

# **Does inter-municipal 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. Specifically, we focus on inter-municipal cooperation in form of inter-local industrial parks. We apply the case study-oriented synthetic control method (SCM) to analyze the causal impact of 12 inter-local industrial parks on municipal tax-setting behavior using data on municipalities from West-German states of Hesse and North Rhine Westphalia between 2000 and 2018. We find significant overall effects of inter-local industrial parks on local tax-setting behavior in the majority of the cases. An ex post analysis suggests that tax coordination only takes place in specific political constellations.

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

JEL: H25, H77, H71, R58

## 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 (Banaszewska et al. 2022; Feiock et al. 2009). There are numerous 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 side-effect of IMC: IMC creates a platform that facilitates the coordination of local policies among union-members. This platform can be used for collusive purposes. In particular, it can be used to coordinate local tax policies and thereby reduce the intensity of inter-local competition (e.g., Bischoff et al. 2021).

So far, this side-effect of IMC has received little attention in the empirical literature on IMC.<sup>1</sup> This is where the current paper comes in. We provide an empirical study of the impact of IMC using data from two 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

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<sup>1</sup> 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.

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 makes it easier to enforce coordination (see Feuerstein, 2005). If IMC is used as a tool to reduce inter-local competition, we expect to observe it for inter-local industrial parks. Finally, local business tax rates provide a clear-cut indicator for the intensity of inter-local competition.

We employ the case study-oriented approach of the synthetic control method (SCM) to establish specific impacts of intercommunal industrial parks (Abadie et al. 2010 ; Abadie 2021). It is especially suitable for cases where the treatment group is small and thus constructing an appropriate control group is challenging. Our analysis covers 12 inter-local industrial parks founded between 2005 and 2014 involving 30 municipalities in the West-German states of Hesse and North Rhine Westphalia. We find a significant increase in tax multipliers and/or a reduction in the spread of inter-municipal tax rates emerges in about half of all cases. These results indicate that inter-local industrial parks are used as a platform for tax coordination not only in exceptional cases. Our ex-post analysis suggests that specific political constellations promote tax coordination.

The paper proceeds as follows. Section 2 reviews the relevant literature. Section 3 presents the main hypothesis and data. Section 4 describes our empirical strategy before section 5 presents the results of this analysis. Section 6 discusses the results and section 7 concludes.

## **2. Review of literature**

### ***Local tax-setting behavior***

Economic theory takes it that local governments compete for mobile businesses and firms (Boyne, 1996; Oates & Schwab 1988). A number of factors such as education and especially

tax policies 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. These models assume governments to be benevolent and thus conclude that tax competition leads to welfare losses.

Besley and Case (1995) show that essentially the same behavioral pattern 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 and thereby increases efficiency in local government. 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). In this case, the welfare interpretation is unclear.

While disagreeing on the welfare implications, all three interpretations above predict the tax-setting behavior to be spatially correlated – a pattern reported in many empirical studies on tax-setting (e.g. Revelli 2001; Allers & 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 municipalities set inefficiently low tax rates and provide too much business-related infrastructure (Jayet & Paty 2006; Riedel et al. 2020; Taylor 1992). This notion is supported by Büttner (2006). He 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 and fight inefficiencies from overly intense inter-local competition 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 & 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) still applies: 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 cooperation” (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. Moreover, the central government ultimately required every municipality to be part of an EIMC. Given these characteristics, EIMC are a very special case that is by no means representative for IMC-arrangements found elsewhere. Unlike the latter, EIMC are neither founded voluntarily, nor is their activity confined to a small set of tasks. In their directly elected council and their right to raise own taxes, they are similar to fully-fledged jurisdictions – similar to the German “Verbandsgemeinde”. This interpretation is supported by Breuillé et al. (2018) who regard EIMCs to be an additional layer in the federal system – albeit without mention in the French Constitution.

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, but 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 interaction 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

#### 3.1 Main hypothesis

Consider a certain municipality located in a competitive environment. 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 welfare along with 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. (Comment: A hint on the additional use of the coordination variable is missing). The above hypothesis implies that municipalities connected by a joint industrial park set higher business tax rates – other things equal.

German municipalities are a suitable testing ground. They provide important public services like local roads, industrial parks or pre-school childcare and have 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 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).<sup>2</sup>

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 industry parks 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).

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<sup>2</sup>

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

(Comment: In my view this section should be the 1<sup>st</sup> section in 3.2 Data.) 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).<sup>3</sup> For every joint industrial park, we know which municipalities participate and the year in which the 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).

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<sup>3</sup>

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/>).

### 3.2 Data

We use a panel data set of municipalities of the two German states Hesse and North Rhine Westphalia between 2000 and 2018. We focus on these two states because their municipalities did not go through fundamental regional reforms like the East-German states, nor are many of their municipalities organized in multi-purpose organizations (so-called Verbandsgemeinden, Samtgemeinden, Ämter, Verwaltungsgemeinschaften). The latter restrictions were imposed because this organization perform municipal tasks on their behalf and thus 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.

Restricting the sample to Hesse and North Rhine Westphalia leaves us with a balanced panel covering 837 municipalities 2000 to 2018. 103 of them are organized in a total of 49 inter-local industry parks. Roughly 70 percent of them have only two members and parks covering more than three members are rare. More than two thirds ~~percent~~ of them were founded before 2005 (see figure 1). In the upcoming analysis, we will focus on those inter-local business parks founded between 2005 and 2014 and encompassing municipalities of only one state.

[Figure 1]

#### 4. Empirical strategy

The synthetic control method (SCM) generalizes the usual difference-in-differences (DiD) model by allowing for uncontrolled confounders that vary over time (Abadie et al. 2010 ; Abadie 2021). The DiD model is prone to a violation of the parallel trend assumption when data no longer support the pre-treatment trends. The SCM method enables a carefully construction of counterfactuals. While the DiD approach only establishes the overall effect of inter-local industrial parks on tax coordination, the synthetic control method provides detailed insights on the impacts of individual cooperations. The practical problem of multiple treated units is settled by aggregation (Abadie 2021).

In obtaining the SCM estimator of effects of a inter-local industrial park in a state for year  $t$ ,  $t= T_0+1, T_0+2, \dots, T$ , we rely on a donor pool of  $n$  municipalities  $r$ ,  $r=1,2,\dots,n$ , within that state, where no joint industrial park exist. In order to control for spillover effects, communities adjacent to the treated area are excluded. The treated area 0 consists of two or more municipalities in which an inter-local industrial park is founded in year  $T_0$ .<sup>4</sup>

Let  $Y_{rt}$  be the indicator of tax coordination as the outcome of interest that is observed for all regions  $r$  at any year  $t$  in the sample period. The effect  $\alpha_{0t}$  is given by the difference between the values of coordination variable with and without a joint industrial park,  $Y_{0t}^F$  and  $Y_{0t}^N$ , in the treated area 0:

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

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<sup>4</sup>

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

While the outcome variable  $Y_{0t}^F$  is observed for  $t > T_0$ ,  $Y_{0t} = Y_{0t}^F$ , the potential extent of tax coordination,  $Y_{0t}^N$ , is unobservable in the post-treatment period. In the SCM approach, the counterfactual  $Y_{0t}^N$  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 best match determines the optimal weights  $w_1^*, w_2^*, \dots, w_n^*$ , with  $0 \leq w_r^* \leq 1$  and  $\sum_r w_r^* = 1$  for  $r=1, 2, \dots, n$ , of the control communities in the synthetic municipality.

~~V is chosen such as to minimize the mean squared prediction error (MSPE) of the synthetic control with respect to in the pre-treatment period.~~

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

$$(2) \quad \hat{Y}_{0t}^N = \sum_{r=1}^n w_r^* \cdot Y_{rt}.$$

For a feasible implementation of SCM, we randomly select  $n=100$  control units from the donor pool. With (2), the synthetic control estimator of the effect of inter-local industrial parks  $\alpha_{0t}$  is given by

$$(3) \quad \hat{\alpha}_{0t} = Y_{0t} - \sum_{r=1}^n w_r^* \cdot Y_{rt}, \quad t=T_0+1, T_0+2, \dots, T.$$

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 area. 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 match between the characteristics of the treated area and the synthetic control unit 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  $t=1, 2, \dots, T_0$ , is deemed as an indication for a low bias.

