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(Not) in my backyard? The impact of citizen initiatives on housing supply in Germany

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(Not) in my backyard?

The impact of citizen initiatives on housing supply in Germany*

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Abstract: We examine the effect of citizen initiatives on finished residential area in the German federal state of Bavaria. There is already a prominent literature on the fiscal effect of initiatives and political economic reasons that drive urban development. Yet, there is almost no literature that links the effect of citizen participation to local land use patterns. This paper attempts to fill this gap. By using neighboring initiatives as an instrument for the occurrence of an initiative in a given municipality, we identify a negative impact of initiatives on finished residential area per capita. Evaluated at the mean, this effect amounts to about 10% regarding the finished residential area per capita. This effect takes place five to nine years after the initiative was conducted.

Keywords: Urban development policies, land use regulations,
direct democracy, spatial iv estimations

JEL classification: D72, D78, Q15, R52

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1 Introduction

Recently, the channels of citizen participation in Germany with regard to governmental processes are subject to change. Classical interaction between politicians and citizens still takes place. However, there are new tools for participation at hand as well. One example for this new kind of involvement is the inclusion of citizens in the local governmental budgetary process, see for example North-Rhine-Westphalia (*Bürgerhaushalt*). Another interesting channel that attracted attention recently consists of citizen initiatives trying to obtain a referendum at a local level.

Some of these referendums led to fierce public debates on the political matter at issue. Recent prominent examples are the reconstruction of a train station in Stuttgart (*Stuttgart21*) and the approval of housing construction in a green area in the city center of Berlin (*Tempelhofer Feld*). Regarding building construction, there is also another interesting example from Munich in Bavaria which took place in 2004. Here, the maximum height of newly approved building was restricted to 100m. The reason for this restriction is the height of the Frauenkirche in Munich, which is exactly 100m.

These local referendums received much attention, even at the federal level in Germany. Interestingly, in the referendum on the *Tempelhofer Feld*, proponents were arguing that there is a lack of developable areas in terms of living space and a scarcity of housing areas in Berlin. The shortage of housing supply became an apparent phenomenon in urbanized areas all over Germany. Therefore, it is worth to explore the interplay of local initiatives (that might lead to a referendum) and the amount of provided housing areas.

This paper contributes to this discussion by estimating the impact of local initiatives on the amount of approved and finished residential areas in Bavaria from 2003 until 2012. Since citizen initiatives were introduced in 1995 in Bavaria, it has become the federal state within Germany where most citizen initiatives took place. We use the introduction and the spatial expansion of initiatives as a natural experiment to obtain a causal effect of initiatives.

There is already a rich empirical literature on the fiscal impact of initiatives for Switzerland and the US (see Section 2 for more details). However, literature on urban development policies and local policies is not that well developed yet. There are some exceptions, i.e. for Spain Sole-Olle and Viladecans-Marsal (2012, 2013), for the US Gerber

and Phillips (2004) and for Germany Garmann (2014). Most of this literature, however, focuses on election processes and party preferences. We will hereby add a contribution examining citizen initiatives with respect to urban development, since the evidence on this political dimension is underdeveloped.

We suppose two possible theoretical mechanisms how local initiatives affect the urban development process. First, the median voter in the respective municipality might be a homevoter (Fischel (2001)). Briefly, a homevoter is described as an inhabitant that allocated all his investments into his own house. Therefore, homevoters have an incentive to use local initiatives in order to maintain the existing conditions and avoid a potential loss in their home's value. A second mechanism might be the loss of reputation for local politicians with the presence of an initiative. Experiencing an initiative might increase the perception that local politicians are not capable of conducting the policies required by their inhabitants. Since politicians want to avoid this sign of bad performance, local governments that already experienced an initiative might be more hesitant with urban development policies in the future.

So far, we painted a picture of rather selfish inhabitants who act in a "not in my backyard" mentality. Another perspective is that the median voter has a stronger preference to avoid urban sprawl and its associated costs than politicians. Negative effects of Urban Sprawl are a loss of natural areas and the typical urbanization effects of increasing pollution and crime. In our results, so far, we are not able to distinguish between myopic inhabitants that avoid development and citizens that want to maintain the natural value of their municipality. However, we believe that the knowledge about the magnitude of the effect of initiatives is already a valuable insight, independent of the underlying mechanism that drives inhabitant behavior. Nevertheless, we stress that it is important to keep these different interpretations in mind while processing with the paper.

Since both local land use policies and the presence of initiatives might be caused by (unobserved) changing voter preferences, a simple OLS regression would lead to biased results. As will be shown in Section 4, the occurrence of initiatives in Bavaria follows a concentric pattern over space and time starting from certain hot spots after the introduction of initiatives in Bavaria. This can be seen as learning effects of local citizens. Since mayors are re-elected by their own citizens, it is sensible to assume that mayors will not react strategically to the occurrence of initiatives in their neighborhood. Therefore we will use the presence of neighboring initiatives as an exogenous variation to identify a

causal effect of citizen initiatives on provided residential areas.

We start our empirical assessment by thoroughly exploring the time frame where initiatives might have an impact on local land use. It seems that initiatives have an effect on local land use within five to nine years after they took place. Even though there is a negative trend of housing construction in Bavaria during our observational period, a local initiative causes a moderate negative dip of around 10% in finished residential area per capita. Interestingly enough, initiatives only influence the provision of residential areas but do not have any effect at all on the provision of non-residential areas. We consider this as evidence for our hypothesis, since voters are more directly affected by housing construction in their immediate neighborhood. Our results remain robust through a variety of robustness checks.

This paper is organized as follows: Section 2 will give a review of the literature on initiatives. Section 3 will describe the institutional setting and the data, which is followed by a motivation for the first stage in Section 4. Our empirical analysis is conducted in Section 5 and we will finish with a conclusion in Section 6.

2 Literature

Citizen initiatives have a long lasting tradition in the public choice literature. From a normative point of view, they have a positive virtue. When the agenda of local politicians does not match the preferences of the median voter, citizen initiatives can correct them (see Romer and Rosenthal (1978); Gerber (1999)).

Most of the empirical literature on initiative effects focuses on fiscal impacts caused by initiatives in the US and Switzerland (see Matsusaka (1995); Feld and Matsusaka (2003); Funk and Gathmann (2011, 2013); Blume, Mueller, and Voigt (2009)). These studies confirm that the presence of local initiatives decreases the spending of local governments. By contrast, the recent contribution by Asatryan, Baskaran, Grigoriadis, and Heinemann (2013) shows that municipalities in Bavaria with the experience of a citizen initiative increase their spending. They attribute this opposite effect to the cooperative fiscal federalism in Germany, which is a different institutional system than in Switzerland or the US.

