transactions are extracted from PERVAL database for the Dijon urban area (2011-2021), in even years. Land use change information is obtained from Corine Land Cover in odd years (2010-2020). This setting is aimed to avoid immediate anticipation effects. Control variables are derived from both PERVAL and INSEE databases from the French government. These several sources are gathered into a GIS (using ArcGIS software) to calculate the distance of each transaction to the closest converted land for each year when possible (if t>T). Although INSEE data comes at IRIS scale (smallest statistical unit in French census), each transaction is equally placed in its corresponding IRIS polygon.