The effect of land consumption on municipal tax revenue: Evidence from Bavaria

Artem Korzhenevych, Sebastian Langer

Leibniz Institute of Ecological Urban and Regional Development, Dresden, Germany

DRESDEN concept

Leibniz Institute of Ecological Urban and Regional Development

Background (1)

- In the year 2000, the growth of settlement and traffic area in Germany reached 129 hectares per day
- German national sustainability strategy: goal of limiting built-up area and transport infrastructure expansion to **30 hectares per day** by 2020
- Similar policies also in Austria, Switzerland, EU as a whole (aim of zero net consumption of land by 2050)
- The aim is to slow down the conversion of undeveloped land and to preserve open areas (biodiversity protection, etc.)
- In 2012-2017, however, daily land consumption for settlement and traffic purposes in Germany still amounted to about 66 hectares (94 soccer fields)

Background (2)

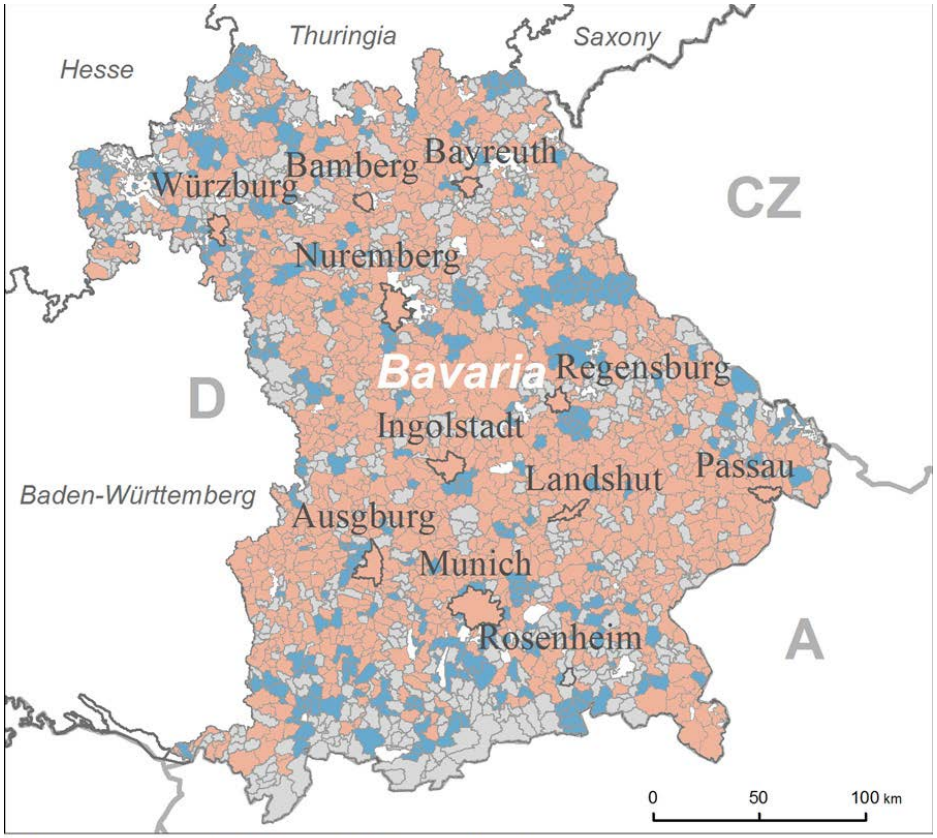
- Competition for tax revenues, jobs, and residents between municipalities
- Conversion of open area as an instrument for attracting new firms and residents and thus, tax revenues (Leviathan theory)
- Local authorities in Germany have a high degree of autonomy in developing and allocating land
- But: Mönnich (2005) and Sbosny and Siebert (2010) speak of “ruinous competition” in this context, that leaves many municipalities with losses rather than profits
- **Research gap: estimate the link between land consumption and tax revenues for a large sample of municipalities**
- Focus on industrial and commercial land use and business taxes

This paper

- Estimates the effect of built-up industrial and commercial (BIC) area changes on business-tax revenues in cross-sectional instrumental variables estimations
- Shows differences between more and less densely populated municipalities
- Draws conclusions on achieving land saving by means of tradable planning permits (TPP)

Study area

- Federal state of Bavaria in Germany
- Largest federal state (12.44 million inhabitants)
- 2056 politically independent municipalities
- Business tax accounts for about 1/3 of all municipal revenues



Data

- Business tax revenue (Gewerbesteuer)
  - Genesis database for Bavaria
  - Tax rate (multiplier) differs across municipalities
- Built-up industrial and commercial area
  - IOER Monitor, based on ATKIS Basic DLM
  - Not reported yearly
  - We calculate the difference between 2013 and 2009
- Other control variables at municipal level: Genesis database
  - Tax multiplier, population, density, total sales, debt level p.c., unemployed p.c., share of employees in manufacturing