Another strand of research focuses on the determinants that lead to the occurrences of local initiatives. Arnold and Freier (2015) examine the effect of signature requirements on the emerging pattern of initiatives by exploiting discontinuities for signature requirements at population thresholds. They find that higher signature requirements cause a decline of local initiatives. Arnold, Freier, Pallauf, and Stadelmann (2014) show that citizen initiatives are rather due to a general dissatisfaction with representative democracy than with a certain party.

The main literature summarized so far ignores the interplay between political processes and local land use. This is where the recent contributions of Sole-Olle and Viladecans-Marsal (2012, 2013) step in. They show that local land use plans are determined by political variables. The first paper shows that increased political competition leads to less newly developed land and the second paper shows that leftist parties in Spain provide less land for development. Therefore, housing an important parameter of local politics.

Gerber and Phillips (2004) show in addition that citizen initiatives in the US change the process of urban development. Even though outcomes are the same in the long run, the short run interactions of all actors substantially change. Against this background, local land use plans are indeed of political interest and political competition as well as parliament composition affect the land use process. Therefore, it is natural that the voter wants to directly influence the local land use process.

The theoretical link between local land usage and citizen initiatives is not sufficiently established yet. A notable exception is the study by Fischel (2001), who introduces the concept of homevoters. These homevoters are characterized by pooling their investments into their houses. Due to a lack of asset diversification, homevoters have a strong incentive to retain the value of their houses. Therefore, they tend to avoid the costs of urbanization. These are the construction costs and the negative effects of urbanization (crime, pollution etc.). These effects are likely to decrease the value of their houses. Another channel how urbanization decreases the house value is the effect of increased supply on the housing price.

Garmann (2014) applies the homevoter hypothesis to the federal state of Hesse in Germany. He uses a gradually implemented policy reform of the nomination scheme of mayors. Before that, city mayors were nominated by the city council. Following the reform, they were directly elected by the citizens. The results show a reduced change

in urban land area and a lower approval of building licenses for residential buildings when the mayor was directly elected by the citizens. According to his argument, directly elected mayors behave more restrictively since their mandate is more reflected by the homevoters.

Another possible mechanism that we suspect is the fact that local citizen initiatives cause a damage to the reputation of the local politician. (Literature!!!) Local initiatives are always a sign for voters disagreeing with the conducted policies. Politicians fear this loss of reputation because it might endanger the probability of getting reelected. Since citizen initiatives are a rather new tool, it is likely that politicians become more hesitant with their urban development policies after experiencing one initiative to prevent the occurrence of further ones.

Given the reviewed literature, it is worth digging deeper to find out if local initiatives influence the urban development process. The literature shows that initiatives should have an influence on local politics. Furthermore, local land use policies are in the interest of politicians. If the median voter in Bavaria is a homevoter, this should lead to a decline in the urban development process. In addition, politicians want to avoid a loss of reputation. Since the autonomy over the urban development process is in the hand of local politicians, they will be hesitant with this tool to avoid further initiatives after they experienced one.

3 Institutions and Data

Bavaria is one of the largest federal states in terms of population, area and economic activity in Germany. 13.16 percent of the German population lives in Bavaria and the state accounts for 19.74 percent of the entire area of Germany in 2013. Our object of investigation are Bavarian municipalities. The federal state of Bavaria consists of 2,056 municipalities, including 25 independent cities (*Kreisfreie Städte*) and 29 major county towns (*Grosse Kreisstädte*). Municipalities are the lowest administrative tier in Germany. They are responsible for various public affairs, i.e. public order, infrastructure, schooling etc. Some of the tasks are conducted in sole responsibility by the municipalities, while other tasks are jointly conducted with higher-tier administration.

Regarding the urban development process, municipalities are obliged to provide land development plans (*Flächennutzungsplan*) that have to be approved by a higher administrative authority. In general, this plan depicts the characteristics of the land use and is not legally binding. Based on the land development plan, the municipality has to develop a legally binding land use plan (*Bebauungsplan*), which indicates the urban patterns, i.e. construction form, green and traffic areas.

In order to verify the possible presence of the homevoter hypothesis, we gathered data from the German Census 2011 for Bavaria.¹ As part of the census, data about the living situations and the real estate property relations was collected as well. This data is available at the municipal level as well but in this state of the research we provide descriptive information at the state level. About 51% of the owners of flats in Bavaria live in their own property. Since we traditionally have more private property in rural than in urban areas, we expect a strong variation of this variable. Therefore, it is not unreasonable to suspect the homevoter hypothesis as a mechanism that drives the negative influence of local initiatives on the supply of residential area. Unfortunately, the available data does not allow to test this directly as our initiative data extends only up to 2011 and we have census data on homeownership only from 2011.

For our research, we combine two different kinds of datasets: regional data on land use patterns and population from the Bavarian State Office for Statistics and a dataset on referendums in Germany. This dataset was assembled by the Universities of Wuppertal and Magdeburg in cooperation with the NGO '*Mehr Demokratie*' ("More Democracy"). It will be described in more detail in Section 3.2.

3.1 Land use data

For our analysis, we collected information on the population as well as the approved and finished residential and non-residential area from 1983 until 2012. In addition, we have gathered net migration, the stock of residential and non-residential area, and the sales price per square meter².

Figure 1 depicts the time pattern of our dependent variable from 1983 until 2012. We will use the finished residential area per capita as our main dependent variable. Also,

¹see <https://www.statistik.bayern.de/statistik/zensus-ergebnisse/>

²Please note that we included a price of zero if no area was sold in a period

we include the approved residential area per capita. The vertical red line marks the introduction of local initiatives in Bavaria. It is worth noting that both time series follow similar patterns. There was an increasing trend of approved and finished residential area until 1994. Afterwards, there is a steady decline in the approval and provision of residential area. In addition, the progression of the approved area per capita shows a larger variation than the finished area.

So far, there is no straightforward explanation of the decline in the provision of residential area after 1995. The consensus is that the government engages less in residential area construction and cuts subsidy programs as well.³

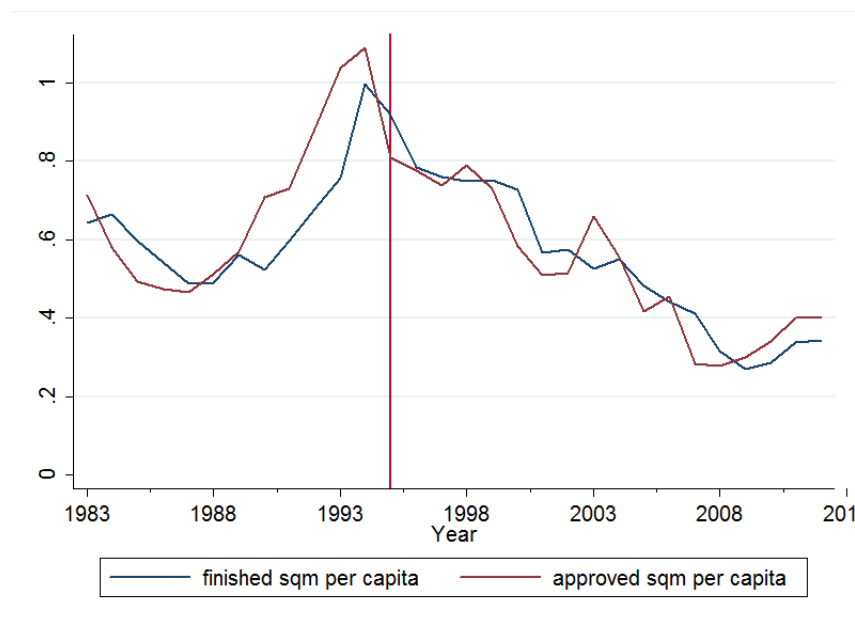


Figure 1: Evolution of residential area in sqm per capita over time. *Source:* Own calculations.

