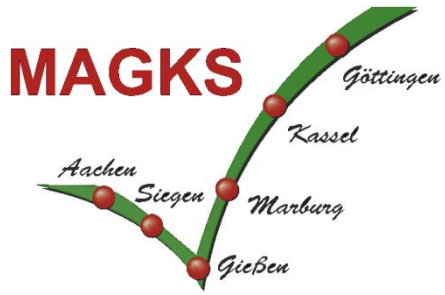

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Does Inter-local Cooperation Reduce the Intensity of Tax Competition? Evidence on Inter-local Industrial Parks in Germany

Does inter-local cooperation reduce the intensity of tax competition?

Evidence on inter-local industrial parks in Germany

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Abstract

We ask whether inter-municipal cooperation serve as a platform by which municipalities coordinate tax policies and reduce the intensity of tax competition. In this paper, we focus on inter-municipal cooperation in form of inter-local industrial parks. We apply the generalized synthetic control method to analyze the causal impact of inter-local industrial parks on municipal tax-setting behavior using data on municipalities from four West-German states between 2000 and 2018. The analysis does not support the notion that inter-local industrial parks constitute a platform used for tax coordination.

Key-words: Inter-local industrial parks, inter-municipal cooperation, tax competition, generalized synthetic control method, Germany

JEL: H25, H77, H71, R58

Statement of interest: no competing interests to declare.

1. Introduction

Inter-municipal cooperation (hereafter IMC) has become increasingly widespread in the industrialized world (e.g., Hulst and van Montfort 2007; Rosenfeld et al. 2016). IMC refers to the voluntary cooperation of municipalities in a distinctly defined set of one or more tasks while it preserves local autonomy in the other tasks. In practice, IMC-arrangements cover a wide spectrum of municipal tasks (Hulst et al. 2009; LeRoux et al. 2010). IMC enables local governments to internalize spillovers and allows especially smaller jurisdictions to exploit economies of scale and scope in the jointly performed tasks (e.g., Feiock et al. 2009). There are many studies assessing the impact of IMC – asking whether existing IMC-arrangements reduce costs and/or increase efficiency in public service production (for a recent survey, Bel and Sebő 2019).

Less attention has been paid to a possible downside of IMC: IMC creates a platform that facilitates the coordination of local policies among union-members that can be used for collusive purposes. In particular, this platform can be used to reduce the intensity of inter-local competition (e.g., Di Liddo and Giuranno 2016; Bischoff et al. 2021). Economists regard inter-local competition to be the primary mechanism behind the positive relationship between decentralization and growth found in many empirical studies (e.g., Hatfield and Kosec 2013; Baskaran et al. 2016). Inter-local competition reduces the leeway of opportunistic governments and forces local governments to set low tax rates and provide high-quality infrastructure and services (e.g., Besley and Case 1995; Martinez-Vazquez et al., 2017). If IMC leads to a reduction in inter-local competition, IMC may be harmful to economic growth.

So far, this downside of IMC has received little attention in the empirical literature.[1] This is where the current paper comes in. We provide an empirical study of the impact of IMC using data from four West-German states in the period 2000 – 2018.We focus on a specific field of inter-municipal cooperation – namely inter-local industrial parks and investigate whether they are used as platforms to reduce inter-local competition. Inter-local industrial parks are a very good testing ground for a number of reasons. First, they require substantial joint investments and thus represent a strong commitment for long-term cooperation (e.g., Bischoff et al. 2021). Second, they are especially suitable for organizing tax coordination because they control important dimensions of the inter-local competition for mobile capital – namely the quality of new local business land and the timing of its development (e.g., Taylor 1992; Bischoff et al. 2021). This control of other dimensions makes it easier to enforce coordination (see Feuerstein 2005). If IMC is used as a tool to reduce inter-local competition, we expect to observed it for inter-local industrial parks. Finally, local business tax rates provide a clear-cut indicator for the intensity of inter-local competition.

We apply the generalized synthetic control method to estimate the causal effect of inter-local industrial parks on local business tax rates. So far, this method has not been applied in studies on local tax-setting behavior. Moreover, we add to the still small body of studies that apply this method to a panel data set with multiple treatment and staggered treatment onset. Our analysis covers 36 inter-local industrial parks founded between 2005 and 2012 involving 89 municipalities in four West-German states. We do not find them to have a significant effect on

[1] Three empirical studies on the impact of the French "Establishments for inter-municipal cooperation" are an exception. They will be discussed in detail in section 2.

local tax rates. Thus, the notion according to which inter-local industrial parks are used as a platform for tax coordination among German municipalities is not supported.

The paper proceeds as follows. Section 2 reviews the relevant literature. Section 3 presents the main hypothesis and data. The empirical strategy is described in section 4. Section 5 presents the results before section 6 discusses the results and concludes.

2. Review of literature

Local tax-setting behavior

Economic theory takes it that local governments compete for mobile businesses and firms (Boyne, 1996; e.g., Oates & Schwab, 1988). There are a number of factors such as education and especially tax policies that may serve as instruments in this competition (e.g., Blair & Premus 1987; Oates & Schwab 1988; Wolkoff, 1992). The most widely studied instruments are local tax rates. The seminal paper by Zodrow and Mieszkowski (1986) and a large number of theoretical papers building on them (Wilson 1999) show that the mobility of capital forces governments to set low tax rates for mobile factors – especially capital. While these models assume governments to be benevolent, Besley and Case (1995) show that essentially the same behavioral patterns can be rationalized by a model that assumes opportunistic incumbents whose aim is to extract rents. In this case, citizens (and firms) compare the bundle of tax rates and public services in their home municipality with the bundle offered in neighboring municipalities. This yardstick competition limits the leeway of incumbents to extract rents through high tax rates. A more recent strand of literature interprets empirical patterns in tax-setting behavior as a result of social learning rather than a form of competition and thus speak of tax-mimicking (e.g., Baskaran 2014). All three interpretations predict the tax-setting behavior to be spatially correlated – a pattern reported in many empirical studies on tax-setting (e.g., Revelli 2001 ; Allers and Elhorst 2005). Hereafter, we will use the term (inter-local) tax interdependence whenever

we refer to the empirical phenomenon but continue to refer the theoretical concepts – in particular inter-local tax competition – whenever the underlying mechanism is meant.

While most studies on inter-local interdependence look at tax-setting behavior, Taylor (1992) turns to the interdependence in infrastructure investments. He argues that time is the main strategic variable: Municipalities can increase the chance of attracting firms if they are faster in providing the necessary infrastructure than their competitors. Jayet and Paty (2006) build a two-stage model of inter-local competition. In stage 1, the municipalities build infrastructure before they compete using tax rates in stage 2. Their model explains why we often see an overprovision of land devoted to business purposes (see also Dembour & Wauthy, 2009). This implies that these tools may be used too extensively and thus municipalities set inefficiently low tax rates and provide too much business-related infrastructure (Jayet & Paty 2006; Riedel et al. 2020; Taylor 1992). Büttner (2006) uses data from Germany to analyze the relationship between tax competition and the amount of land that municipalities dedicate for commercial purposes. He finds that municipalities exposed to more intense tax competition provide a higher amount of commercial land.

Policy coordination and inter-municipal cooperation

Local governments can increase their freedom of maneuver by coordinating their (tax) policies. However, the literature on tax coordination (e.g., Keen & Konrad 2013) points at severe limits in the enforceability of tax agreements (see also Kehoe 1989). In particular, enforceability is limited by the fact that tax rates are just one among many instruments in the competition for mobile capital. The literature also shows that coordination is more difficult among heterogeneous jurisdictions. For instance, the outsider position is found to be particularly interesting for small jurisdictions with large neighbors (e.g., Keen & Konrad 2013). Drawing analogies from the literature on cartels (e.g., Levenstein & Suslow 2006), the likelihood of successful

coordination can be increased if jurisdictions are organized in associations because these facilitate surveillance and side-payments and provide a platform to punish defectors (see Feuerstein 2005).

