



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

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ABSTRACT

This paper aims to quantify the municipal tax-revenue effects of increases in built-up areas. The assumed existence of these effects is one of the key reasons for ongoing land consumption on the part of the municipalities. Some previous case studies have however suggested that these effects may not be large enough, especially in rural municipalities, and would thus make land development unprofitable.

We estimate the effect of built-up industrial and commercial (BIC) area change on business tax revenues in cross-sectional instrumental variable estimations. Based on detailed data for Bavaria, we find that an increase in municipal BIC area has a significant and positive tax-revenue effect. The size of this effect differs sharply between urban and rural municipalities and between cities with different population densities. The positive overall effects become much smaller when large cities are excluded from the sample. Based on these findings, we reflect on the tradable planning permits scheme recently discussed in the literature on land use in the context of policies aiming to limit land consumption. In addition, we relate our estimates to the average municipal costs for land development and undertake a number of robustness checks.

1. Introduction

One important reason for ongoing land consumption in developed countries like Germany (despite low population growth) is the competition for tax revenues, jobs, and residents between municipalities (Krumm, 2001; Pagano, 2003; Brunori, 2004; Bizer, 2005; Zollinger and Seidl, 2005; Wassmer, 2008; Nuissl and Schroeter-Schlaack, 2009). Municipal governments often see the conversion of open area and land development as an instrument for attracting new firms and residents and thus obtaining additional tax revenues (Ladd, 1998; Lewis, 2001; Michaelis, 2002; Wassmer, 2002; Wassmer, 2003; Bizer, 2005; Gottlieb, 2006; Henger and Thomä, 2009; Paulsen, 2013; Brandt, 2014). This is the case particularly in Germany, where the basic constitutional law gives local authorities a high degree of autonomy in developing and allocating land (Siedentop et al., 2009; Henger and Thomä, 2009).

The aim of this paper is to quantify the municipal tax-revenue effects of increases in the built-up area. As explained below, we focus on the built-up industrial and commercial area and its effect on business-tax revenue. Although the tax revenue impact of land consumption is commonly assumed to be intact and strong (Lucy and Fisher, 2000; Wassmer, 2002; Reidenbach et al., 2007; European Commission, 2012), to the best of our knowledge there are no empirical estimates of this

relationship for a large sample of municipalities. Research on this point usually takes the form of case studies. For example, the cost of community service studies (COCS) in the USA usually contains calculations for the fiscal balance of individual land consumption projects (Leighton and Meyer, 1999; Dorfman, 2006). In Germany, relatively few such case studies exist (e.g. Gutsche, 2003; Krause-Junk, 2007; Bizer, 2005; Artmann, 2013).

Indications that the assumed link between land consumption and tax revenues may not be generally valid come e.g. from Mönnich (2005) and Sbosny and Siebert (2010). These authors describe a situation where neighboring municipalities simultaneously choose to convert open areas in order to attract firms and residents as “ruinous competition” that leaves many municipalities with losses rather than profits. Other authors show in particular that municipalities tend to overrate the tax-revenue effects of new industrial and commercial sites (Bade et al., 1993; Gutsche, 2003; Krause-Junk, 2007; Reidenbach et al., 2007; Schweppe-Kraft et al., 2008; Wixforth, 2009). An empirical study of this relationship is thus likely to be relevant for planning practice.

The conversion of land for industrial and commercial use is one component of overall land consumption from which German municipalities may directly expect future tax revenues. After starting their business activities, most newly settled companies in Germany are

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obliged to pay local business taxes. These business taxes constitute a large portion of municipal budgets. In testing the validity and strength of the link between land consumption and municipal tax revenues, this paper thus focuses on the tax-revenue effects of changes in built-up industrial and commercial (BIC) area. This indicator reveals actual land consumption, i.e. the total realization of construction projects for industrial and commercial purposes.

We use data for municipalities in Bavaria in the period 2009–2013. The federal state of Bavaria was selected because in comparison with the other German states, data availability is particularly good. Furthermore, Bavaria's many municipalities are very heterogeneous in size, population density, industrial structure etc. A German-wide analysis was not possible due to lack of synchronized land-consumption data.

In terms of economic theory, this paper is connected to the literature on public choice. One assumption entertained by some authors in this field is that the municipalities' aim is to maximize their tax revenues. This assumption is operative e.g. in the Leviathan theory developed by Brennan and Buchanan (1980), which was later analyzed further by Edwards and Keen (1996) and Feld (2014). According to this theory, local policies are chosen strategically in order to attract mobile production factors. Factor mobility leads to competition between local governments (Feld, 2014). In the context of our paper, one prediction of this theory is that a municipality will actively develop land or allocate open space for industrial and commercial purposes if this is going to attract companies that the municipal government can impose taxes on.