For comparison purposes, we also show the data for non residential area per capita from 1983 until 2012. This is illustrated in Figure 2. Both time series are rather stable over time and follow similar patterns.

³We also see certain patterns that follow the decline of governmental subsidize schemes. For example in Figure 1, the expiry of the grant scheme for first-home buyers (*Eigenheimzulage*) is well represented by a small upward from 2005 until 2006 and an even stronger decline from 2006 to 2007 in approved residential area per capita.

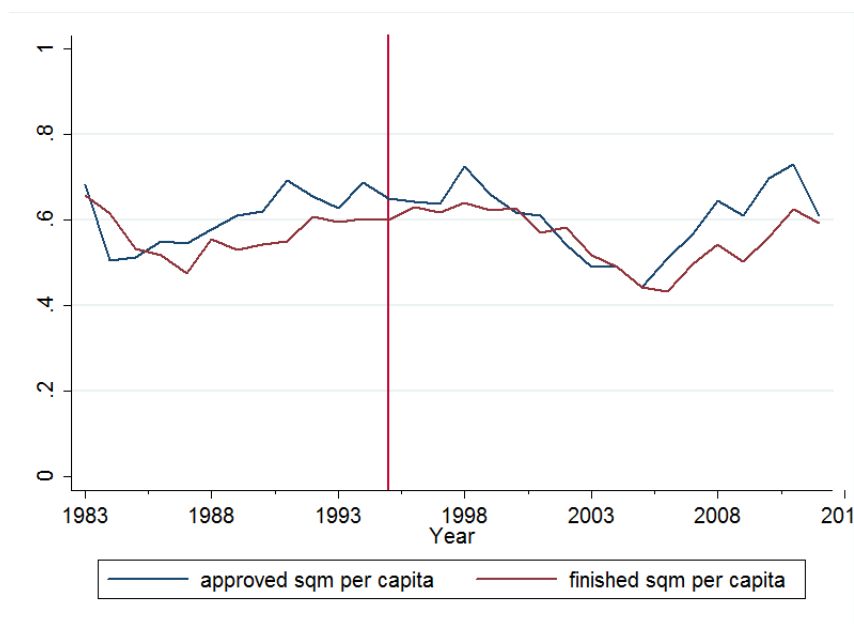


Figure 2: Evolution of non residential area in sqm per capita over time. *Source:* Own calculations.

3.2 Local initiatives

Local initiatives in Bavaria were introduced on the 1st of November 1995. Before this point in time, initiatives were only allowed at the state level and involved high barriers to enter the initiative process (for details see Asatryan, Baskaran, Grigoriadis, and Heineemann (2013)). The resulting dissatisfaction caused a state-wide referendum to introduce local initiatives. This referendum was successful and had a state-wide acceptance rate of 57.8 percent. Since then, local initiatives are frequently used in Bavaria and it has become the state with the most initiatives in Germany.

Interaction of local citizens with the political process consists of two steps. If inhabitants are dissatisfied with a certain aspect of politics, they can pronounce their disagreement and start a local initiative (*Bürgerbegehren*). During the local initiative, a certain amount of signatures needs to be collected in order to move on to the second step. If the signature requirement is met, a local election about the approval or dismissal of the topic is held (*Bürgerentscheid*).

Our dataset from "More Democracy" (*Mehr Demokratie e.V.*) consists of 2,155 local ini-

tiatives from 1995 until 2011. Regarding the time dimension, an extensive usage of local initiatives occurred directly after the state wide referendum in 1995. The most initiatives were initiated between 1996 and 1999, which can be seen in Figure 3. Afterwards, initiatives were still an often used instrument of citizen participation, but the amount of initiatives settled down to a steady state of around one hundred initiatives per year.

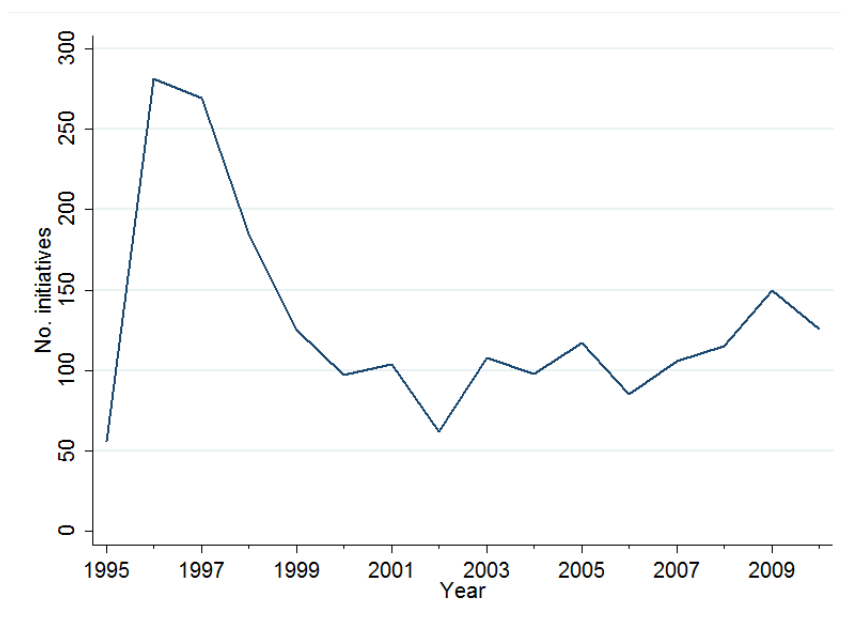


Figure 3: Number of initiatives by year. *Source:* Mehr Demokratie Bayern e.V.

Regarding the topics of initiatives, we observe a big variety as shown in Table 1. We have information on the kind of topic the local initiative deals with and whether the following referendum was successful.⁴ Furthermore, we have an outcome "unknown" for initiatives when the exact outcome is not reported. We suppose two possible circumstances relating to this: either the local initiative was not able to collect enough signatures or the local politicians already adjusted their policy path towards the initiative.