Identification

- OLS regression:

$$\Delta TR_i = \beta_0 + \beta_1 \, \Delta BIC\_area_i + \sum \gamma_i \, \Delta X_i + \epsilon_i$$

- Potential endogeneity between built-up area and business tax revenue!
- We use open-space area in 1995 as an instrument for BIC area change between 2009 and 2013
- Open space includes agricultural areas and most of urban open space (parks, urban gardens, recreational areas etc)
- Two-stage least squares estimation with an IV

Main results

	(1)	(2)	(3)	(4)	(5)
	OLS	OLS	IV	IV	IV
Built-up industrial and commercial area change	20.81*** (7.56)	**12.73** (5.49)**	20.52*** (7.84)	16.9*** (4.97)	**12.85*** (3.57)**
Control variables at municipal level	No	Yes	No	Yes	Yes
Business-tax multiplier (one year lagged)		0.015** (0.007)		0.006 (0.004)	0.015** (0.007)
Taxable turnover from products and services		0.005* (0.003)		0.007* (0.004)	0.005* (0.003)
Further controls at county level	No	Yes	No	No	Yes
GDP per capita		0.828** (0.397)			0.827** (0.394)
N	1694	1383	1694	1383	1383
R^2	0.14	0.38	0.15	0.30	0.39

First-stage results:					
Open space 1995			0.003*** (0.0003)	0.003*** (0.0003)	0.003*** (0.0003)
t-value			10.34	9.36	9.20
First-stage diagnostic					
Kleibergen-Paap F-statistic (instrument relevance)			106.99	87.61	84.70

* p<0.1, ** p<0.05, *** p<0.01. Robust standard errors in parentheses.

Urban-rural differentials (IV)

	(1)	(2)	(4)	(5)	(6)	(7)	(8)
Interaction dummy (municipality belongs to certain density quantile or type)	**Top 75 %**	**Top 50 %**	**Top 25 %**	**Top 10 %**	**Top 5%**	**Partially or mostly urban (BBSR)**	**Mostly urban (BBSR)**
BIC area change	7.01*** (3.82)	6.16** (2.8)	6.69** (2.63)	7.27*** (2.24)	6.83*** (2.18)	5.01** (2.48)	7.14*** (2.43)
BIC area change x Interaction dummy	7.25*** (3.44)	13.18*** (3.9)	22.16*** (6.32)	42.62*** (10.97)	53.29*** (13.28)	19.71*** (5.07)	34.61*** (9.02)
Control variables	YES	YES	YES	YES	YES	YES	YES
N	1383	1383	1383	1383	1383	1383	1383
R^2	0.40	0.42	0.45	0.56	0.62	0.44	0.49
First-stage diagnostic:							
Kleibergen-Paap F-statistic	45.59	49.08	51.66	47.67	50.94	39.88	50.93

* p<0.1, ** p<0.05, *** p<0.01. Robust standard errors in parentheses.

- Revenue effect substantially higher effects in urban areas
- Low revenue effect in the periphery

Robustness checks (IV)

	(1)	(2)	(3)	(4)	(5)	(6)
	2009-2012	2010-2013	5-year lag of the tax multiplier	Only positive tax revenue changes	Extreme residuals excluded	Cities with county status excluded
BIC area change	21.09*** (5.58)	10.29** (4.03)	12.54*** (3.56)	14.42*** (4.32)	7.16*** (1.70)	**6.84*** (1.69)**
Wald test (p-value) H_0= coefficient not signif. different from 12.85 (key estimate)	0.1403	0.5263	0.9326	0.7157	0.0008	0.0004
Control variables	YES	YES	YES	YES	YES	YES
N	1472	1339	1383	1044	1373	1363
F	2.33	2.44	2.71	2.78	8.22	3.22
R^2	0.28	0.53	0.39	0.49	0.32	0.09

* p<0.1, ** p<0.05, *** p<0.01. Robust standard errors in parentheses.

- The effect seems to be driven by the most densely populated cities

Discussion

- Cautious comparison with the costs of land development (initial costs of 15-35 €/m^2, yearly maintenance costs of 3-4 €/m^2) suggests that the investigated built-up areas in Bavaria may be profitable, no “ruinous competition”
- Still, in other regions, the balance could be different
- Large differences in the tax effects of BIC area change among municipalities: background for tradable planning permits -> incentivize reduction of land consumption in the periphery
- Implementation of TPPs in Germany not yet foreseen
- More detailed analysis needed: land development data, account for property tax changes, changes in transfer payments

Questions and comments are welcome

a.korzhenevych@ioer.de

Published paper:

S. Langer, A. Korzhenevych (2018)

The effect of industrial and commercial land consumption on municipal tax revenue: Evidence from Bavaria

In: *Land Use Policy* 77 (2018), S. 279-287