Statistical inference of the tax effect of inter-local industrial parks  $\hat{\alpha}_{0t}$  can be based on placebo tests as a special variant of permutation tests (Abadie & 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 tax effects of intercommunal industrial parks  $\hat{\alpha}_{rt}^{PL}$ ,  $r=1,2,\dots,n$ , is generated. According to our main hypothesis of rising business tax rates or catching-up following the agreement of a joint industrial park, one-sided placebo tests are conducted.<sup>5</sup> In order to obtain valid inference, control municipalities with a bad pre-treatment match are excluded from testing.<sup>6</sup> 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 ( $m \leq n$ ) with an acceptable pre-treatment fit (Galvani & Quistorff 2017):

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<sup>5</sup> The one-sided inference can substantially increase the power of the test (Abadie (2021)).

<sup>6</sup> 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.

We apply the synthetic control method to estimate the treatment effects of joint industrial parks formed in the period from 2005 to 2014 on tax coordination in five sub-subsequent years in the four German states Hesse and North Rhine-Westphalia. Between 2005 and 2014, these states saw 12 new agreements on joint industrial parks involving a total of 30 participating municipalities<sup>7</sup>. Seven agreements involved 2 municipalities while only one park consists of more than 3 municipalities. The average number of members is 2.5.

Municipalities that started cooperating before 2004 or after 2014 were excluded from the donor pool – leaving us with 734 untreated municipalities. Figure 2 shows the municipalities in the treatment group (dark blue) and the municipalities with joint industry parks that were excluded from the sample because they were founded before or after the above-mentioned period (light blue). The latter were excluded from the donor pool. In addition, we exclude all neighbors of municipalities with joint business parks from the donor pool to rule out spillover effects. This leaves us with 495 municipalities in the final donor pool. Figure 3 shows the distribution of business tax multipliers in donor pool and treatment group for selected years.

[Figure 2+3]

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 essential municipal characteristics. We resorted to random sampling because of the size of the donor pools (Hesse: 298; North Rhine-Westphalia 161). Moreover, a random

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<sup>7</sup> The municipality Eschweiler in North Rhine Westphalia had to be excluded because of incomplete data.



selection of control units tends to be favorable for a bias bound of the SCM estimator (Abadie et al. 2010; Abadie 2021)).

Table 1 provides the descriptive statistics for municipalities in the treatment group and in the donor pool. We use the per capita tax revenues from vertical tax sharing generated by the observed municipality. We control for the seat share of Christian democrats as well as local associations in the municipal council to account for partisan effects and differences in local preferences. Next to these time-variant confounders, we use a number of other variables that are indirectly related to local tax-setting behavior and potentially drive the emergence of inter-local industry parks (e.g. Bischoff et al. 2021). Two variables account for the availability of suitable land in municipality  $m$  and its neighbors. The dummy variable “land\_scarse” takes on the value 1 if the share of land available for development (captured by land currently used in farming and forestry) in a certain municipality  $m$  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 municipality  $m$  (0 else) and a separate variable equal to the number of neighboring municipalities with a motorway junction. We use the (logarithm of the) total number of citizens, the share of inhabitants younger than 18. In addition, we include the corresponding median values among municipality  $m$ 's neighbors as well as the median for the fiscal capacity among neighboring municipalities. We include the number of neighboring municipalities that have the same strongest party in the local council as municipality  $m$  to capture expected political transaction costs associated with tax coordination without formal municipal agreement (e.g. Bergholz 2018; Bischoff & Wolfschütz 2020). Finally, we use time-invariant confounders. Urban clusters are marked using a dummy that takes 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 number of neighboring municipalities in total and the number of neighbors belonging to the same county (e.g. Bischoff et al. 2021). Separate dummies mark municipalities located at state borders and all years with an active IMC-promotion policy at state level.

[Table 1]

To construct synthetic controls for the treated areas, optimal weights of the selected control municipalities,  $w_1^*, w_2^*, \dots, w_n^*$ , and the regional characteristics and pre-treatment outcome,  $v_1^*, v_2^*, \dots, v_{k+1}^*$ , have to be determined for all inter-local industrial parks ~~formed over time by state and by year.~~<sup>8</sup> 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.

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<sup>8</sup> The optimal weights are 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..

## 5. Results

In Hesse, the inter-local industrial parks in our sample were founded in 2005, 2006 and 2011. For three out of five clusters with inter-local industrial parks significant increases of the business tax multiplier are ascertained. In one case we find significant differences in the tax multiplier of the cooperating municipality and the synthetic control unit at the 5% level (Fig. 4). In the two other cases, the differences in tax multipliers prove to be weakly significant (10% level).

[Figure 4]

For North Rhine-Westphalia, we analyze seven industrial parks founded between 2007 and 2014. In four clusters of municipalities the rise of the tax rate turns out to be significant after the foundations of the joint industry parks. We find significant differences at the 5% level in the business tax multiplier for the two parks founded in 2010 and weakly significant effects for two parks founded in 2013 and 2014 (Fig. 5).

[Figure 5]

In sum, we find evidence that inter-local industrial parks serve as a platform to coordinate tax policies and reduce the intensity of inter-local tax competition in more than half of the of the cases in both German states. At both levels of significance the rise of the tax multipliers appears to be sizeable. However, our main hypothesis seems to be only supported when specific political constellations are met.

In the analysis underlying figure 4 and 5, we use the business tax rate to measure the intensity of tax competition a municipality is exposed to. In the underlying logic, tax coordination implies an increase in business tax rates in the treated units – as compared to the counterfactual. However, tax coordination could also imply a reduced bandwidth of tax rates among

cooperating municipalities. This can be achieved without an increase in tax rates. To capture this second form of tax coordination, we calculated the following new indicator:

$$Y_{rt} = \frac{n}{n-1} (\max\{t_{it}\} - \text{av}\{t_{it}\})$$

For a municipality within the treatment group, it calculates the average deviation in the tax rate  $t_{it}$  of all partners in the joint industry parks to the highest tax rate in the consortium. Here,  $n$  is the number of partners. For the non-treated municipalities, the same indicator was calculated for a fictitious inter-local industry park consisting of the municipality and random selection of  $n$  direct neighbors. We keep the constellation of municipalities for which the measure is calculated constant across the entire period.

Using this measure, we reran the analyses above. The results are presented in figure 6 and 7. We find two weakly significant effects for the inter-local business parks in Hesse. In one of these cases the substantial reduction of the bandwidth of the tax rate comes along with a significant increase of the overall tax rate. The other case reflects the different coordination behaviour of the participating municipalities. Overall, 80% of the inter-local industrial parks in Hesse are used as a platform to coordinate tax policies. In North Rhine Westphalia the three significant effects in the second form of tax coordination coincide with significant increases of the average tax rate. Thus, in North Rhine Westphalia also with the additional indicator, tax coordination is ascertained in narrow 60% of newly founded inter-local industry parks.

[Figure 6 + 7]

Table 2 summarizes the results of the results of SCM analyses of average tax increases (ATI) and tax coordination (TC).

[Table 2]

## 6. Discussion

In sum, we find strong support for our main hypothesis in Hesse. Here in four out of five cases at least one of the two forms of tax coordination is established. But also in North-Rhine Westfalia inter-local industrial parks are used as a platform of tax coordination in more than half of cases. In the majority of foundations, tax coordination takes place in form of significant increases of the overall tax rate. A significant reduction of the bandwidth of the tax rate is only ascertained in a minority of cases.

In an ex post analysis, we examine the question whether the significant cases differ from the nonsignificant ones. To this end, we compare the collaborations with respect to a number of different characteristics. These include time-invariant characteristics like border members, number of neighbors with abundant land and freeway access and time-variant variables like population size, tax capacity and scarcity of land. Also local tax multipliers prior to the treatment year are considered. In addition to the average value within the consortium, we look at the standard deviation. The higher the latter, the more heterogeneous the interests are – other things equal – and thus the more difficult it is to coordinate. We as well compare the consortia with respect to the composition of their local council using the share of seats held by CDU or local initiatives and how long the strongest party is prevalent.