The critical role of inter-local platforms in the coordination of tax policies provides a link to the literature on IMC. IMC constitutes a platform that allows for the coordination of policies (e.g. Feiock 2009); Bergholz 2018). The scientific literature contains numerous studies on the factors driving the emergence of IMC in a variety of tasks (see Bel and Warner 2016). Among these studies, the study by Bischoff et al. (2021) is closely related to our current study. They provide an empirical analysis on the question whether intra-regional competition fosters inter-municipal cooperation. They apply a hazard model to a panel of more than 6 000 West-German municipalities between 2000 and 2015 and find inter-local industrial parks more likely to emerge among municipalities that – other things equal – have low business tax rates and high land tax rates. The current paper builds on Bischoff et al. (2021) and ask whether the foundation of inter-local industrial parks change local tax-setting behavior in a way consistent with a reduction of inter-local tax competition.

Inter-local competition and IMC

Very few papers address the relationship between IMC and inter-local competition. Di Liddo and Giuranno (2016) analyze the impact of IMC on yardstick competition in a theoretical model. They argue that governments interested in extracting rents make use of IMC because this increases the amount of extractable rents without reducing the probability of re-election. While rent extraction is unlikely to play a major role in industrial parks, the main logic of Di Liddo and Giuranno (2016) clearly applies to industrial parks: Inter-local industrial parks may serve as a means to take the bite out of intra-regional competition for mobile capital.

There are three empirical papers on the French "Establishments for inter-municipal co-operation" (EIMC) that are closely related to the current study. Charlot et al. (2015) analyze the impact of EIMC in urban French municipalities on local business taxes. Using spatial panel models, they find EIMC-membership to lead to higher business tax rates. Breuillé et al. (2018) analyze the impact of EIMC on the rates of four major local taxes using a difference-in-difference approach as well as instrumental variable techniques. They show that the membership in an EIMC increases the overall burden from municipal tax rates considerably while the tax rates imposed by member municipalities themselves decrease. Agrawal et al. (2020) apply a spatial econometrics approach and use historical unions as an instrument for the EIMC formed recently. They find the policy interaction of municipalities within the same EIMCs to be more intense than the interaction with outside municipalities. In sum, these studies support the notion that EIMC reduce the intensity of inter-local tax competition.

EIMC are multi-purpose institutions in charge of a wide range of important municipal tasks. The underlying legislation allows municipalities to share the local tax base with the EIMC or to transfer the right to raise local taxes to it. Since, 2014, the EIMC council is elected by the citizens in the member municipalities. Finally, every municipality was required to be part of an EIMC. This is why Breuillé et al. (2018) regard EIMCs to be an additional layer in the federal system – albeit without mention in the French Constitution. For these reasons, EIMC are a very special case that is by no means representative for IMC-arrangements found elsewhere as these are founded voluntarily, confined to a small set of tasks and do neither have a directly elected council nor the right to raise own taxes.

We are not aware of any study on inter-local tax interdependence and IMC in Germany. However, there are studies that indirectly relate to this topic. Büttner and Schwerin (2016) explore the fact that a strikingly large number of German municipalities apply exactly the same tax rate. They argue that this tax bunching is an indication of partial tax coordination, though

they do not provide any empirical evidence to back this hypothesis. Blesse and Martin (2015) analyze the tax setting behavior of municipalities in the German state North Rhine-Westphalia and find more intense tax interactions among municipalities located in the same county or administrative district (Regierungsbezirk) or covered by the same local newspaper. While these studies indicate that tax coordination takes place where there are networks or organizations of inter-local interaction, they do not explicitly test for the relationship between tax-setting behavior and the establishment of these networks or organizations. This is where our paper comes in.

3. Main Hypothesis and data

Consider a certain municipality m. If tax competition is intense, both citizens and a benevolent local government share the objective to reduce the intensity of tax competition because this increases their budgetary room of maneuver. If governments are opportunistic, the main logic of Di Liddo and Giuranno (2016) applies: Inter-local industrial parks can serve as a means by which local governments can take the bite out of yardstick competition and thereby facilitate rent-extraction without diminishing their re-election prospects.

By establishing an inter-local industrial park, municipalities create an institutional platform that facilitates inter-local coordination in the future. If we combine the main logic of the theory of tax coordination with Taylor (1992)'s theory on competition in infrastructure investments, we see that inter-local industrial parks are a particularly promising instrument in tax coordination: Municipalities that agree on a joint industrial park automatically also agree on a common quality of infrastructure and timing of land development. This implies a commitment not to circumvent a possible agreement on tax policy by shifting the competition to the field of infrastructure quality or the time of finalizing it. Thus, we hypothesize:

Main Hypothesis:

Inter-local industrial parks constitute a platform that is used to reduce the intensity of intra-regional tax competition.

Following the literature on tax interdependence (see section 2), we use the multiplier of the local business tax as the main indicator. The above hypothesis implies that municipalities connected by a joint industrial park set higher business tax rates – other things equal. In the upcoming analysis, we use data on municipalities in the West-German states Hesse, North Rhine-Westfalia, Bavaria and Baden-Wuerttemberg between 2000 and 2018 to test the above hypothesis.[2]

German municipalities provide important public services like local roads, industrial parks or pre-school childcare. They have considerable leeway when choosing quality and quantity of many public services. More than 50 percent of municipal revenues come from unconditional grants distributed through a formula-based fiscal equalization system and from vertical tax sharing (e.g., Büttner 2006). The local business tax is the most important endogenous source of municipal revenues accounting for 18 percent of revenues in West-Germany in 2015. Municipalities set the effective rate on profits of local business establishments by fixing the so-called tax multiplier (applied to a unified tax base). Similarly, they determine the tax multipliers and receive the revenues from local land taxes (e.g., Bischoff & Krabel 2017). The land tax A levied

[2] As the method requires a long and strictly balanced panel, we had to exclude the East-German states because these went through fundamental regional reforms. Some West-German states were excluded because many of their municipalities are organized in multi-purpose organizations (so-called Verbandsgemeinden, Samtgemeinden, Ämter) that perform municipal tasks on their behalf. These organizations may serve as a platform to organize tax policy coordination. In many cases, joint industrial parks are organized within these organizations. This makes it difficult to define an adequate control group. Finally, a few municipalities are dropped from the sample because of missing data.

on land used in agriculture and forestry raises negligible revenues while the land tax B levied on the ratable value of real estate contributes some 5 percent to the budget of West-German municipalities on average (in 2015).[3]

German local governments can regulate the use of land within its borders. Similar to the system of land zoning in the US, German land-use regulation follows the principle of functional zoning. Accordingly, municipalities develop plans of land-usage in which they legally dedicate land to specific purposes (Hirt 2012). Firms are only allowed to operate on land dedicated to business activities. Changes in the plans for land-usage must pass the municipal council and need approval by an upper-tier administration. In most cases, German municipalities play an active role in the developing and marketing and managing business land (e.g., Bischoff et al, 2021). When municipalities are developed jointly, the details of the cooperation is often settled in formal contracts. In many cases, special inter-municipal unions (Zweckverbände) are formed for these purposes (e.g., Bischoff et al. 2021).