Furthermore, the extensive literature on agglomeration effects and land use (e.g. Verhoef and Nijkamp, 2008; Lin and Ben, 2009; Combes et al., 2012; Ahrend and Lembcke, 2016) suggests that we can expect tax revenue effects from land consumption to be higher in urban than in rural areas. In urban areas, these effects are arguably higher in more densely populated cities. This prediction of heterogeneity in returns to land consumption is fundamental to one of the solutions to the problem of inefficient land consumption, the tradable planning permit scheme (TPP), which is widely discussed in Germany (e.g. Bovet, 2006; Schweppe-Kraft et al., 2008; Davy, 2009; Henger and Bizer, 2009; Bovet et al., 2013; Meub et al., 2016). The TPP scheme has found its way into international debate as well (e.g. Pruetz and Standridge, 2008; Shih and Chang, 2015; Linkous, 2017). These authors argue that TPP is an appropriate economic instrument that may be more effective in managing land consumption than stricter planning controls. The TPP approach is based on a cap-and-trade principle in meeting predefined goals. Under such a scheme, areas with higher land demand will tend to buy planning permits from areas with less land demand once their contingents are exhausted and as long as it is profitable to do so. This coordination process under the TPP scheme then leads to an efficient allocation based on the municipalities' willingness to pay.

This paper fills a gap by providing an empirical study investigating the tax-revenue effects of land consumption for a large sample of municipalities. Specifically, we aim to estimate the effect of BIC area changes on business-tax revenues in cross-sectional instrumental variables estimations. We find a positive and significant effect of BIC area increase on the business-tax revenues of Bavarian municipalities. Furthermore, we detect significant differences between more and less densely populated municipalities. The heterogeneity identified reveals where land consumption is more/less profitable for municipalities. These findings enable us to draw conclusions pertaining to the likelihood of achieving land saving by means of a tradable planning permits (TPP) scheme. Furthermore, we relate our estimates to the costs of land development and can thus reflect meaningfully on the validity of the "ruinous competition" hypothesis.

The paper proceeds as follows: In the next section we describe the data. The third section examines the empirical method and the identification challenges. Section 4 presents and discusses the key results, followed by robustness checks in Section 5. Section 6 discusses the findings in the light of land development costs and tradable planning

permits. Section 7 concludes.

2. Data description

2.1. Business tax

The local business tax is the most important source of revenue for the municipalities in Germany. In particular, in Bavaria it accounts for about than one-third of all municipal revenues (Bavarian State Office for Statistics, 2013). All companies, corporations and unincorporated firms with an exception of freelancers as well as public and agricultural businesses are subject to this tax. Only businesses with positive earnings are taxed – it is a tax on profits. In the study period, about 45 percent of all commercial businesses in Bavaria had a positive tax rate (Bavarian State Office for Statistics, 2012). The tax as such is subject to the principle of equivalence, which means that the businesses do not receive a certain direct benefit from the state for their payments. It is rather meant to carry a part of the municipality's costs (e.g. road construction, infrastructure connection).

According to Article 106 (6) of the German basic constitutional law, municipal governments possess tax sovereignty on impersonal taxes such as property and business taxes (Rudzio, 2011). The business tax is implemented in two steps. The German Business Tax Act (*Gewerbesteuer-gesetz*) defines the general assessment base, which is the firm profit. Thereby, unincorporated firms benefit from a tax-free allowance of 24,500 €. For this reason, many small businesses are virtually exempt from the tax. The profit is first multiplied with the basic tax rate (since 2008: 3.5%), which is uniform nation-wide. In the second step, the actual tax payment is then formed by multiplying the uniform basic tax with a tax multiplier that is set by the municipalities annually. In 2004, a minimum tax multiplier of 200% was implemented nation-wide (Fossen and Steiner, 2018). In Bavaria, this tax multiplier varies widely across municipalities, ranging from 230% to 490%. From 2009 to 2013, 502 of the analyzed 2054 municipalities changed their business tax multiplier, 475 increased it and 27 decreased it. The data on the municipal business-tax revenue as well as on municipal business-tax multipliers for the period 2009–2013 stem from the Genesis database.

2.2. Built-up industrial and commercial area

Bavaria is the largest German federal state (70,550 square kilometers (km²) or 7.055 million hectares) and the second most populous (12.44 million inhabitants). It has 2056 politically independent municipalities. In addition, it has 199 unincorporated areas (mainly lakes and forests), where no land is used for industrial and commercial purposes. We have excluded these areas from our analysis.

Data on built-up industrial and commercial (BIC) area in Bavaria stem from the IOER Monitor¹ (Krüger et al., 2013; Meinel and Krüger, 2014), which is based on official topographical base data, i.e. the so-called ATKIS Basic Digital Landscape Model (ATKIS Basic DLM) of the Authoritative Topographic and Cartographic Information System (Amtliches Topographisch-Kartographisches Informationssystem (ATKIS), 2017). Geometrically and semantically, the ATKIS Basic DLM is the most precise topographical dataset available for Germany (Röber et al., 2009). The update cycles vary among the federal states. In the study period, data actuality for Bavaria was two years behind actual time.

Due to lower frequency of data updating before 2009, the dataset for Bavaria used in this paper covers the years 2009 to 2013 only. For the years before 2009, various other necessary control variables from the Genesis Database² were also unavailable. Because the BIC area data

¹ IOER. Monitor of Settlement and Open Space Development. Online: www.ioer-monitor.de.

² Municipal data was made available from the Genesis database Bavaria.

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