A descriptive statistical analysis reveals that a long presence of the same strongest party, scarcity of land, low or moderate tax capacity and a freeway access seem to facilitate tax coordination in both German states. In Hesse, strong IMC support additionally favours tax coordination, whereas in North Rhine-Westfalia significant tax increases additionally come along with a high CDU share and a lack of neighbours with abundant land. We run univariate Wilcoxon rank-sum tests to compare the characteristics inductively.

[Table 3]

The results are reported in table 3. In most characteristics, we do not find any differences. However, differences are found for the share of seats in the local council held by CDU and local initiatives. Those joint business parks for which we find evidence for successful tax coordination are characterized by a higher share of CDU members and a lower share of members from local initiatives. These results cannot be interpreted in a causal way. Yet they provide a hint that tax coordination may be more likely in certain political constellations than others.

Summing up, our results do not support the notion that inter-local business parks are systematically founded to undermine intra-regional tax competition in favor higher business tax rates. As inter-local business parks represent a particularly suitable form of IMC for this purpose, our results suggest that IMC does not go along with a reduction inter-local competition.

Our results are quite well in line with the studies by Charlot et al. (2015), Breuillé et al. (2018) and Agrawal et al. (2020) on the role of the French EIMC. They find the formation of EIMC to lead to an increase in local tax rates. However, EIMC are formed to provide a wide array of different services, while inter-municipal cooperation represents a narrow and clearly defined field of government activity. EIMC 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) 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 & Warner 2016).

On the other hand, Banaszewska et al. (2022) analyze the impact of inter-municipal unions founded to promote local business development on local economic performance in Poland. Many inter-municipal unions included in their sample are involved in developing industry parks. They find a positive impact on local employment rates while there is no indication that

the number of resident firms is reduced. Their results stand against the notion that IMC generally facilitates collusive behavior at the expense of local firms.

## 7. Conclusion

Using data on municipalities in four West-German states between 2000 and 2018, we test whether inter-local industrial parks reduce the intensity of tax competition the cooperating municipalities face. We apply the synthetic control method to 12 inter-local business parks founded in two German states between 2005 and 2014. In the vast majority of cases we find evidence for successful tax coordination in both German states. This especially holds for Hesse where significant tax effects are established in the municipalities of nearly all newly founded business parks. But also in North-Rhine Westfalia concerted action is observed in the majority of cases. The ex post analysis provides some insight as to whether political constellations will favour coordinated behaviour. Most often a high share of CDU members and the prevalence of the same strongest party characterize successful tax coordination. Occasionally, low or moderate tax capacity and a low number of neighbors with abundant land seem to play a role. Final results for the sub-set of data with information on other unions are still pending.

Our study is the first to use the SCM analysis in the context of IMC or local tax-setting behavior before. Its main advantage lies in the carefully targeted construction of counterfactuals and the control for unobserved confounders that vary over time. In contrast to the DiD approach the synthetic control method provides detailed insights on the impacts of inter-local industrial parks on tax coordination. This enables us to identify the drivers of tax rate effects and tax coordination.

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.

In addition, our study adds to the literature on the impact of IMC on local economic performance. More empirical studies are needed to see whether the results of the current paper holds for 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.



## References

- Abadie, A. (2021). Using Synthetic Controls: Feasibility, Data Requirements, and Methodological Aspects. *Journal of Economic Literature*, 59(2), 391–425.  
<https://doi.org/10.1257/jel.20191450>
- Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California’s Tobacco Control Program. *Journal of the American Statistical Association*, 105(490), 493–505.  
<https://doi.org/10.1198/jasa.2009.ap08746>
- Abadie, A., Diamond, A., & Hainmueller, J. (2011). Synth : An R Package for Synthetic Control Methods in Comparative Case Studies. *Journal of Statistical Software*, 42(13).  
<https://doi.org/10.18637/jss.v042.i13>
- Abadie, A., Diamond, A., & Hainmueller, J. (2015). Comparative Politics and the Synthetic Control Method. *American Journal of Political Science*, 59(2), 495–510.  
<https://doi.org/10.1111/ajps.12116>
- Abadie, A., & Gardeazabal, J. (2003). The Economic Costs of Conflict: A Case Study of the Basque Country. *The American Economic Review*, 93(1), 113–132.
- Agrawal, D. R., Breuillé, M.-L., & Le Gallo, J. (2020). Tax Competition with Intermunicipal Cooperation. *SSRN Electronic Journal*. Advance online publication.  
<https://doi.org/10.2139/ssrn.3560611>
- Allers, M. A., & Elhorst, J. P. (2005). Tax mimicking and yardstick competition among local governments in the Netherlands. *International Tax and Public Finance*, 12(4), 493–513.

- Banaszewska, M., Bischoff, I., Bode, E., & Chodakowska, A. (2022). Does inter-municipal cooperation help improve local economic performance? – Evidence from Poland. *Regional Science and Urban Economics*, 92, 103748. <https://doi.org/10.1016/j.regsci-urbeco.2021.103748>
- Baskaran, T. (2014). Identifying local tax mimicking with administrative borders and a policy reform. *Journal of Public Economics*, 118, 41–51. <https://doi.org/10.1016/j.jpu-beco.2014.06.011>
- Bel, G. et al. (2022). Styles of inter-municipal cooperation and the multiple principal problem: a comparative analysis of European economic area countries, <https://doi.org/10.1080/03003930.2022.2041416>
- Bel, G., & Sebő, M. (2019). Does Inter-Municipal Cooperation Really Reduce Delivery Costs? An Empirical Evaluation of the Role of Scale Economies, Transaction Costs, and Governance Arrangements. *Urban Affairs Review*, 44(3), 1-36. <https://doi.org/10.1177/1078087419839492>
- Bel, G., & Warner, M. E. (2016). Factors explaining inter-municipal cooperation in service delivery: A meta-regression analysis. *Journal of Economic Policy Reform*, 19(2), 91–115.
- Bergholz, C. (2018). Inter-municipal cooperation in the case of spillovers: Evidence from Western German municipalities. *Local Government Studies*, 44(1), 22–43. <https://doi.org/10.1080/03003930.2017.1403902>
- Besley, T., & Case, A. (1995). Incumbent Behavior: Vote Seeking, Tax Setting and Yardstick Competition. *American Economic Review*, 85(1), 25–45. <https://doi.org/10.3386/w4041>

- Bischoff, I., & Krabel, S. (2017). Local taxes and political influence: evidence from locally dominant firms in German municipalities. *International Tax and Public Finance*, 24(2), 313–337.
- Bischoff, I., Melch, S., & Wolfschütz, E. (2021). Does Interlocal Competition Drive Cooperation in Local Economic Development Policies? Evidence on Interlocal Business Parks in Germany. *Urban Affairs Review*, 57(4), 1049–1083.  
<https://doi.org/10.1177/1078087420908650>
- Bischoff, I., & Wolfschütz, E. (2020). Inter-municipal cooperation in administrative tasks - the role of population dynamics and elections. *Local Government Studies*(<https://doi.org/10.1080/03003930.2020.1771307>), 1-25.
- Blair, J. P., & Premus, R. (1987). Major Factors in Industrial Location: A Review. *Economic Development Quarterly*, 1(1), 72–85. <https://doi.org/10.1177/089124248700100109>
- Blesse, S., & Martin, T. (2015). Let's Stay in Touch - Evidence on the Role of Social Learning in Local Tax Interactions. *ZEW - Centre for European Economic Research Discussion Paper*, No. 15-081. <https://doi.org/10.2139/ssrn.2710651>
- Boyne, G. A. (1996). Competition and Local Government: A Public Choice Perspective. *Urban Studies*, 33(4-5), 703–721. <https://doi.org/10.1080/00420989650011799>
- Breuilé, M.-L., Duran-Vigneron, P., & Samson, A.-L. (2018). Inter-municipal cooperation and local taxation. *Journal of Urban Economics*, 107, 47–64.  
<https://doi.org/10.1016/j.jue.2018.08.001>
- Bundesministerium der Finanzen (Ed.). (2021). *Eckdaten zur Entwicklung und Struktur der Kommunal Finanzen 2011 bis 2020*. <https://www.bundesfinanzministerium.de/Con->

tent/DE/Standardartikel/Themen/Oeffentliche\_Finzen/Foederale\_Finanzbeziehungen/Kommunalfinzen/Eckdaten\_EntwicklungKommunalfinzen.pdf?\_\_blob=publicationFile&v=3