By looking at Table 1, one can see that only a small share of initiatives is directly related to new housing areas. Therefore, a direct effect of initiatives will only have small influence. However, we suspect an indirect influence, i.e. local initiatives prevent

⁴Regarding the assignment of the initiative to the topic, we suspect slight measurement errors looking into some detailed referendum descriptions. For example, some referendums against the demolition of certain houses might fit into the construction section as well.

Table 1: Local initiatives by topic 1995 - 2011

Topic	Total	Share	Success	Failure	Unknown
Public infrastructure (<i>Öff. Infrastruktur / Versorgung</i>)	277	12,87	112	70	95
Social infrastructure (<i>Soziale Infrastruktur</i>)	279	12,96	124	91	64
Culture (<i>Kultur</i>)	90	4,18	41	26	23
Disposal (<i>Entsorgung</i>)	140	6,51	52	23	65
Economy (<i>Wirtschaft</i>)	380	17,66	168	118	95
Traffic (<i>Verkehr</i>)	458	21,28	166	157	136
Fees (<i>Abgaben</i>)	37	1,72	6	11	20
Constitution (<i>Hauptsatzung</i>)	25	1,16	12	4	9
Residence (<i>Wohngebiete</i>)	28	1,30	13	12	3
Other land-use planning (<i>andere Bauleitplanungen</i>)	211	9,80	89	73	49
Local government reorganization (<i>Gebietsreform</i>)	24	1,12	8	12	4
Miscellaneous (<i>Sonstiges</i>)	88	4,09	36	10	42
Mobile communications (<i>Wirtschaft: Mobilfunk</i>)	115	5,34	59	14	43
Σ	2,155	100	886	621	648

Notes: Source: Mehr Demokratie Bayern e.V.

the necessary infrastructure (i.e. roads) to develop further residential area. As already mentioned in Section 2, if the underlying effect is the reputation loss of politicians, the topic of the initiative becomes less important.

4 Spatial Spread of initiatives in Bavaria

The literature review from Section 2 already indicated some of the important mechanisms (signature requirements, dissatisfaction with representative democracy) that explain the occurrence of initiatives. In addition, we suppose a learning effect of citizens when initiatives take place in neighboring municipalities. By observing an initiative in a neighboring municipality, inhabitants become aware of the instrument of citizen initiatives, given that it is a rather new instrument of participation. Therefore, it is more likely that inhabitants will use local initiatives themselves if they want to participate in local political process, after observing this instrument at their neighbors.

This idea is supported by examining the spatial pattern of the initiatives over time in Figure B.3 in the Appendix. There are some hot spots in the beginning, i.e. 1995 or 1996. Visual inspection suggests that, over time, new local initiatives gradually evolve around municipalities that already experienced an initiative. The spread follows a concentric pattern, which lends more support to our learning citizen hypothesis.

If we aggregate initiatives over NUTS2 (NUTS3) regions and years, there is a strong linear

relationship between the probability of having an initiative and the share of neighbors that had an initiative. This is illustrated for NUTS2 regions in Figure B.1 in Appendix B and for NUTS3 regions in Figure B.2 in Appendix B. Based on inspection, we also note that the effect becomes weaker with a more disaggregated observation unit, but still remains significant.

In a next step we want to formally describe this relation between initiatives and neighbors having an initiative at the municipality level.⁵ The resulting descriptive OLS regression looks as follows:

$$\text{Init}_{it} = c_0 + \rho \cdot \text{Neighinit}_{it} + \beta X_{it} + \mu_i + \tau_t + \epsilon_{it} \quad (1)$$

$$\text{with } \text{Neighinit}_{it} = \frac{1}{N_i} \sum_{j=1}^{N_i} \sum_{T=0}^{T_{max}} \text{Init}_{jt-T}$$

Here, Init_{it} is a binary variable that takes the value of one when municipality i experiences an initiative at time t . c_0 denotes the constant, μ_i and τ_t are municipality and time fixed effects, respectively. Our coefficient of interest is ρ which indicates the share of neighbors⁶ that had an initiative in time t . We keep the expression of Neighinit_{it} as flexible as possible with regard to the time frame. In our basic specification, we will only allow for contemporaneous influences of neighboring municipalities. In further specifications, we will extend T_{max} with respect to further lags in the past since it is likely that learning effects unfold their maximal efficiency after a certain time. X_{it} denotes demographic control variables.

We expect $\rho > 0$, so that spillovers are positive: if neighboring municipalities use initiatives, the probability of having an initiative in the given municipality increases.

The resulting model estimates the probability of observing an initiative in a given municipality in a given year. These models are also known as discrete-time binary choice

⁵German municipalities are classified as LAU-1 regions and are lower administrative units than the NUTS2 regions, which are counties. Please note that independent cities are simultaneously NUTS3 and LAU-1 regions.

⁶We consider municipalities to be neighbors if they share a common border. In further specifications, we use as well the neighbors of neighbors, i.e. neighbors of contiguity second order.

models. The neighbor spillovers are assumed to be constant over time and unit (ρ is not indexed by i or t), but we allow for different intercepts in each year via the yearly fixed effects. The baseline "hazard" of observing an initiative thus changes each year. To control for different initiative usage patterns in municipalities of different size and urbanization degree, we include a squared and cubic population term as well as the population density in the vector of control variables X .

The results of the linear probability model are shown in Table 2. Column (1) and (2) show the results of a pooled estimation with and without control variables. Model (3) and (4) show the impact of year and municipality FE separately. Column (5) shows the full model results including both kinds of fixed effects. We extend the dependent variable with respect to the last two years in column (6).

Throughout Model (1) to (4) in Table 2, one can observe that the covariates as well as the year and municipal fixed effects each explain some part of the occurrence of local initiatives.

Since the coefficient for neighboring initiatives in column (5) seems rather small, some clarifications are necessary. From 1996 until 2011, the baseline probability of having a local initiative in municipality i in year t is 4.8%. Given the fact that on average 14.15% of the neighbors experienced an initiative within the observation period, neighboring initiatives increase the probability by ten percentage points. Since the spatial spread of the initiatives follows a concentric pattern and a lot of units do not have any neighboring initiatives within the period, this effect can be interpreted as a lower bound. Therefore, we consider this to be an effect of a reasonable size providing a valid instrument in Section 5.

The extended time frame in (6) might be necessary for two reasons. First, as already argued, the learning effect of initiatives might need some time to become effective. Second, our explanatory variable does not have a lot of variation, which can be seen in Table A.1 in Appendix A. To overcome this problem, we extend the variation by enlarging the time frame for initiatives.

By extending the dependent variables to account for initiatives in the given or the preceding two years, the baseline probability increases to 12.47%. Again, evaluating the effect of neighboring initiatives at its mean, the lower bound of 9.9% remains literally the same.