Given the lack of official data, we collect data on joint industrial parks from 1) from an extensive study on German joint industrial parks by Wuschansky and König (2006), 2) official data on municipality owned enterprises, 3) official data on administrative unions, 4) federal commercial estate databases. 5) finally, we conduct supplementary internet searches to have a complete data set of joint industrial parks in Germany (see also, Bischoff et al. 2021).[4] For every joint industrial park, we know which municipalities participate and the year in which the

[3] Data on revenue shares from Bundesministerium der Finanzen (2021) and own calculations.

[4] The data on joint industrial parks is complemented by a wide range of official municipal level data provided by the Regional Database of the German Federal Statistical Office and the statistical Offices of the Länder. Further data on the German highway network was kindly provided by Leibniz Institute of Ecological Urban and Regional Development (http://autobahn.ioer.info/).

contractual agreement underlying the joint industrial park was signed. Less than 8 percent of the German municipalities participate in a joint industrial park. Cooperation is more frequent in Western and South-Western states. Some parks date back to the 1970s. Most inter-local industrial parks encompass two cooperating municipalities while parks with four or more partners are rare (e.g., Bischoff et al., 2021).

5. Empirical strategy

To test our main hypothesis, we apply the synthetic control method (SCM). It generalizes the usual difference-in-differences model by allowing for uncontrolled confounders that vary over time (Abadie et al. 2010 ; Abadie 2021). In obtaining the SCM estimator of effects of an inter-local industrial park in a state for year t, t= T_0+1, T_0+2, ..., T, we rely on a donor pool of n municipalities r, r=1,2,...,n, where no joint industrial park exists in the whole period of investigation. The treated area 0 consists of two or more municipalities in which an inter-local industrial park is founded in year T_0.[5]

Let Y_{rt} be the business tax multiplier as the outcome of interest that is observed for all regions r at any year t in the sample period. The effect α_{0t} is given by the difference between the tax multiplier with a joint industrial park, Y_{0t}^F, and without this form of IMC, Y_{0t}^N, in the treated area 0:

(1) $\alpha_{0t} = Y_{0t}^F - Y_{0t}^N$, t=$T_0$+1, T_0+2, ...T.

While the outcome variable Y_{0t}^F is observed for t > T_0, $Y_{0t} = Y_{0t}^F$, the potential tax multiplier Y_{0t}^N is unobservable in the post-treatment period. In the SCM approach, the counterfactual

[5] As inter-local industrial parks can be founded at any time in year T_0, we assess the initial change in business taxes starting in year T_0+1.

Y_{0t}^{N} is estimated by constructing a synthetic control unit that resembles the treated area in its characteristics and outcome in the pre-treatment period as close as possible. The synthetic municipality is represented by an nx1 vector of weights, $\mathbf{w} = (w_1, w_2, ..., w_n)'$, with $0 \leq w_r \leq 1$ and $\sum_r w_r = 1$ for r=1,2,...,n.

Suppose k characteristics are chosen as predictors of the business tax multiplier. Let **X** be a (k+1)xn matrix of k characteristics and a linear combination of the tax multiplier for the control municipalities and $\mathbf{x}_0$ the respective (k+1)x1 vector for the treated area 0 in the pre-treatment period.[6] Optimal weights $\mathbf{w}^* = (w_1^*, w_2^*, ..., w_n^*)'$ can be obtained by minimizing a distance $\|\mathbf{x}_0 - \mathbf{X} \cdot \mathbf{w}\|_{\mathbf{V}}$ for a given positive semidefinite matrix $\mathbf{V} = \text{diag}(v_1, v_2, ..., v_n)$. The constants v_1, v_2, ..., v_{k+1} are weights that reflect the relative importance of the variables in reproducing the characteristics and outcome of the treated region in the entire or a part of the pre-treatment period. For this, Abadie (2021) makes use of the seminorm (Abadie and Gardeazabal 2003; Abadie et al., 2015)

$$(2) \quad \|\mathbf{x}_0 - \mathbf{X} \cdot \mathbf{w}\|_{\mathbf{V}} = \left[(\mathbf{x}_0 - \mathbf{X} \cdot \mathbf{w}) \cdot \mathbf{V} \cdot (\mathbf{x}_0 - \mathbf{X} \cdot \mathbf{w})\right]^{1/2}.$$

V is chosen such as to minimize the mean squared prediction error (MSPE) of the synthetic control with respect to Y_{0t}^{N} in the pre-treatment period,

$$(3) \quad \underset{\mathbf{V} \in O}{\arg\min} \left(\mathbf{z}_0 - \mathbf{Z} \cdot \mathbf{w}^*(\mathbf{V})\right)' \left(\mathbf{z}_0 - \mathbf{Z} \cdot \mathbf{w}^*(\mathbf{V})\right),$$

where O is a set of all positive semidefinite diagonal matrices **V** (Abadie and Gardeazabal 2003; Abadie et al. 2011; Abadie 2021).

[6] In general, several linear combinations of the outcome variable could be included (Abadie and Gardeazabal , 2003; Abadie et al. 2010).

The synthetic control method uses the optimal weights $w_1^*, w_2^*, ..., w_n^*$ to estimate the counterfactual tax multiplier Y_{0t}^N as a linear combination of observed outcomes Y_{rt} in a set of control municipalities:

(4) $\hat{Y}_{0t}^N = \sum_{r=1}^{n} w_r^* \cdot Y_{rt}$.

For a feasible implementation of SCM, we randomly select n=100 control units from the donor pool. With (4), the synthetic control estimator of the effect of inter-local industrial parks α_{0t} is given by

(5) $\hat{\alpha}_{0t} = Y_{0t} - \sum_{r=1}^{n} w_r^* \cdot Y_{rt}$, $t=T_0+1, T_0+2, ...T.$

Abadie (2021) examines the properties of the SCM estimator $\hat{\alpha}_{0t}$ for an underlying linear factor model that does not impose parallel output trends (see also Abadie et al. 2010). Multiple unobserved components are allowed to exert varying effects over time. $\hat{\alpha}_{0t}$ is an unbiased estimator of the effect if the synthetic control reproduces the observed and unobserved characteristics of the treated areas. With regard to the unobserved features the match is favorable when transitory shocks are small. Although the bias bound inversely depends on T_0, a bad fit between $\mathbf{x}_0$ and $\mathbf{X} \cdot \mathbf{w}$ cannot be compensated by an increased pre-treatment period. In particular, the ability of the synthetic control $\hat{Y}_{0t}^N$ to reproduce the path of the tax multiplier Y_{0t} in the pre-treatment period t=1, 2, ..., T_0, is deemed as an indication for a low bias.

Statistical inference of the effect of inter-local industrial parks $\hat{\alpha}_{0t}$ can be based on placebo tests as a special variant of permutation tests (Abadie and Gardeazabal 2003; Abadie et al. 2010; Abadie 2021). In our approach, the treatment is successively assigned to all randomly selected control municipalities of the donor pool. By estimating the placebo effect in the control regions, a permutation distribution of inter-local industrial parks impacts $\hat{\alpha}_{rt}^{PL}$, r=1,2,,,,,n, is

generated. Suppose, SCM estimates a sizeable effect of inter-local industrial parks. If, however, the magnitude is comparable to the placebo effects, we have no confidence that the estimated impact $\hat{\alpha}_{0t}$ is due to the joint industrial park. A causal interpretation presupposes that the magnitude of $\hat{\alpha}_{0t}$ will usually not be achieved in the control communalities.