- Büttner, T. (2006). *Commercial Land Use and Interjurisdictional Competition: Conference Paper*. Verein für Socialpolitik/ German Economic Association.
- Büttner, T., & Schwerin, A. v. (2016). Yardstick competition and partial coordination: Exploring the empirical distribution of local business tax rates. *Journal of Economic Behavior & Organization*, *124*, 178–201.
- Cavallo, E., Galiani, S., Noy, I., & Pantano, J. (2013). Catastrophic Natural Disasters and Economic Growth. *Review of Economics and Statistics*, *95*(5), 1549–1561.  
[https://doi.org/10.1162/REST\\_a\\_00413](https://doi.org/10.1162/REST_a_00413)
- Charlot, S., Paty, S [S.], & Piguët, V. (2015). Does Fiscal Cooperation Increase Local Tax Rates in Urban Areas? *Regional Studies*, *49*(10), 1706–1721.  
<https://doi.org/10.1080/00343404.2013.878798>
- de Chaisemartin, C., & D'Haultfœuille, X. (2020). Two-Way Fixed Effects Estimators with Heterogeneous Treatment Effects. *American Economic Review*, *110* (9), 2964-2996
- Dembour, C., & Wauthy, X. (2009). Investment in public infrastructure with spillovers and tax competition between contiguous regions. *Regional Science and Urban Economics*, *39*(6), 679–687. <https://doi.org/10.1016/j.regsciurbeco.2009.02.007>
- Di Liddo, G., & Giuranno, M. G. (2016). Asymmetric yardstick competition and municipal cooperation. *Economics Letters*, *141*, 64–66. <https://doi.org/10.1016/j.econlet.2016.01.015>
- Feiock, R. C. (2009). Metropolitan Governance and Institutional Collective Action. *Urban Affairs Review*, *44*(3), 356–377. <https://doi.org/10.1177/1078087408324000>

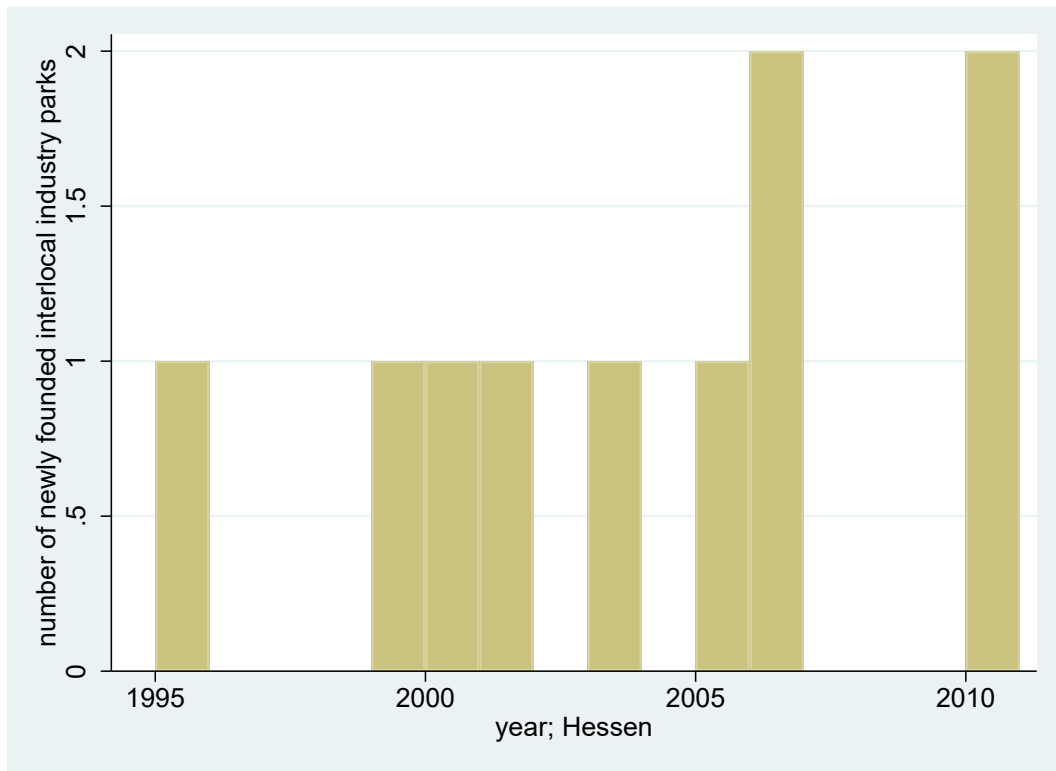
- Feiock, R. C., Steinacker, A., & Park, H. J. (2009). Institutional Collective Action and Economic Development Joint Ventures. *Public Administration Review*, 69(2), 256–270. <https://doi.org/10.1111/j.1540-6210.2008.01972.x>
- Feuerstein, S. (2005). Collusion in industrial economics: A survey. *Journal of Industry, Competition and Trade*, 5(5), 163–198.
- Galiani, S., & Quistorff, B. (2017). The Synth\_Runner Package: Utilities to Automate Synthetic Control Estimation Using Synth. *The Stata Journal: Promoting Communications on Statistics and Stata*, 17(4), 834–849. <https://doi.org/10.1177/1536867X1801700404>
- Hirt, S. (2012). Mixed Use by Default. *Journal of Planning Literature*, 27(4), 375–393. <https://doi.org/10.1177/0885412212451029>
- Hulst, R., van Montfort, A., Haveri, A., Airaksinen, J., & Kelly, J. (2009). Institutional Shifts In Inter-Municipal Service Delivery. *Public Organization Review*, 9(3), 263–285. <https://doi.org/10.1007/s11115-009-0085-8>
- Jayet, H., & Paty, S [Sonia] (2006). Capital indivisibility and tax competition: Are there too many business areas when some of them are empty? *Journal of Urban Economics*, 60(3), 399–417. <https://doi.org/10.1016/j.jue.2006.04.001>
- Keen, M., & Konrad, K. A. (2013). The Theory of International Tax Competition and Coordination. In A. Auerbach, R. Chetty, M. Feldstein, & E. Saez (Eds.), *Handbook of Public Economics. Handbook of public economics* (5th ed., Vol. 5, pp. 257–328). North Holland/Elsevier. <https://doi.org/10.1016/B978-0-444-53759-1.00005-4>
- Kehoe, P. J. (1989). Policy Cooperation Among Benevolent Governments May Be Undesirable. *The Review of Economic Studies*, 56(2), 289. <https://doi.org/10.2307/2297462>

- LeRoux, K., Brandenburger, P. W., & Pandey, S. K. (2010). Interlocal Service Cooperation in U.S. Cities: A Social Network Explanation. *Public Administration Review*, 70(2), 268–278. <https://doi.org/10.1111/j.1540-6210.2010.02133.x>
- Levenstein, M., & Suslow, V. Y. (2006). What determines cartel success? *Journal of Economic Literature*, 44(1), 43–95.
- Oates, W. E., & Schwab, R. M. (1988). Economic competition among jurisdictions: efficiency enhancing or distortion inducing? *Journal of Public Economics*, 35(3), 333–354. [https://doi.org/10.1016/0047-2727\(88\)90036-9](https://doi.org/10.1016/0047-2727(88)90036-9)
- Revelli, F. (2001). Spatial patterns in local taxation: tax mimicking or error mimicking? *Applied Economics*, 33(9), 1101–1107. <https://doi.org/10.1080/00036840010007164>
- Riedel, N., Simmler, M., & Wittrock, C. (2020). Local fiscal policies and their impact on the number and spatial distribution of new firms. *Regional Science and Urban Economics*, 83, 103525. <https://doi.org/10.1016/j.regsciurbeco.2020.103525>
- Schmidheiny, T., & Siegloch, S. (2020). *On Event Studies and Distributed-Lags in Two-Way Fixed Effects Models: Identification, Equivalence, and Generalization: Version November 2020*.
- Taylor, L. (1992). Infrastructural competition among jurisdictions. *Journal of Public Economics*, 49(2), 241–259.
- Wellisch, D. (2006). *Theory of public finance in a federal state*. Cambridge Univ. Press. <https://doi.org/10.1017/CBO9780511613319>
- Wilson, J. D. (1999). Theories of tax competition. *National Tax Journal*, 52(2), 269–304.
- Wolkoff, M. J. (1992). Is Economic Development Decision Making Rational? *Urban Affairs Quarterly*, 27(3), 340–355. <https://doi.org/10.1177/004208169202700302>