Table 2: Linear probability of having an initiative 1996 - 2011

	Dep Var: Init _{it} (1/0)					Init _{it,t-1,t-2} (1/0)
	(1) Pooled	(2) Pooled	(3) FE	(4) FE	(5) FE	(6) Last three years
Neighboring init _{j,t,t-1,t-2}	0.081*** (0.008)	0.061*** (0.008)	0.068*** (0.008)	0.057*** (0.009)	0.034*** (0.009)	0.087*** (0.019)
Population in 1.000 _{it}		0.005*** (0.000)			-0.022* (0.012)	-0.024 (0.019)
Population _{it} ²		-0.102*** (0.015)			0.154 (0.288)	0.616* (0.370)
Population _{it} ³		0.005*** (0.001)			-0.005 (0.013)	-0.028* (0.016)
Population density _{it}		0.004 (0.008)			-0.017 (0.169)	-0.638 (0.416)
Constant	0.037*** (0.001)	0.014*** (0.002)	0.093*** (0.004)		0.214*** (0.046)	0.358*** (0.076)
Municipality FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	Yes	No	Yes	Yes
N	32896	32896	32896	32896	32896	32896
R ²	0.0043	0.0452	0.0133	0.0016	0.0144	0.0185

Notes: Dependent Variable: Dummy initiative in t. Robust Standard Errors in parenthesis *Source*: Own calculations.

5 Empirics

5.1 Main specification

So far, we have shown a spatial spread of initiatives which suggests that citizens learn or get inspired from neighboring initiatives. In this Section, we will use this phenomenon to estimate a causal effect of local initiatives on the finished area in municipalities via an instrumental variable strategy. Our second stage to be estimated is formally given as follows:

$$Y_{it} = c_0 + \lambda \sum_{T_{min}}^{T_{max}} \text{init}_{i,t-T} + \beta X_{it} + \mu_i + \tau_t + \epsilon_{it} \quad (2)$$

In equation (2), Y_{it} is our outcome variable, i.e. the finished residential area per capita in municipality i at year t . c_0 denotes the intercept, X_{it} the explanatory variables. Again, municipality and year fixed effects are denoted by μ_i and τ_t .

Our coefficient of interest is λ which represents the effect of having an initiative in a further to be defined time in the past. This means that we will specify different points

in time and intervals to isolate the period initiatives become effective in. In other words, we will not yet define the exact time for initiatives to have an effect, but we will instead estimate the basic model with different specifications of T_{min} and T_{max} .

Simply regressing residential area on the lagged probability of having an initiative will give biased results. First, common shocks within the municipality might be jointly correlated with past initiatives and provided residential area. Second, it is not clear whether the urban development process triggers initiatives or citizen participation shapes the process. We use a lagged specification for initiatives to ensure some exogeneity. However endogeneity should still remain. Third, we know from Section 3 that, overall, Bavarian municipalities experienced a decreasing trend in finished residential area per capita. Therefore we need to separate this negative time trend from a causal effect of initiatives.

Our first stage thus appears as defined in (1). However, we keep the time component more flexible by not defining a specific interval for T_{min} and T_{max} yet.

$$\sum_{T_{min}}^{T_{max}} \text{init}_{i,t-T} = c_0 + \rho \sum_{T_{min}}^{T_{max}} \text{Neighinit}_{j,t-T} + \beta X_{it} + \mu_i + \tau_t + \epsilon_{it} \quad (3)$$

In a first step, we will regress different specifications of T_{min} and T_{max} , while keeping the difference between both variables identical for comparison purposes. In order to exploit the dataset as extensively as possible, we supplement the used observations with each lag. These results for the second stage while are illustrated in Table 3.

We vary T_{min} and T_{max} up to a maximum of ten years in the past, i.e. in our maximum lagged specification ($T_{min} = 8; T_{max} = 10$) an initiative will have an influence eight to ten years after it took place. On the other hand, $T_{min} = 0$ implies a contemporaneous effect of initiatives on finished residential area.

All weak identification tests are passed independently of the time frame. This gives us more confidence about the relevance of our instruments. Furthermore, the coefficient for initiatives shows a significant effect after five to nine years. We come to this conclusion by referring to the only significant estimators from row (6) to (8). Before this time frame and afterwards, the coefficient remains insignificant.

Table 3: Finished residential area per capita with different time frames for local initiatives.

	Explanatory variable	Years	Coeff	SE	N	Cragg-Donald Wald F	Kleibergen-Paap rk Wald F
(1)	$\text{init}_{i,t,t-1,t-2}$	(1998 - 2012)	-0.127	(0.196)	30840	41.644	32.588
(2)	$\text{init}_{i,t-1,t-2,t-3}$	(1999 - 2012)	-0.053	(0.188)	28784	39.702	31.247
(3)	$\text{init}_{i,t-2,t-3,t-4}$	(2000 - 2012)	0.066	(0.163)	26728	47.748	37.639
(4)	$\text{init}_{i,t-3,t-4,t-5}$	(2001 - 2012)	0.122	(0.152)	24672	50.115	39.532
(5)	$\text{init}_{i,t-4,t-5,t-6}$	(2002 - 2012)	-0.098	(0.123)	22616	72.778	57.266
(6)	$\text{init}_{i,t-5,t-6,t-7}$	(2003 - 2012)	-0.349***	(0.114)	20560	87.078	68.897
(7)	$\text{init}_{i,t-6,t-7,t-8}$	(2004 - 2012)	-0.272**	(0.112)	18504	85.653	67.641
(8)	$\text{init}_{i,t-7,t-8,t-9}$	(2005 - 2012)	-0.239**	(0.119)	16448	70.729	57.317
(9)	$\text{init}_{i,t-8,t-9,t-10}$	(2006 - 2012)	0.010	(0.147)	14392	40.786	36.559

Notes: Dependent variable: finished residential sqm per capita. Estimations include municipality and year fixed effects. Control variables are Population in level, squared and cubic terms as well as population density. Robust Standard Errors in parenthesis
Source: Own calculations.

Due to the highest statistical significance, we prefer model (6) in Table 3 and will use it as baseline specification in our paper. Again, some clarifications regarding the magnitude of the coefficient are necessary. In the given observation period (2003 - 2012), the mean (std) of finished residential area per capita was 0.396 (0.350). Given our instrumental variable strategy, we can assume that a municipality randomly experiences an initiative with a probability of 12%. Therefore, the negative mean effect of initiatives on the finished residential area per capita is about 10% $((-0.349 \cdot 0.12) / 0.396)$. This suggests that there is a moderate negative effect of initiatives on provided residential area which is around 10% of the finished area.

This effect is of a rather small size but economically significant. It is unlikely that a single local initiative would change the entire urban development plan. Instead, the land use policy might be conducted more hesitant, but the original path will not be broken. This makes it reasonable to assume that initiatives cause a modest negative dip that intensifies the overall negative trend of urban development.