According to our main hypothesis of rising business tax rates following the agreement of a joint industrial park, one-sided placebo tests are conducted.[7] In order to obtain valid inference, control municipalities with a bad pre-treatment fit of the tax multiplier are excluded from testing.[8] As in a classical permutation test, lead-specific actual significance levels (p-values) can be computed by establishing the rank of the real effect $\hat{\alpha}_{0t}$ in the distribution of the placebo effects (Cavallo et al., 2013). The adjusted p-value at lead h is obtained from the reduced sample of m control municipalities (m≤n) with an acceptable pre-treatment fit (Galiani and Quistorff, 2017):

$$(6) \quad \text{adj p-value}_h = P(\alpha_{r,h}^{PL} \geq \hat{\alpha}_{0,h}) = \sum_{r=1}^{m} I\left(\alpha_{r,h}^{PL} \geq \hat{\alpha}_{0,h}\right) \Big/ m .$$

$\hat{\alpha}_{0,h}$ and $\alpha_{r,h}^{PL}$ are the lead h-specific effects in the treated and control areas, respectively. adj p-value_h is the probability of obtaining at least a large business tax gap as $\hat{\alpha}_{0,h}$ at lead h when no foundation of a joint industrial park takes place.

[7] The one-sided inference can substantially increase the power of the test (Abadie 2021).

[8] Abadie et al. (2011) gauge a bad pre-treatment fit by means of the ratio between the pre-treatment MSPEs of a placebo and the treated unit. Per default a ratio of 20 is used to discard the placebo. However, robustness checks show that our testing results hold for a wide range of MSPE ratios.

6. Results

We apply the SCM to establish causal effects of joint industrial parks formed in the period 2005 – 2012 in the German states Baden-Wuerttemberg, Bavaria, Hesse and North Rhine-Westfalia on business tax multipliers in the subsequent years. In the analysis below, the point in time when the treatment starts is defined as the year in which the formal agreement about the joint industrial park is signed and the platform (mostly administrative unions or municipal enterprises) are founded. Between 2005 and 2012, the four states included in this study saw 36 new agreements on joint industrial parks involving a total of 89 participating municipalities (see figure 1). The majority of these joint industrial parks (20) involved 2 municipalities while only 3 involved more than 5 municipalities. The average number of members is 3.2. Municipalities that started cooperating after 2012 were excluded from the donor pool – leaving us with 3331 municipalities in the donor pool. Figure 2 shows the wide regional dispersion of treatment group (dark blue) and donor pool (blue). Figure 3 shows the distribution of business tax multipliers in donor pool and treatment group for selected years.

[Figure 1 - 3 about here]

We exclude all neighbors of treated municipalities from the donor pool to rule out spillover effects. When generating the synthetic control group, we restrict the relevant donor pool to municipalities from the same state as the treated municipalities to avoid any biases resulting from differences in state regulation or changes in the latter. In each case, 100 randomly selected municipalities from the relevant part of the donor pool are used to construct synthetic controls with respect to all variables described in the data section. We recurred to random sampling because of the size of the donor pools (Bavaria 1619; Baden-Wuerttemberg: 387, Hesse: 298; North Rhine-Westfalia 161). Moreover, a random selection of control units tends to be favorable for a bias bound of the SCM estimator (Abadie et al. 2010; Abadie 2021).

To construct synthetic controls for the treated areas, optimal weights of the selected control municipalities, $w_1^*, w_2^*, \ldots, w_n^*$, and the regional characteristics and pre-treatment outcome, $v_1^*, v_2^*, \ldots, v_{k+1}^*$, have to be determined for all inter-local industrial parks formed over time by state and by year. As a result, we obtain synthetic control regions that resemble the treated areas much more closely than a simple average of the control municipalities. While the similarity is very close for some variables, a nearly perfect match cannot be obtained for all variables (Abadie et al. 2011; Cavallo et al. 2013). However, variables with larger deviations usually have low v-weights and thus only play a subordinate role in the construction of the synthetic controls. This construction process accounts for time-variant uncontrolled confounders as well as variables found to drive the emergence of inter-local industrial parks. These variables captures land scarcity and the quality of transport connections and include demographic, fiscal and political characteristic. A detailed description of the variables used in the construction of synthetic controls is presented in Appendix A.

In Baden-Wuerttemberg, inter-local industrial parks were founded in nearly all years of the period of investigation. In 2005, where nine municipalities founded joint industrial parks, the working hypothesis is clearly rejected as the business tax multiplier of the synthetic control municipality exceeds the average value of the regions with an inter-local industrial park in almost all years of the treatment period. Virtually the same pattern emerges for the joint industrial parks founded in 2008 and 2010 with four and nine treated municipalities, respectively. For municipalities forming a joint industrial park in 2009, a higher multiplier of the synthetic control observed initially seizes to exist after three years (Fig. 1). In this year, only one joint industrial park with two neighboring municipalities was founded.

By contrast, inter-local industrial parks founded in the years 2007, 2011 and 2012 in Baden-Wuerttemberg are associated with a rise in business tax multiplier that is not observed in

comparable municipalities. Placebo tests show that most impacts of inter-local industrial parks in these founding years are at least significant at the 10 percent level. For the industrial park founded in 2007, the increase in tax multipliers proves significant up to five years after the three involved municipalities start cooperating. The foundation of a joint industrial park among three municipalities in 2011 causes weakly significant tax effects with a lag of two years. Finally, turning to the five treated municipalities that started cooperation in 2012, we observe an increase in business tax multipliers after 2015 that cannot explained by chance. In sum, significant increases in business tax multipliers are observed in almost one third of the treated municipalities in Baden-Wurttemberg (Fig.4).

[Figure 4 about here]

In Bavaria, significantly positive differences in the business tax multipliers between treated municipalities and synthetic controls are only ascertained for the two municipalities that founded a joint industrial park in 2005. Placebo tests indicate that these differences are significant at the 10 percent level. Contrary to that, the joint business parks founded in 2006 and 2009 are not found to have a significant impact on business tax multipliers. The majority of inter-local industrial parks are founded in Bavaria in the years 2010 and 2011. In both years, the business tax multipliers in the treated and synthetic control municipalities follow a very similar path. On the whole, placebo tests reveal a causal effect of inter-local industrial parks on business tax multipliers only in 7 percent of the involved municipalities in Bavaria.

[Figure 5 about here]

In Hesse, most joint industrial parks in our sample were founded in 2005, 2006 or 2011. For the founding year 2006, we do not observe any differences in the tax multipliers between the five clusters of municipalities with inter-local industrial park and the synthetic control municipality (Fig. 6). In the two other treatment years, the observed business tax multipliers of the

treated municipalities lie well above their counterfactual in the synthetic control group. The difference in tax multipliers proves weakly significant for the cooperation of three municipalities in 2005 but not significant for those inter-local industrial parks launched in 2011. In all, barely one fourth of treated municipalities in Hesse experience a causal impact of joint industrial parks on local business tax multipliers.

[Figure 6 about here]

Finally, we turn to North Rhine-Westfalia. Joint industrial parks founded in 2007 and 2011 witness an increase in business tax multipliers that is weaker than in the synthetic control municipalities for the whole post-treatment period (Fig. 7). The municipalities starting cooperation in 2010 witness somewhat higher tax multipliers in the post-treatment period yet the placebo tests fail to ascertain statistical significance. Thus, in North Rhine-Westfalia none of the inter-local business parks involve a significant increase in business tax multipliers.

[Figure 7 about here]

In a next step, we redo the above analysis using a different measure for the intensity of tax competition. Namely, we use the ratio of business tax multiplier to the multiplier of land tax B. The rationale behind this measure is the following: The theory of tax competition predicts that municipalities facing intense tax competition for mobile tax bases are forced to resort to other, less mobile tax bases to cover expenditures. The land tax B – levied on real estate and buildings and constructions – is highly suitable for this purpose (e.g. Wellisch 2006; Bischoff et al. 2021). The lower this ratio, the lower the business tax multiplier relative to the land tax multiplier and thus the higher the intensity of tax competition. Our main hypothesis predicts that inter-local industrial parks reduce the intensity of tax competition and thus lead to an increase in the ratio among cooperating municipalities. Redoing the above analysis with this alternative measure does not change our main conclusion (for a concise presentation of results,

see table 1). The estimators for the impact of inter-local industrial parks yield positive signs in some cases and negative ones in others. However, none of the estimators is significant.