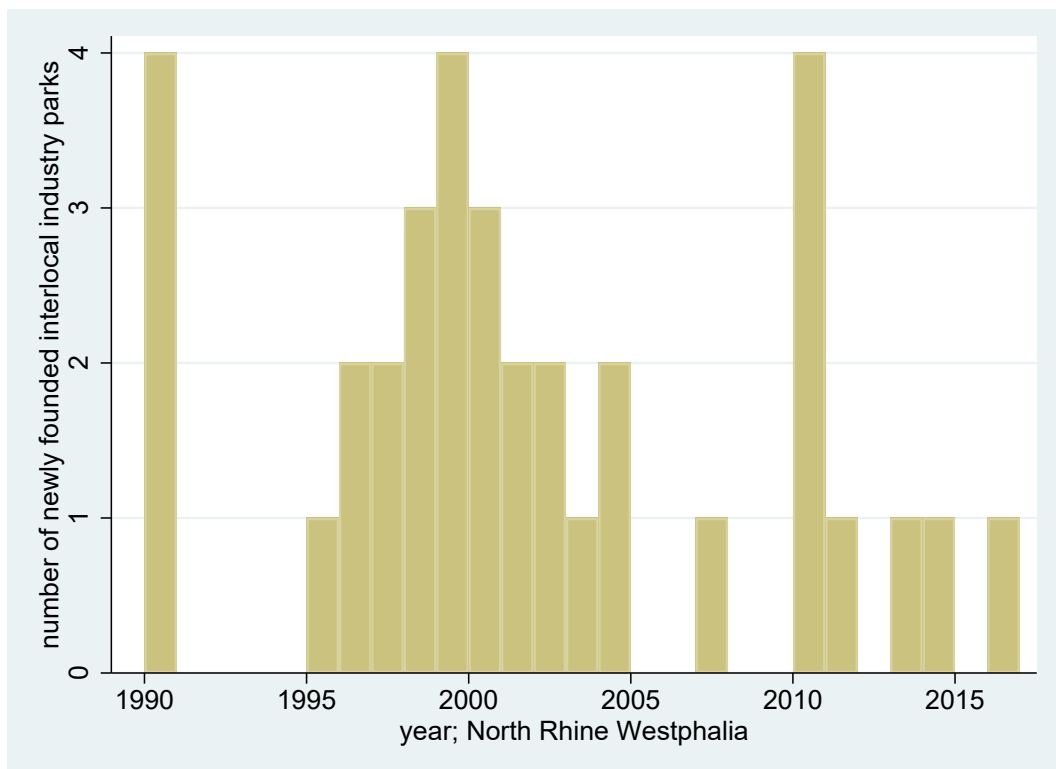
- Wuschansky, B., & König, K. (2006). *Interkommunale Gewerbegebiete in Deutschland.: Grundlagen und Empfehlungen zur Planung, Förderung, Finanzierung, Organisation, Vermarktung ; 146 Projektbeschreibungen und abgeleitete Erkenntnisse*. Dortmund. ILS – Institut für Landes- und Stadtentwicklungsforschung.
- Zodrow, G. R., & Mieszkowski, P. (1986). Pigou, Tiebout, property taxation, and the under-provision of local public goods. *Journal of Urban Economics*, 19(3), 356–370.  
[https://doi.org/10.1016/0094-1190\(86\)90048-3](https://doi.org/10.1016/0094-1190(86)90048-3)