In further examinations, we vary the difference between T_{min} and T_{max} to explore the robustness of our estimators more deeply. The results are shown in Table A.2 in Appendix A. Models (1) to (5) explore only one year periods referencing to the lag and the year before. Models (6) to (10) extend the time frame considering up to three more periods and (11) to (13) consider even up to four periods.

Even when we change the time frame where initiatives have an effect, the impact of five to nine years after the initiative is still found. This leads us to the conclusion that our

variable of interest is robust to changes in the specification. Most of the variation seems to occur six to seven years after the initiatives took place. This is evident when observing the results in row (3), (4), (7) and (8). It is also worth noting that our effect becomes fuzzy when using up to four year lags. This is reflected by the decreased significance from row (11) to (13), where the 10% significance level is never passed. This is the reason why we abstain from using up to 5 year periods. These results increase our confidence in the estimation method and so far our achieved baseline results. However, we should be cautious to avoid accounting for a too broad time frame for initiatives to become effective.

As additional robustness checks, we included contiguous neighbors of second order as well, i.e. neighbors that share a border with the neighbors of the given municipality. These results are shown in Table A.3 in Appendix B. It might be possible that our baseline spatial identification is too limited to capture the real impact of initiatives. On the other hand, one might suspect a bias concerning the neighboring initiatives, i.e. the more neighbors the higher the impact becomes.

This can be described by the number of neighbors. On average, municipalities have a mean of 5.52 (std. 1.85) neighbors of first order contiguity. When the second order neighbors are included the municipalities have a mean of 18.32 (std. 5.48) neighbors. Throughout all specifications, the magnitude and significance of the effect of initiatives show the same patterns as in our baseline results in Table 3. We observe from row (1) to (9) that the weak identification tests for the first stage becomes stronger than the baseline results in Table 3. However, the magnitude and significance so far found regarding the coefficient of interest in the second stage remains unchanged. This also holds for model (8), where the 5% significance level is just barely missed (p-value of 0.051).

In a last exercise for this Section, we explore the impact of different sets of covariates on our baseline results in Table 4. In (1) we again run the baseline regression with a naive OLS regression. In (2) we use our baseline 2SLS specification without any covariates, i.e. only our variable of interest and the fixed effects in both dimensions. (3) adds potential controls for the housing market to ensure that our instrument does not accidentally catch any noise from the real estate markets. As housing market controls we include, with a time lag of T_{min} , i.e. 5 years, the net per capita migration, stock of residential area per sqm and sales prices per sqm in Euro. We do not include these estimations in our baseline model to avoid potential endogeneity problems. Model (4) replaces the

finished sqm per capita with the approved square meter per capita. Model (5) and (6) use different dependent variables, namely approved and finished non-residential area per capita.

Table 4: Tests for sensitivity to methods and covariates

	Finished sqm pc			Approved sqm pc	Finished build pc	Approved build pc
	(1) OLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
$\text{init}_{i,t-5,t-6,t-7}$	0.000 (0.008)	-0.345*** (0.114)	-0.356*** (0.115)	-0.383*** (0.117)	0.347 (0.306)	0.005 (0.299)
Population Controls _t	Yes	No	Yes	Yes	Yes	Yes
Housing Market Controls _{t-5}	No	No	Yes	Yes	No	No
N	20560	20560	20560	20560	20560	20560
R ²	0.1041	-	-	-	-	-
Cragg-Donald Wald F	-	87.814	86.113	87.078	87.078	87.078
Kleibergen-Paap rk Wald F	-	68.826	68.258	68.897	68.897	68.897

Notes: Estimations include municipality and year fixed effects and use data from the years 2003- 2012. Control variables are Population in level, squared and cubic, population density. As controls for the housing market, the 5 year lag of net per capita migration, stock of residential area per sqm, sales prices per sqm are included. Robust Standard Errors in parenthesis
Source: Own calculations.

Our results show that the OLS approach in (1) neglects the influence of initiatives on housing due to the potential endogeneity of local initiatives. (2) and (3) show that the population covariates and the housing market covariates do not substantially change the result. Due to the aforementioned endogeneity concerns, we exclude these variables out in further robustness checks. (4) shows that initiatives as well seem to have an influence on the newly approved residential area per capita, which suggests that initiatives might also have changed the mindset of local politicians. On the other hand, we do not see any effect of initiatives on the finished and approved non-residential area.⁷ This reassures us that the channel through which initiatives affect local land planning is rather the residential area that affects citizens directly than the building area located far away from residences.

5.2 Robustness

So far, we demonstrated that our instrument works independently of the time horizon considered for initiatives to take effect. However, one might still question the source of the variation. Possible objections might be that only certain city sizes or certain kinds of initiatives drive the variation. In the following section, we will take these issues into account.

⁷This effect remains unchanged when we change the time horizon as we did before regarding the residential area.

By examining the distribution of initiatives in detail, one can see that larger municipalities are associated with a higher likelihood of receiving an initiative within the observation period. Since a scarcity of space is especially present in urban areas, one might argue that our coefficient just reflects the lack of space in urban regions. Therefore, we exclude municipalities based their number of inhabitants according to different criteria. The results are shown in Table 5.

Column (1) gives the baseline results for comparison. In (2) we exclude independent cities (*Kreisfreie Städte*) and major county towns (*Große Kreisstädte*). In (3) and (4) we verify the variation in smaller municipalities by considering only municipalities with a population constantly below 10,000 and 5,000 inhabitants, respectively, between 2003 and 2012. In (5) we only keep municipalities with a population above 5,000. Please note that even though we exclude certain observations, they still might indirectly affect the first stage through neighboring observations.

The results remain significant throughout columns (1) to (4), irrespective of the subsamples that are selected. It is interesting to note that the exclusion of the larger municipalities (that had more local initiatives) does not change the results. In column (5), however, the coefficient still remains negative but becomes insignificant.

Table 5: Different municipal sizes

	Dependent var: finished sqm per capita 2003 - 2012				
	(1)	(2)	(3)	(4)	(5)
	Reference	No big cites	only pop<10000	only pop<5000	only pop>5000
init _{<i>i,t-5,t-6,t-7</i>}	-0.356*** (0.115)	-0.385*** (0.125)	-0.343*** (0.117)	-0.419** (0.165)	-0.149 (0.321)
Population Controls	Yes	Yes	Yes	Yes	Yes
N	20560	20020	18230	14960	2800
Cragg-Donald Wald F	86.113	77.869	98.711	63.775	4.063
Kleibergen-Paap rk Wald F	68.258	60.494	72.436	45.442	2.727

Notes: Dependent variable: Residential area in square meter per capita. Estimations include municipality and year fixed effects. Control variables are Population in level, squared and cubic terms as well as population density. (1) is the baseline model. (2) excludes independent cities and big cities. (3) uses only municipalities with a constant population below 10,000 between 2003 and 2012. (4) is similar to (3) but with a threshold of 5,000. (5) uses only estimations with constantly more than 5000 inhabitants. Robust Standard Errors in parenthesis *Source:* Own calculations.