[Table 1 about here]

In sum, the results above do not support our main hypothesis. We find no evidence that inter-local industrial parks serve as a platform to coordinate tax policies and reduce the intensity of inter-local tax competition.

7. Discussion and conclusion

In this paper, we focus on municipal tax-setting behavior as a crucial dimension of inter-local competition. The research-guiding logic is the following: There is considerable evidence that decentralization– through its impact on inter-local competition – promotes efficiency and economic growth. This conviction raises concerns that IMC may be used to reduce the intensity of inter-local competition and thus the efficiency gains from decentralization. We take this concern to the test using data on municipalities in four West-German states between 2005 and 2018. Specifically, we test whether inter-local industrial parks formed between 2005 and 2012 reduce the intensity of tax competition the cooperating municipalities face. We use the local business tax multiplier and the ratio of business to land tax multiplier to capture the intensity of tax competition. We apply the generalized synthetic control method to arrive results that allow for a causal interpretation. We find no indication that the agreements about inter-local industrial parks serve as a tool to reduce inter-local tax competition.

These results are not in line with the studies on the role of the French EIMC. These studies show that the formation of EIMC leads to an increase in local tax rates. This difference in results can be explained by the fundamental differences between EIMC and the inter-local industrial parks analyzed in this paper. While the latter represent inter-municipal cooperation in a narrow and clearly defined field of government activity, EIMC are formed to provide a wide array of

different services. They have their own, directly elected council and the right to raise their own taxes. Furthermore, every French municipality has to join an EIMC. This is why Breuillé et al. (2018, p.49) call them "… in practice, an additional level of sub-national jurisdictions…". They are not representative for the phenomenon IMC – defined as the voluntary cooperation of municipalities in a distinctly defined set of one or more tasks that preserves local autonomy in the other tasks (e.g., Feiock, 2009; Bel and Warner 2016).

Contrary to that, the inter-local industrial parks analyzed in our paper clearly belong to this category. Moreover, they represent a highly suitable testing ground for our main hypothesis (see introduction). If IMC is used as a platform to reduce the intensity of inter-local tax competition, we expect to see an effect of inter-local industrial parks on local tax setting behavior. The fact that we do not find any evidence for a competition-reducing effect for inter-local industrial parks suggests that IMC does not go along with a reduction inter-local competition.

Our analysis employs SCM – a method that has not been applied in the context of IMC or tax competition before. Its main advantage is its greater flexibility compared to the difference-in-differences analysis. In particular, unobserved confounders need not to be time-invariant but are allowed to vary over time. While the parallel trend assumption is abandoned, pre-intervention covariates are assumed to have a linear relationship with outcomes post-treatment. Much experience on the application of the synthetic control approach is available for single treated units. Some practical problems occur in the case of multiple treated units when treatment effects are estimated for each treated unit separately and afterwards aggregated (Abadie 2021). Whereas they can largely be avoided by synthetic control analysis with aggregated treated units, experience from applications in the case of multiple treated units is rare.

Our study is not without limitations. Most importantly, we focus on year in which the agreement about launching an inter-local industrial park is reached rather than the year when the first firms actually settle therein. One may argue that this is a rather early stage because

coordination needs time. On the other hand, we do not find the difference in tax multipliers between treated municipalities and synthetic control groups to increase over time. Moreover, the platform “joint industrial park” is established once the inter-local agreement is reached and the interaction among local government officials are likely to be more intense in the early phase of the cooperation when essential decisions are made.

More empirical studies are needed to see whether the results of the current paper can be generalized. Future studies on a possible competition-reducing effects must cover other regions with different institutional settings and different fields of cooperation. In addition, other indicators have to be analyzed. The model by Di Liddo and Giuranno (2016) suggests that budgetary measures capturing managerial slack are promising in this respect. Such measures can be used to capture the impact of IMC on the intensity of yardstick competition in numerous fields of local government activity.

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Figures

Figure 1: Municipalities forming a new inter-local industrial parks between 2005 and 2012 (by state)

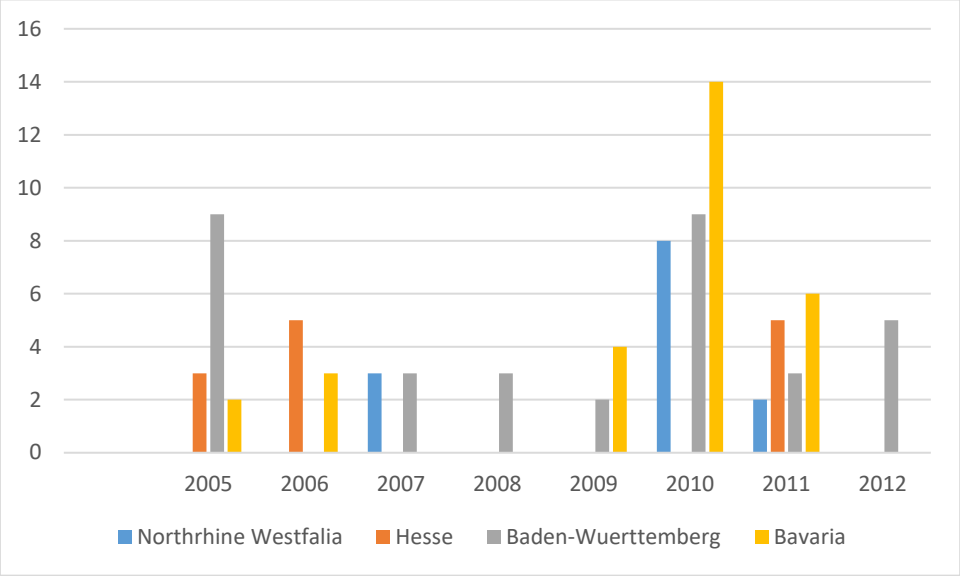


Figure 2: Map of treatment group and donor pool

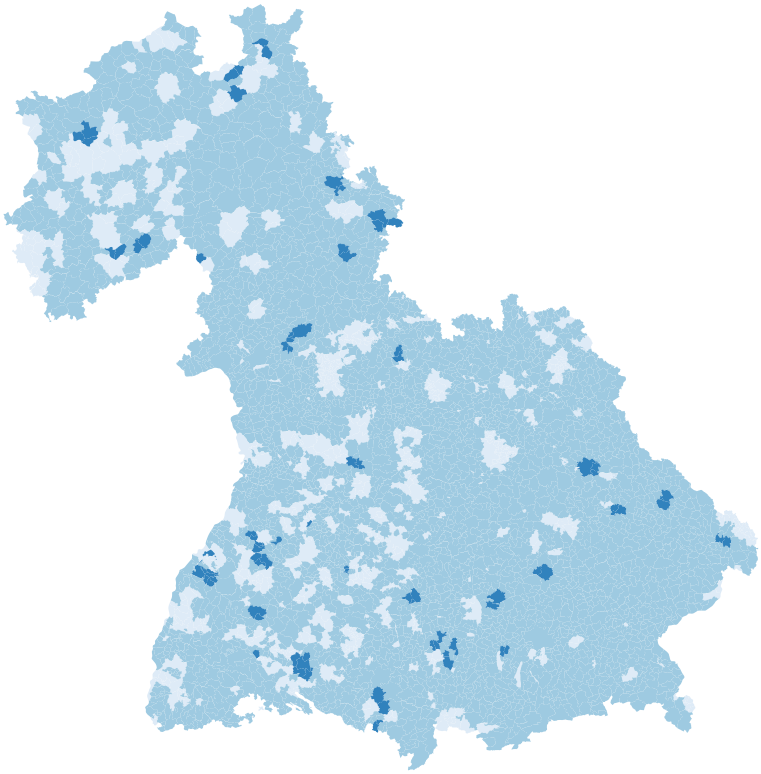


Figure 3: Business tax multiplier in treatment group and donor pool (selected years)