**Figure 1: Municipalities forming a new inter-local industrial parks (1990 -2017)**

**1a. Hesse**

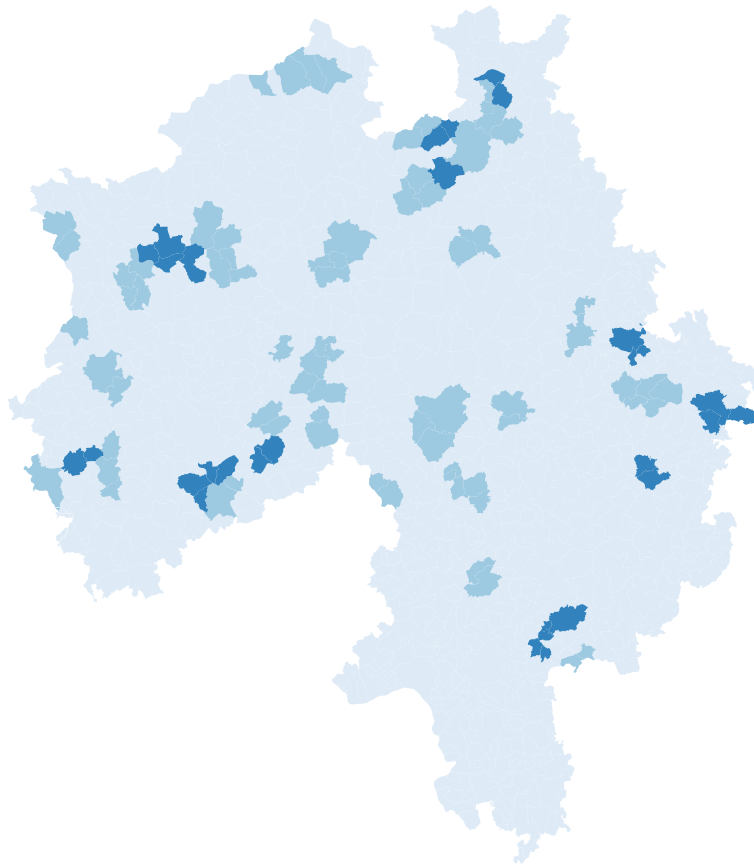


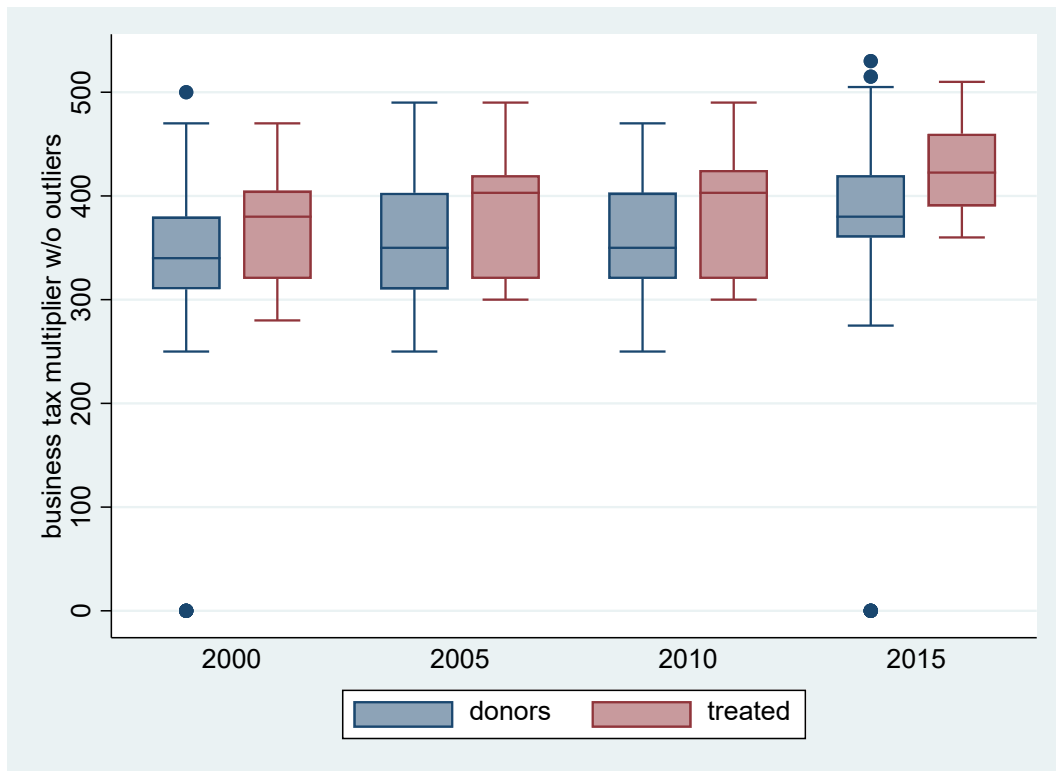
**1b. North Rhine Westphalia**



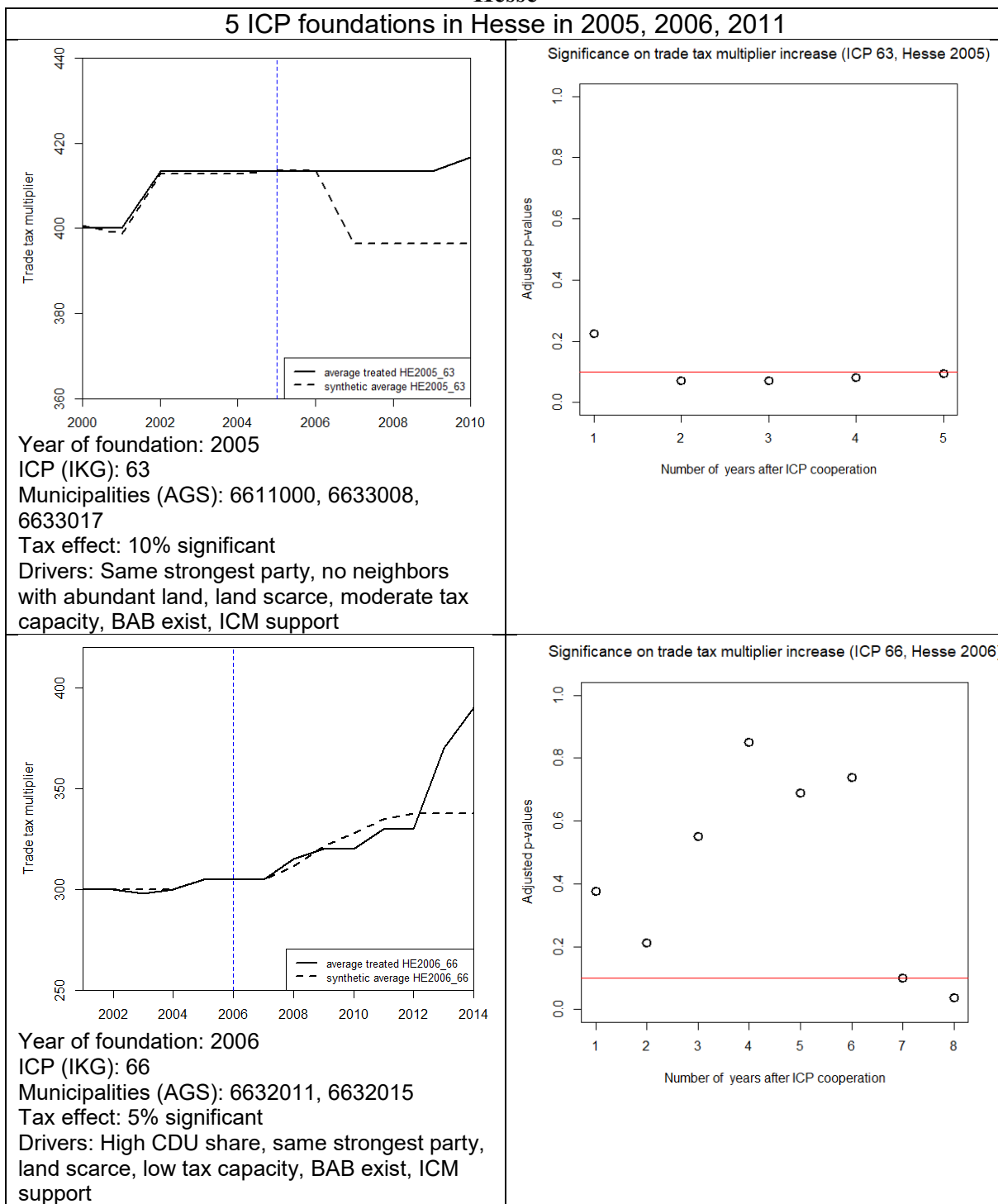


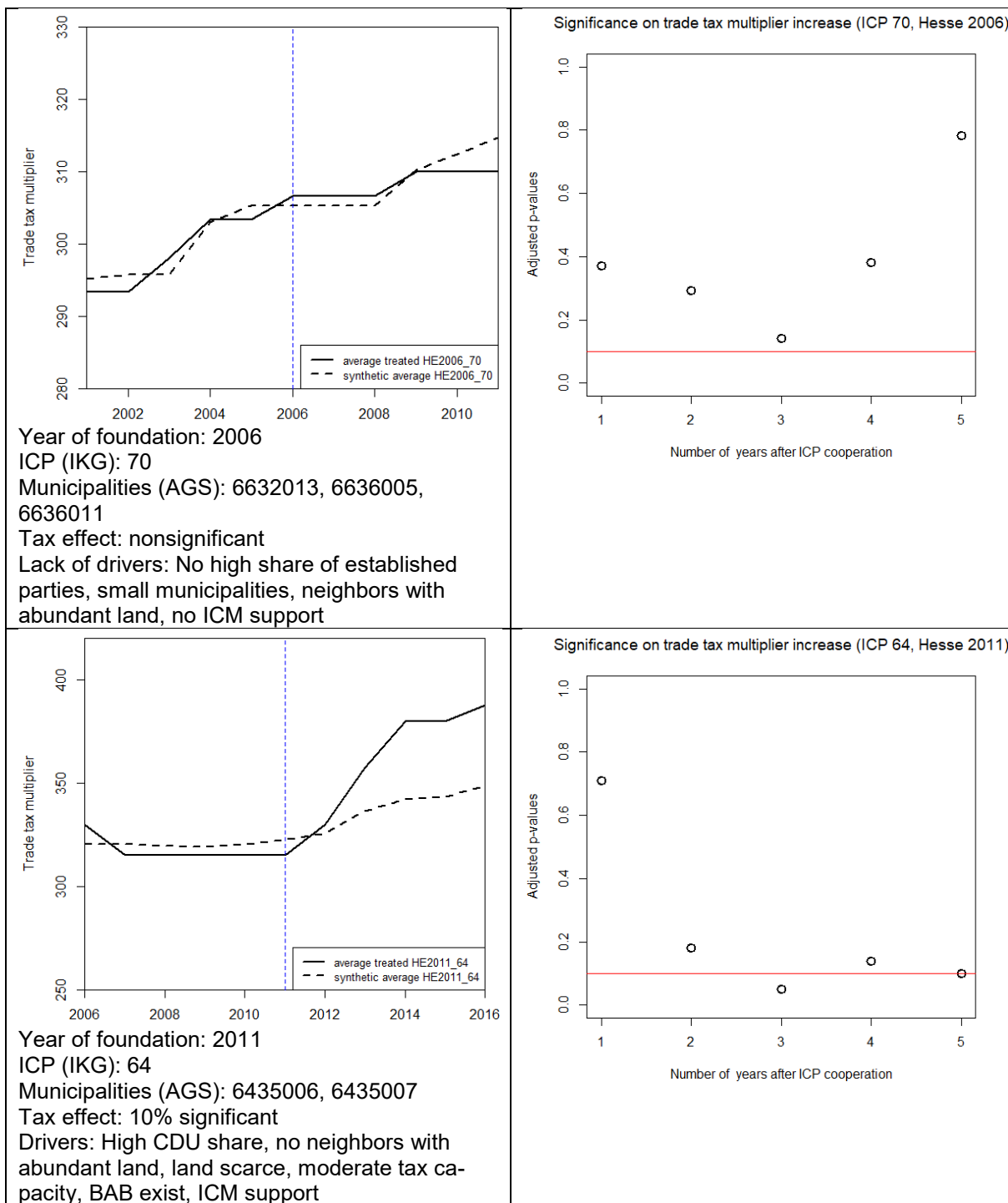
**Figure 2: Map of municipalities with joint business park**