So far, we used all available initiatives in our research. The critical reader might argue that some kinds of initiatives might not even have an indirect effect on housing. While it is likely that prevented road construction changes the accessibility of potential residential areas, a local government reorganization (*Gebietsreform*) or a change of the municipal constitution should not even indirectly affect the urban development process. Therefore,

we establish certain subcategories which show that our model remains valid even though we limit the amount of potential referendums. This is illustrated in Table 6. In column (1), we limit the utilized referendums to topics which we consider relevant in regard to housing provision, for example referendums that affect the infrastructure process.⁸ Furthermore, in (2) we exclude initiatives that turned into referendums and were rejected. Afterwards, we use only referendums that were succesful in (3), and in (4) we exclude initiatives that were initiated by the municipal council. It is worth noting that for all excluded subcategories we use only the same style neighboring initiatives as instrument.

Table 6: Different subcategories of initiatives

	(1) relevant	(2) drop declined	(3) onlysuccess	(4) onlycitizen
$\text{init}_{i,t-5,t-6,t-7}$	-0.628*** (0.234)	-0.419** (0.188)	-1.207*** (0.462)	-0.323*** (0.109)
Population Controls	Yes	Yes	Yes	Yes
N	20560	20560	20560	20560
Cragg-Donald Wald F	29.124	41.072	16.474	98.982
Kleibergen-Paap rk Wald F	23.898	32.681	13.172	76.946

Notes: Dependent variable: Residential area in square meter per capita. Estimations include municipality and year fixed effects. Control variables are Population in level, squared and cubic terms as well as population density. Robust Standard Errors in parenthesis *Source:* Own calculations.

In Table 6, one can see that the effect remains significant using the subsamples of local initiatives. Excluding initiatives according to certain criteria gives the results that we would have expected. Especially interesting is that restricting the topics to the ones that we assume to be relevant, leads to a doubling of the coefficient in model (1). The exclusion of rejected initiatives leads to a slight increase of the effect of initiatives, as can be seen in (2). This also shows that initiatives which did not turn into a referendum have an influence on the land use patterns in a municipality. In (3) we see that using only initiatives that were successful has an even stronger effect. Nevertheless, we do not use any of the so far estimated models as our main specification, since we believe that the overall presence of initiatives affects urban planning. We would thereby limit the used initiatives even more, which would cause a decline in variation. It is worth noting that there are no differences between citizen and county initiatives, as can be seen in (4).

We remark as well that our instrument is in need of a lot of observations to be a relevant one. This "hunger" can be seen by referring to model (1) until (3). Here, we see reduced

⁸We removed all initiatives with the topics of fees, constitution, local government reorganization and mobile communications

but still significant first stage weak identification tests for the estimates. To reassure ourselves of the validity of our instrument, we replicate the results in (3) with a Limited Information Maximum Likelihood approach to control for possibly weak instruments in light of the low first stage statistic. The results remain unchanged.

Some last reassuring tests are conducted in Table A.4 in Appendix A. In column (1) and (2), we limit the variation of our dependent variable by taking its first differences. This accounts for municipality specific time trends in addition to the year and municipality fixed effects. The coefficient still remains significant in column (1) at the 10% level, which reassures us that our model does not pick up the negative time trend.

Column (3) and (4) show the log specification of per capita and levels⁹. Again, the negative coefficient remains significant. Finally, we split our sample in two equally large parts (T=5) from 2003 until 2007 and 2008 until 2012, which is shown in (5) and (6) in Table A.4. One can see that most of the variation stems from the initial period of initiatives between 1996 and 1999 where most initiatives happened. However, the substantially lower first stage statistics convince us to stay with the entire sample to exploit the full data set and to satisfy the already mentioned "hunger" of our instrument.

6 Conclusion

By using neighboring initiatives as an instrument for the occurrence of an initiative in a given municipality, we show a negative impact of initiatives on finished residential area per capita. Evaluated at the mean, this effect amounts to about 10% on the finished residential area per capita. This effect takes place within five to nine years after the initiative was conducted.

The results regarding the first and the second stage as well as the effective time frame are remarkably robust with regard to different specifications. We also learned that our instrument has a significant influence. However, it is in need for a large number of observations in order to pass the weak instrument test.

Our main findings show that local initiatives make local politicians more cautious. They are therefore more hesitant to provide new residential areas. However, by interpreting

⁹Municipalities without any finished residential area per capita got a 1 assigned.

these results, one should keep in mind that Bavaria experienced a declining trend of municipal areas.

We also touched the important question of the effects of initiatives. Despite identifying the negative effect, we cannot know if we observe the myopic inhabitant or the median voter that wants to prevent urban sprawl. This could be an interesting aspect for future research.

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A Appendix - Tables

Table A.1: Variation of Neighbors over time.

Year	Mean	Std. Dev.	Min	Max	N
ShareNeighbors 95	0.031	0.086	0	1	2056
ShareNeighbors 96	0.121	0.156	0	1	2056
ShareNeighbors 97	0.111	0.148	0	1	2056
ShareNeighbors 98	0.073	0.126	0	1	2056
ShareNeighbors 99	0.055	0.106	0	1	2056
ShareNeighbors 00	0.045	0.106	0	1	2056
ShareNeighbors 01	0.046	0.102	0	1	2056
ShareNeighbors 02	0.029	0.077	0	1	2056
ShareNeighbors 03	0.046	0.097	0	1	2056
ShareNeighbors 04	0.048	0.107	0	1	2056
ShareNeighbors 05	0.045	0.111	0	1	2056
ShareNeighbors 06	0.038	0.091	0	1	2056
ShareNeighbors 07	0.052	0.106	0	1	2056
ShareNeighbors 08	0.050	0.104	0	1	2056
ShareNeighbors 09	0.070	0.118	0	1	2056
ShareNeighbors 10	0.054	0.104	0	1	2056
ShareNeighbors 11	0.024	0.076	0	1	2056

Notes: Source: Own calculations.

Table A.2: Basis specifications with different time frames.