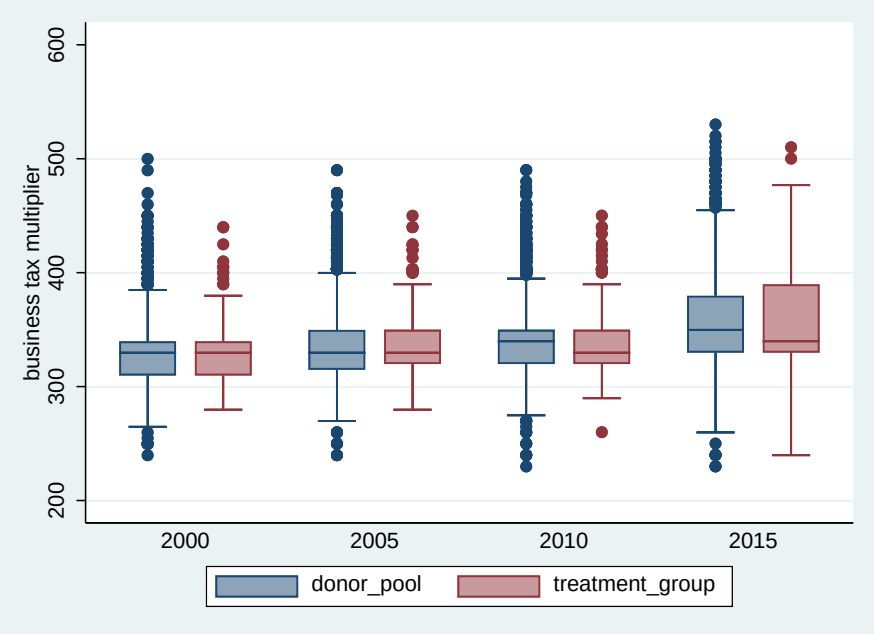
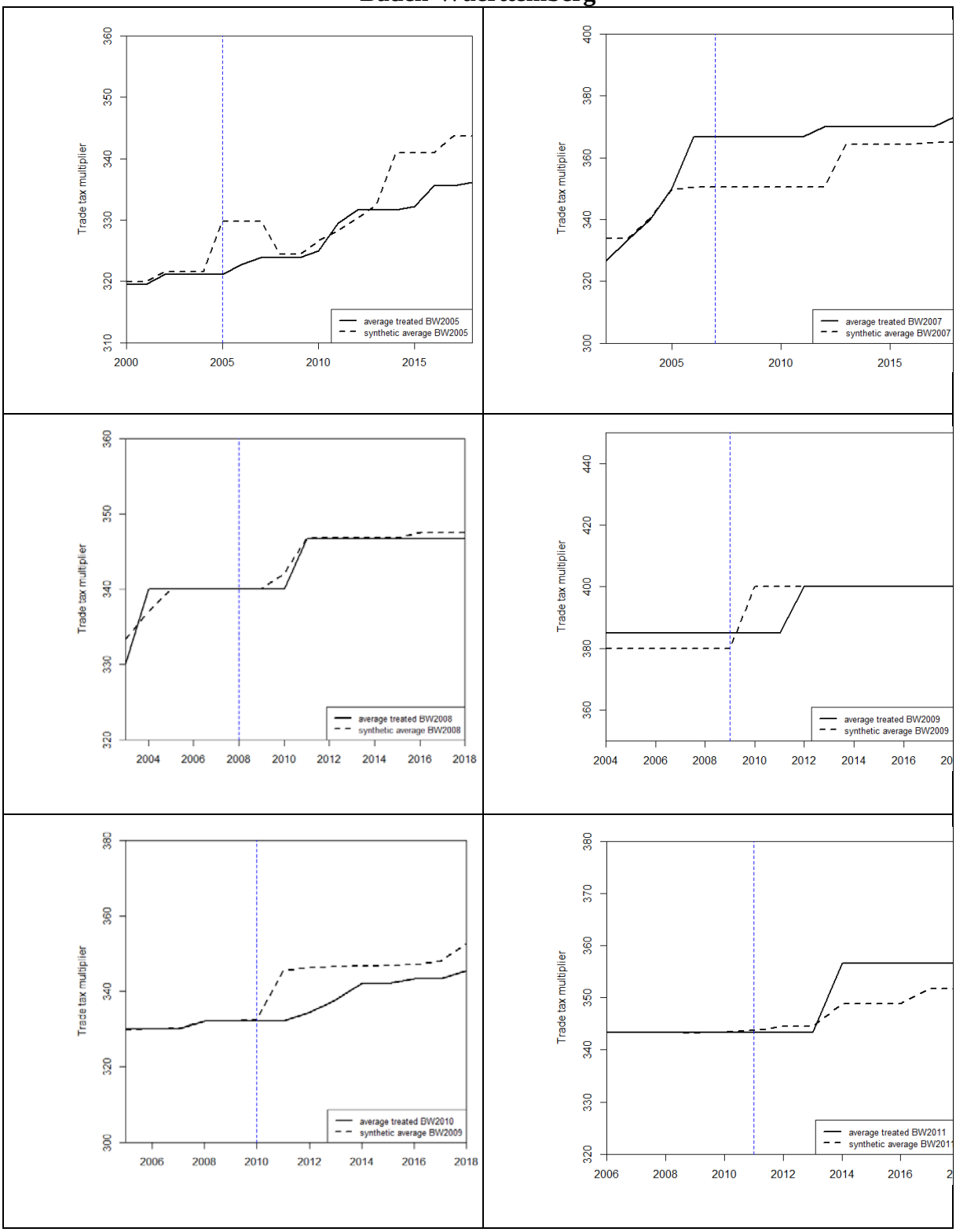


Figure 4: Real and synthetic business tax multiplier for inter-local industrial parks in Baden-Wuerttemberg



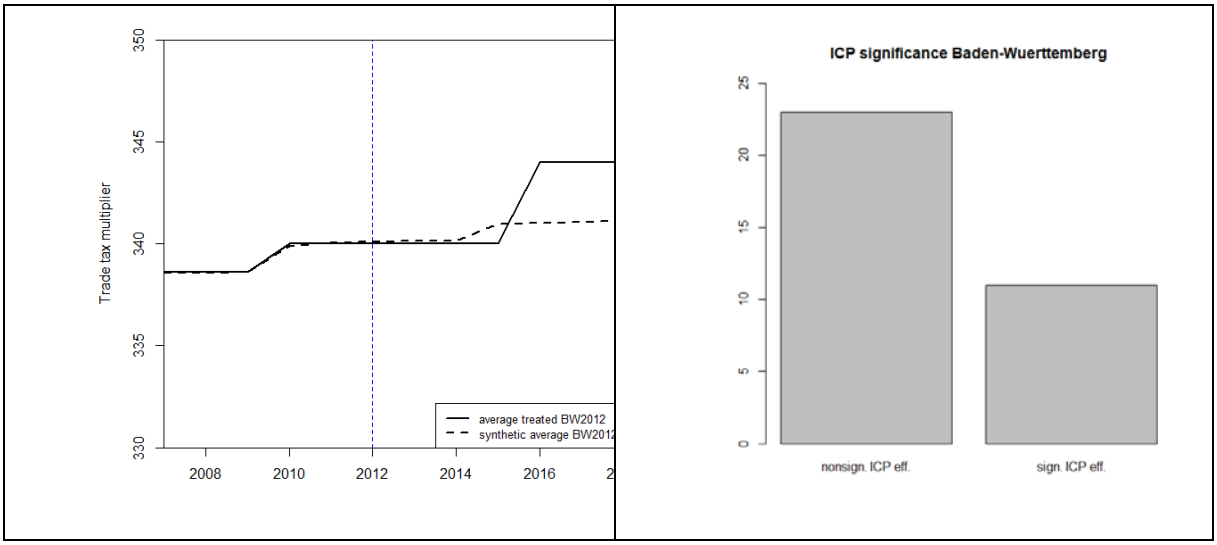

Trade tax multiplier
350
345
340
335
330
2008
2010
2012
2014
2016
average treated BW2012
synthetic average BW2012
ICP significance Baden-Wuerttemberg
25
20
15
10
5
0
nonsign. ICP eff.
sign. ICP eff.