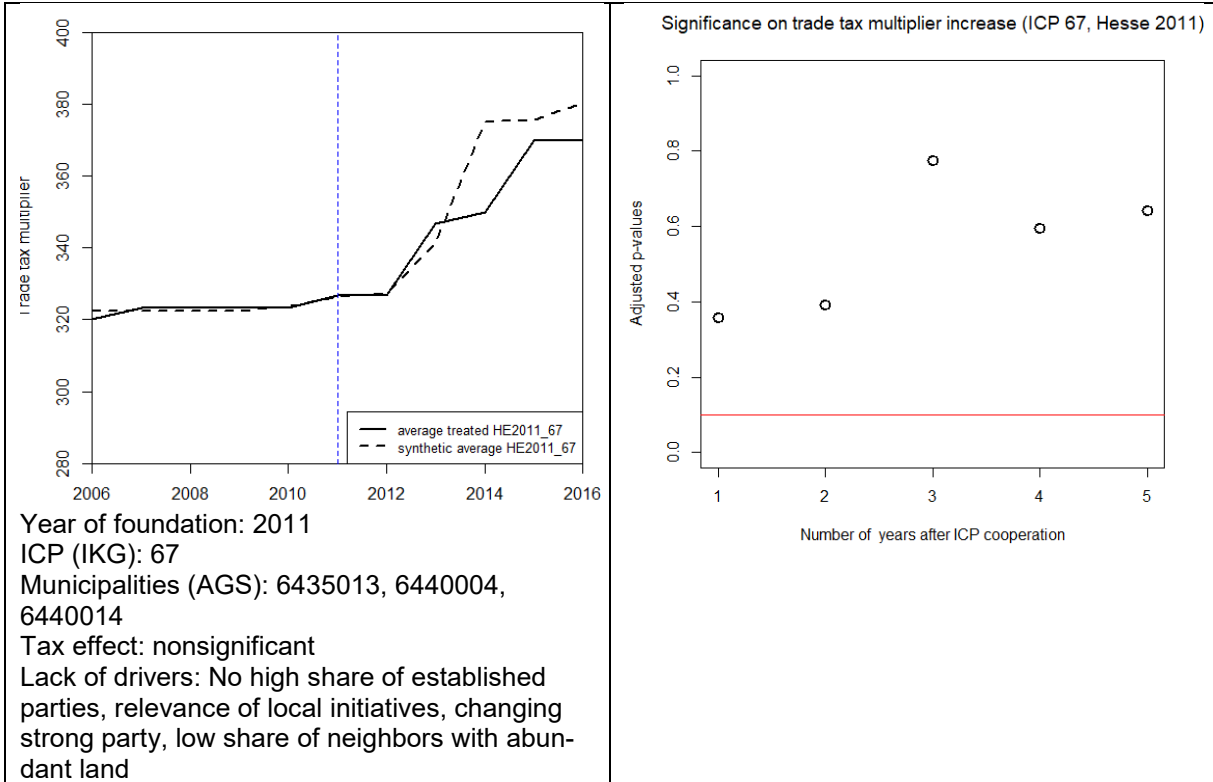


**Figure 3: Business tax multiplier in treatment group and donor pool (selected years)**

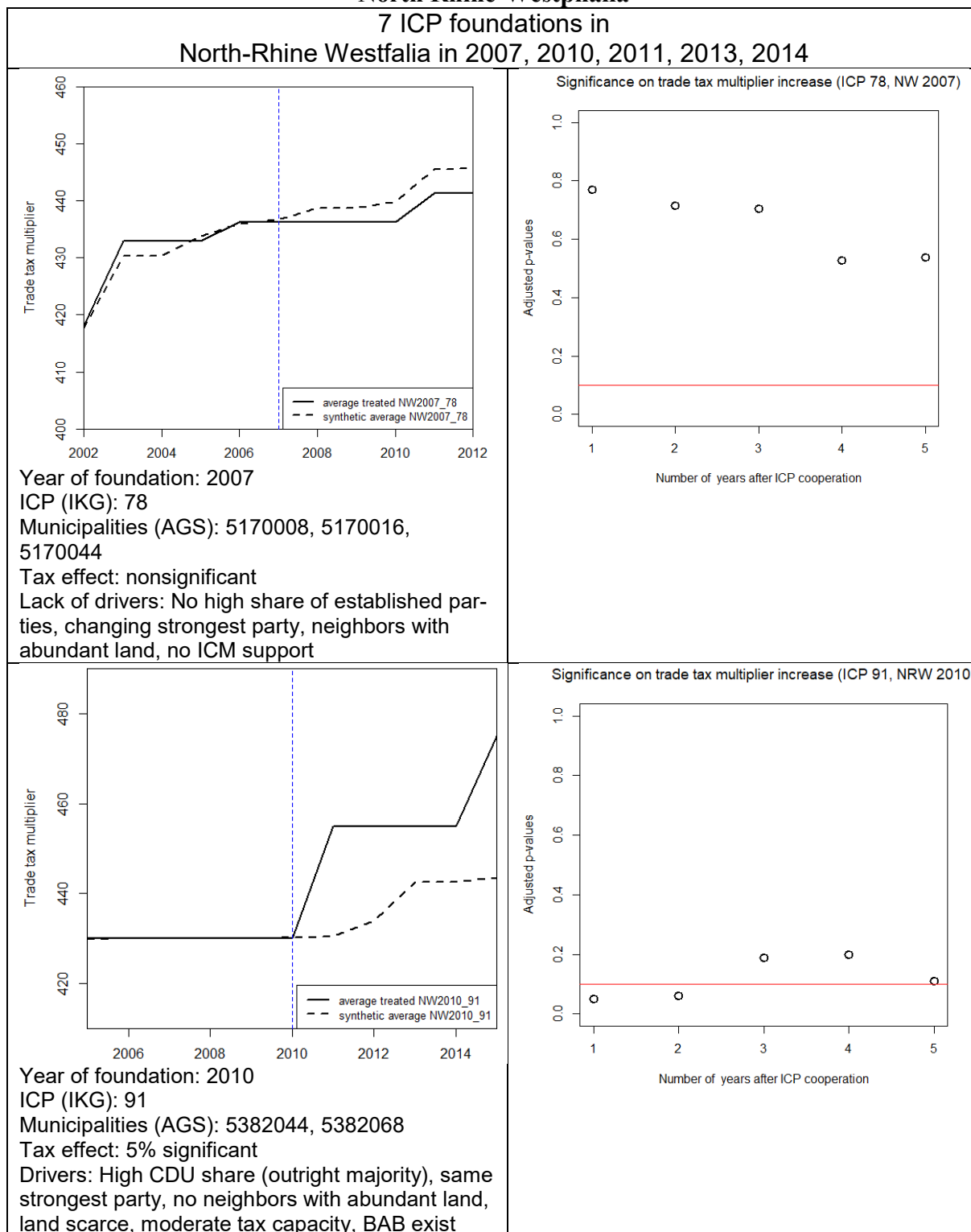
**Figure 4: Real and synthetic business tax multiplier for inter-local industrial parks in Hesse**