Lag structure	Years	Coeff	SE	N	Cragg-Donald Wald F	Kleibergen-Paap rk Wald F
1 year						
(1) $\text{init}_{i,t-4,t-5}$	(2001 - 2012)	-0.006	(0.153)	24672	58.362	41.597
(2) $\text{init}_{i,t-5,t-6}$	(2002 - 2012)	-0.231*	(0.139)	22616	69.660	49.848
(3) $\text{init}_{i,t-6,t-7}$	(2003 - 2012)	-0.524***	(0.151)	20560	68.349	49.270
(4) $\text{init}_{i,t-7,t-8}$	(2004 - 2012)	-0.301**	(0.148)	18504	54.541	41.155
(5) $\text{init}_{i,t-8,t-9}$	(2005 - 2012)	-0.137	(0.167)	16448	37.431	31.959
3 years						
(6) $\text{init}_{i,t-3,t-4,t-5,t-6}$	(2002 - 2012)	0.079	(0.144)	22616	47.885	39.280
(7) $\text{init}_{i,t-4,t-5,t-6,t-7}$	(2003 - 2012)	-0.277**	(0.125)	20560	67.652	55.673
(8) $\text{init}_{i,t-5,t-6,t-7,t-8}$	(2004 - 2012)	-0.233**	(0.106)	18504	87.482	71.233
(9) $\text{init}_{i,t-6,t-7,t-8,t-9}$	(2005 - 2012)	-0.207*	(0.106)	16448	85.499	68.773
(10) $\text{init}_{i,t-7,t-8,t-9,t-10}$	(2006 - 2012)	-0.037	(0.118)	14392	62.992	51.789
4 years						
(11) $\text{init}_{i,t-4,t-5,t-6,t-7,t-8}$	(2004 - 2012)	-0.177	(0.124)	18504	63.260	50.814
(12) $\text{init}_{i,t-5,t-6,t-7,t-8,t-9}$	(2005 - 2012)	-0.183*	(0.108)	16448	81.283	65.521
(13) $\text{init}_{i,t-6,t-7,t-8,t-9,t-10}$	(2006 - 2012)	-0.033	(0.110)	14392	76.398	62.175

Notes: Dependent variable: finished residential sqm per capita. Estimations include municipality and year fixed effects. Control variables are Population in level, squared and cubic terms as well as population density. Robust Standard Errors in parenthesis
Source: Own calculations.

Table A.3: Basic specifications with different time frames and second contiguity neighbors.

Variable	Years	Coeff	SE	N	Cragg-Donald Wald F	Kleibergen-Paap rk Wald F
(1) $\text{init}_{i,t,t-1,t-2}$	(1998 - 2012)	-0.188	(0.147)	30840	72.617	52.055
(2) $\text{init}_{i,t-1,t-2,t-3}$	(1999 - 2012)	-0.076	(0.144)	28784	66.642	48.188
(3) $\text{init}_{i,t-2,t-3,t-4}$	(2000 - 2012)	0.084	(0.135)	26728	68.921	50.093
(4) $\text{init}_{i,t-3,t-4,t-5}$	(2001 - 2012)	0.189	(0.124)	24672	75.694	54.739
(5) $\text{init}_{i,t-4,t-5,t-6}$	(2002 - 2012)	-0.073	(0.106)	22616	92.468	67.051
(6) $\text{init}_{i,t-5,t-6,t-7}$	(2003 - 2012)	-0.302***	(0.102)	20560	107.610	79.539
(7) $\text{init}_{i,t-6,t-7,t-8}$	(2004 - 2012)	-0.199**	(0.098)	18504	108.481	77.649
(8) $\text{init}_{i,t-7,t-8,t-9}$	(2005 - 2012)	-0.190*	(0.097)	16448	94.256	68.038
(9) $\text{init}_{i,t-8,t-9,t-10}$	(2006 - 2012)	0.010	(0.129)	14392	52.816	45.092

Notes: Dependent variable: finished residential sqm per capita. Estimations include municipality and year fixed effects. For the first stage, neighboring initiatives from first and second contiguity order neighbors were used. Control variables are Population in level, squared and cubic terms as well as population density. Robust Standard Errors in parenthesis
Source: Own calculations.

Table A.4: Further robustness

	(1)	(2)	(3)	(4)	(5)	(6)
	Linear change Δ finish pc	Δ approved pc	logs log finish pc	log finish	2003 - 2007 finish pc	2008 - 2012 finish pc
init _{<i>i,t-5,t-6,t-7</i>}	-0.274* (0.157)	-0.213 (0.150)	-0.642** (0.291)	-1.135* (0.595)	-1.149*** (0.296)	0.066 (0.250)
Population Controls	Yes	Yes	Yes	Yes	Yes	Yes
Residential Market Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	20560	20560	20560	20560	10280	10280
Mean effect of initiative	142%	-	7.2%	2.1%	34.4%	-
Std effect of initiative	8.3%	-	9.8%	6.8%	42.1%	-
Cragg-Donald Wald F	86.113	86.113	86.113	86.113	32.414	15.958
Kleibergen-Paap rk Wald F	68.258	68.258	68.258	68.258	28.379	8.758

Notes: Dependent Variable: Estimations include municipality and year fixed effects. Control variables are Population in level, squared and cubic terms as well as population density. Robust Standard Errors in parenthesis *Source:* Own calculations.

B Appendix - Figures

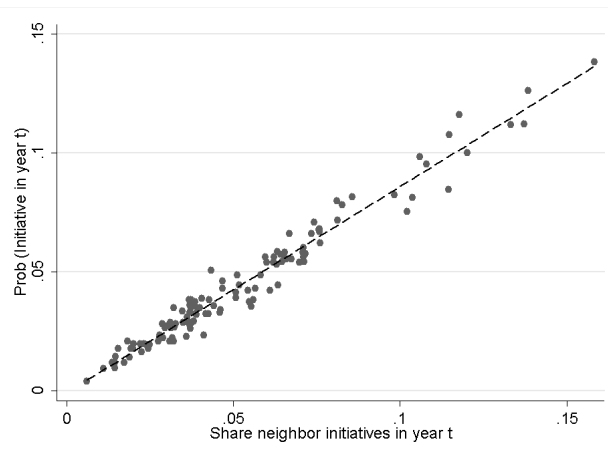


Figure B.1: Initiatives and neighboring initiatives pooled by NUTS2, 1995 - 2011
Source: Own calculations

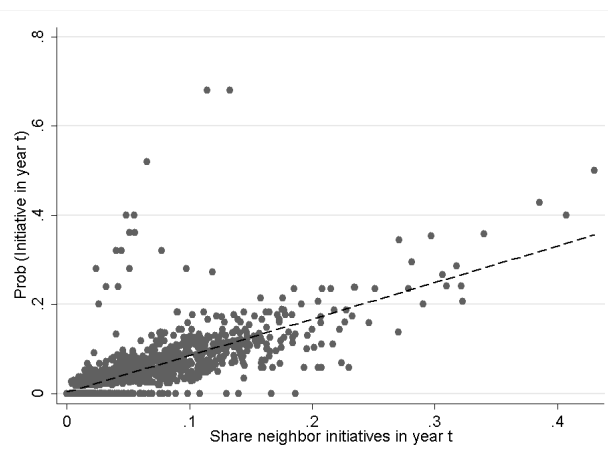


Figure B.2: Initiatives and neighboring initiatives pooled by NUTS3, 1995 - 2011.
Source: Own calculations



Figure B.3: Evolution of non residential area in sqm per capita over time. *Source:* Own calculations