Figure 5: Real and synthetic business tax multiplier for inter-local industrial parks in Bavaria

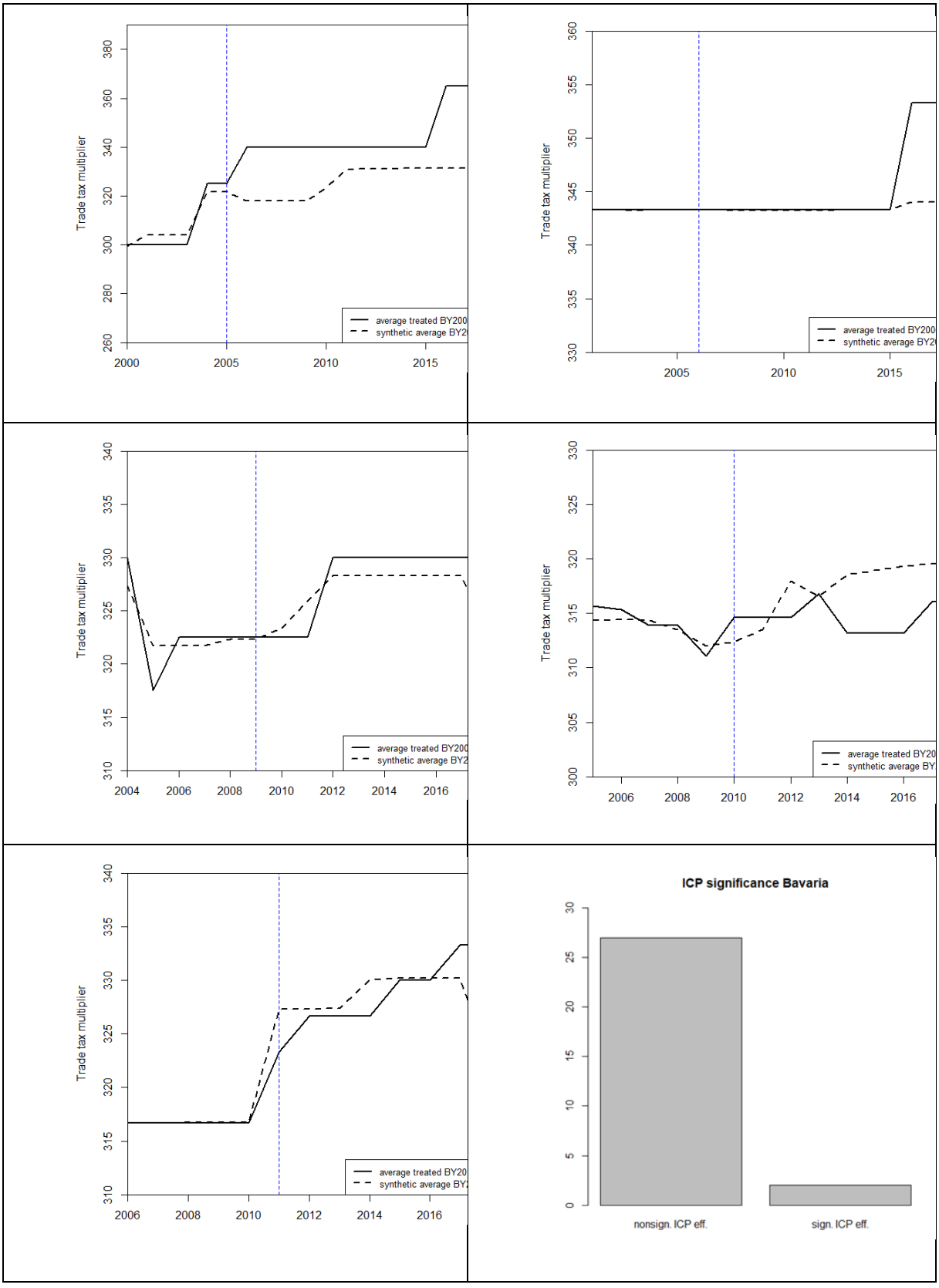


Figure 6: Real and synthetic business tax multiplier for inter-local industrial parks in Hesse

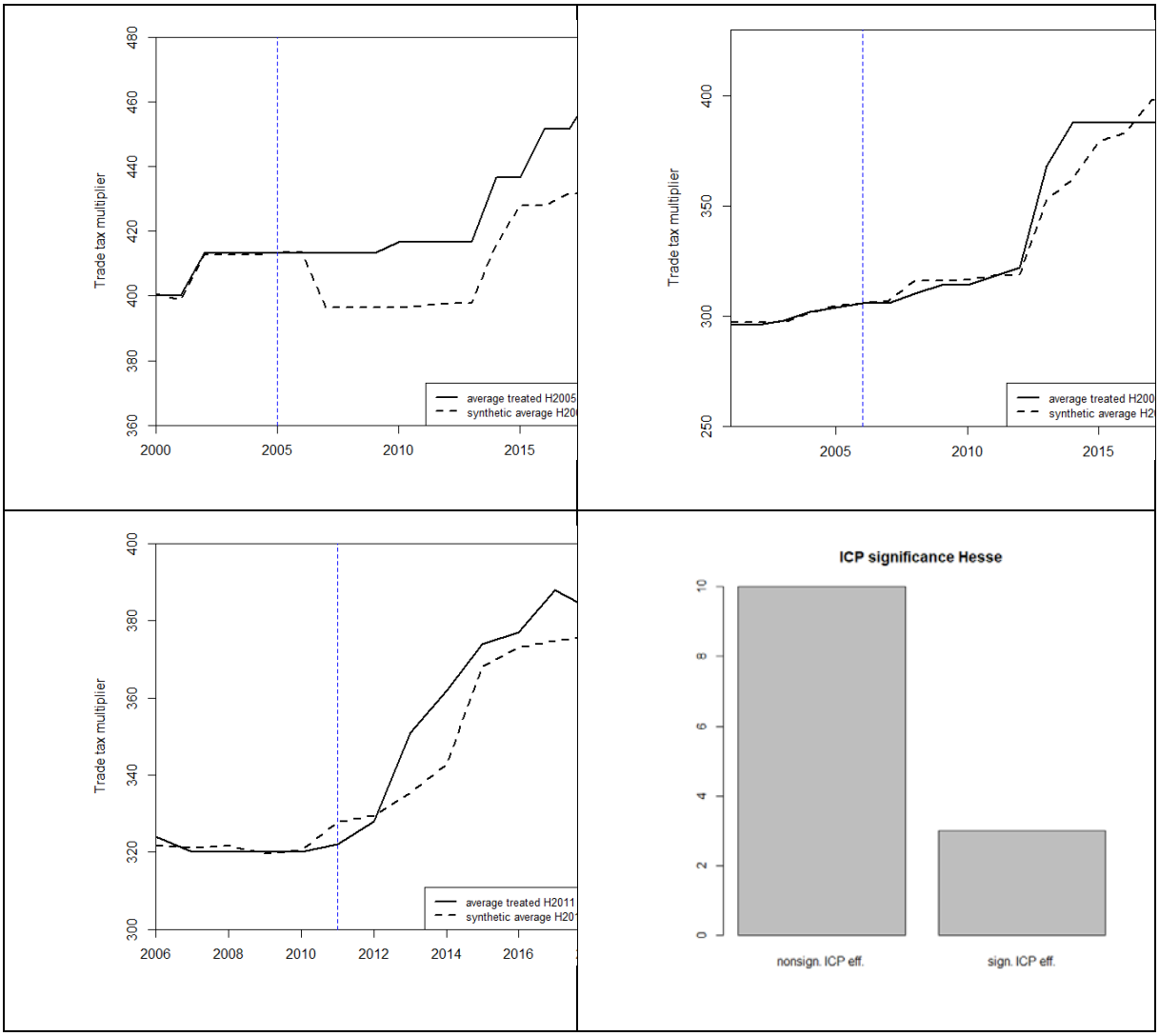


Figure 7: Real and synthetic business tax multiplier for inter-local industrial parks in North Rhine-Westfalia

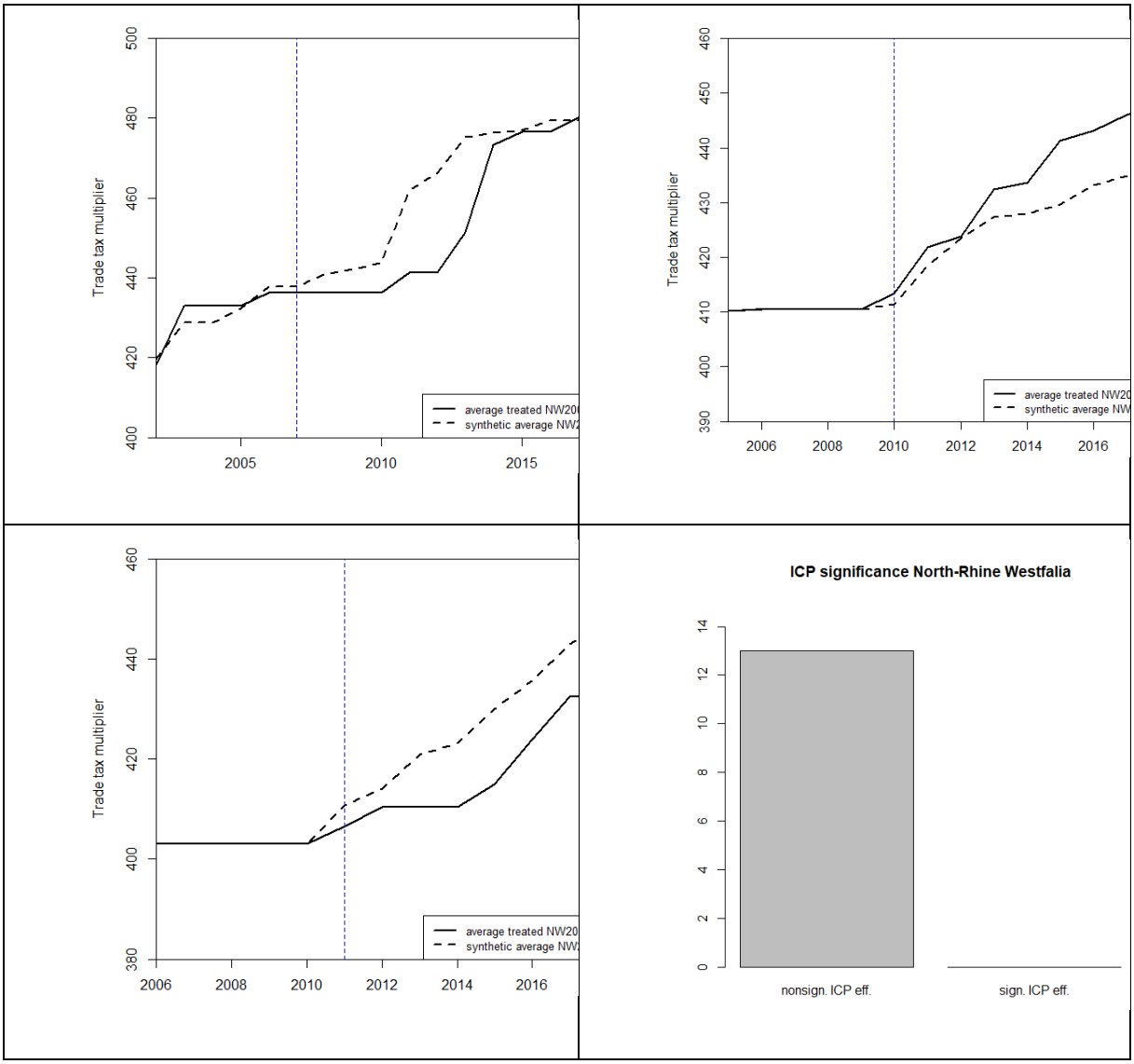


Table 1: Placebo tests for tax ratio

State	Positive effects	Negative effects
Baden-Wuerttemberg	2008, 2011, 2012	2005, 20067, 2009, 2010
Bavaria	2006, 2011	2005, 2009, 2010
Hesse	2005	2006, 2011
North Rhine-Westfalia	2007, 2010, 2011	-

Note: All effects of inter-local industrial parks on the tax ratio only deviate from placebo effects by chance.

Appendix A: Variables used to generate the synthetic control group

When generating the synthetic control groups, the random sampling procedure accounts for time-variant uncontrolled confounders of local tax policy as well as variables found to drive the emergence of inter-local industrial parks. Two variables account for the availability of suitable land in municipality m and its neighbors The dummy variable "land_scarce" takes on the value 1 if the share of land available for development (captured by land currently used in farming and forestry) in m is below the median of all municipalities (0 else). In addition, we introduce the number of neighboring municipalities for which the corresponding share is larger than the median. The availability of a good transport connection is captured by a dummy variable that takes on the value 1 if there is a motorway junction within the jurisdictional borders of m (0 else) and a separate variable equal to the number of neighboring municipalities with a motorway junction. Urban clusters are marked using a dummy that on the value 1 in all cases where municipality m or one of its neighboring municipalities has more than 100.000 inhabitants (0 else) or has the status of a city with county rights. We use the (logarithm of the) total number of citizens and per capita tax revenues from vertical tax sharing generated by the observed municipality as a proxy for its fiscal capacity. Again, we also include the median value for logarithmic population size and fiscal capacity among municipality m's neighbors. We also control for the share of inhabitants younger than 18 years and the median share in the neighboring municipalities. We control for the seat share of Christian democrats as well as local associations in the municipal council. In addition, we include the number of neighboring municipalities that have the same strongest party in the local council as municipality m. The later variable captures expected political transaction costs associated with IMC(e.g., Bergholz, 2018; Bischoff & Wolfschütz, 2020). Transaction costs also depend on the level of embeddedness in other network for exchange among neighboring municipalities. To this end, we use the number of neigh-

boring municipalities belonging to the same county (e.g., Bischoff et al. 2021). A dummy variable marks municipalities located at state borders. In addition, we control for the number of neighboring municipalities regardless of what country or state they belong to. A final dummy variable marks all state-year-combinations with an active IMC-promotion policy at state level.