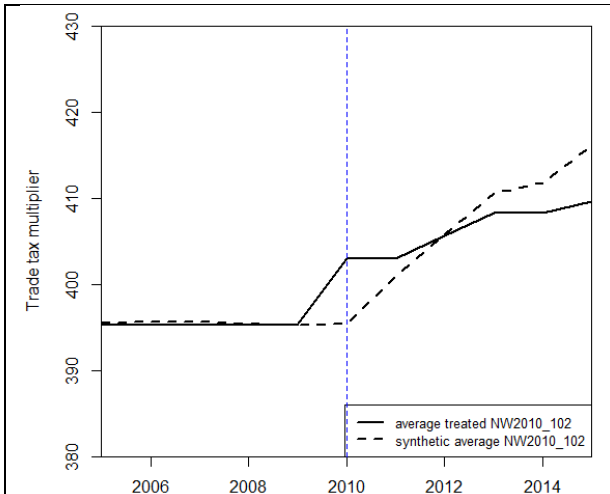




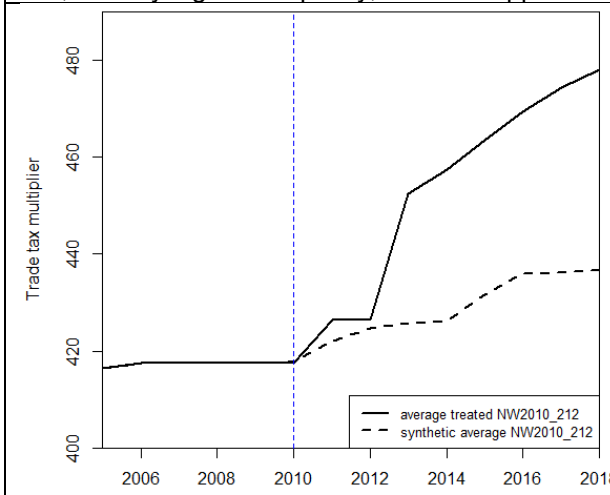
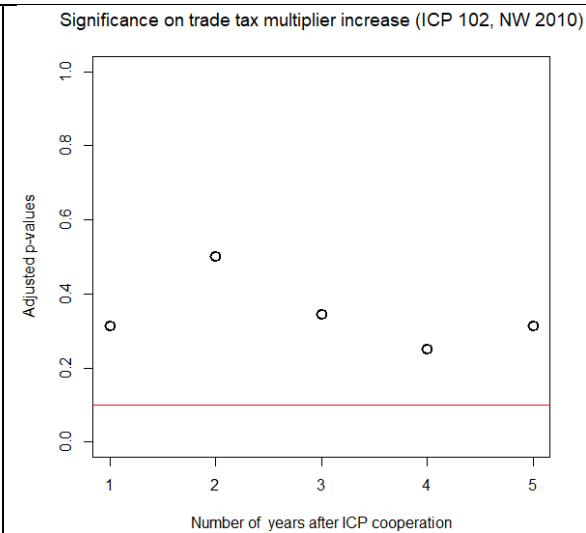


**Figure 5: Real and synthetic business tax multiplier for inter-local industrial parks in North Rhine-Westphalia**

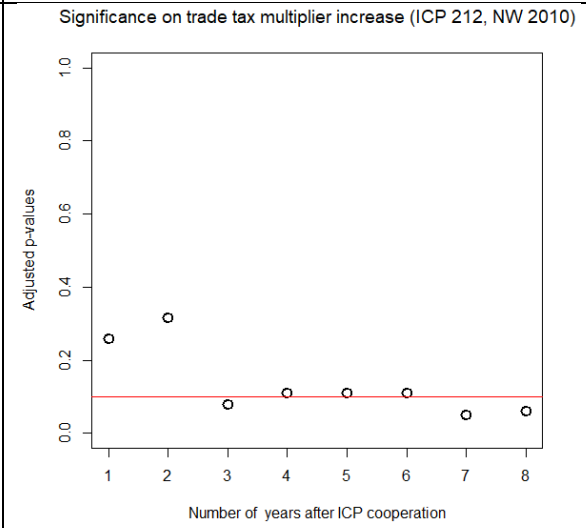


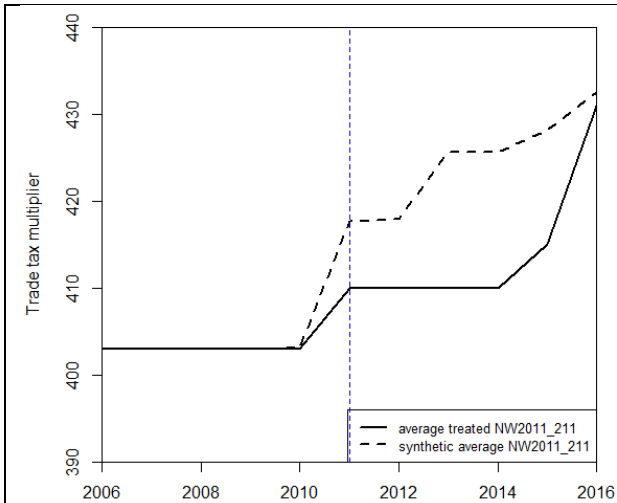


Year of foundation: 2010  
 ICP (IKG): 102  
 Municipalities (AGS): 5754008, 5754012, 5754052  
 Tax effect: nonsignificant  
 Lack of drivers: no high share of established parties, already high tax capacity, no ICM support

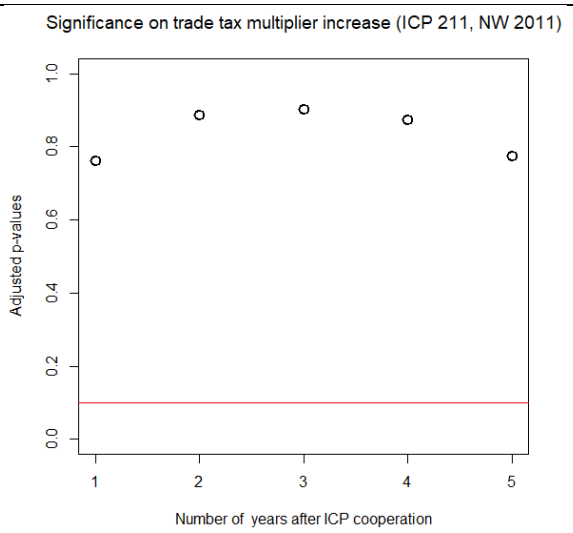


Year of foundation: 2010  
 ICP (IKG): 212  
 Municipalities (AGS): 5382036, 5382040  
 Tax effect: 5% significant  
 Drivers: High CDU share (outright majority), same strongest party, no neighbors with abundant land, land scarce, low tax capacity

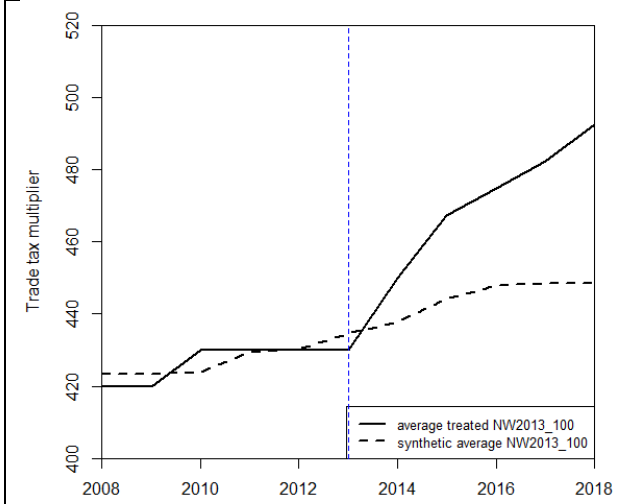




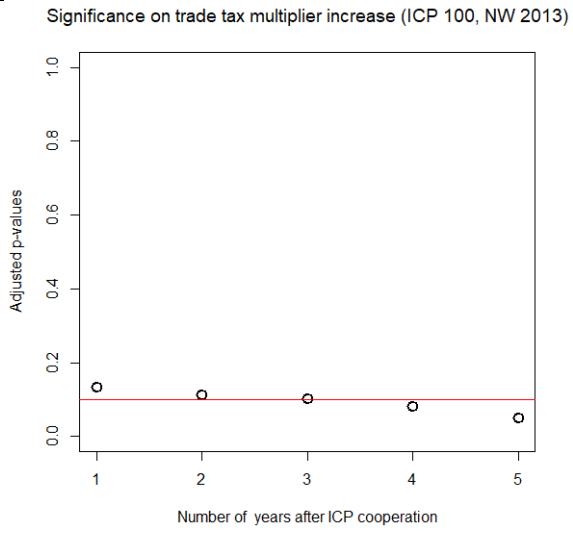
Year of foundation: 2011  
 ICP (IKG): 211  
 Municipalities (AGS): 5758024, 5770016  
 Tax effect: nonsignificant  
 Lack of drivers: changing strongest party, no ICM support



Significance on trade tax multiplier increase (ICP 211, NW 2011)

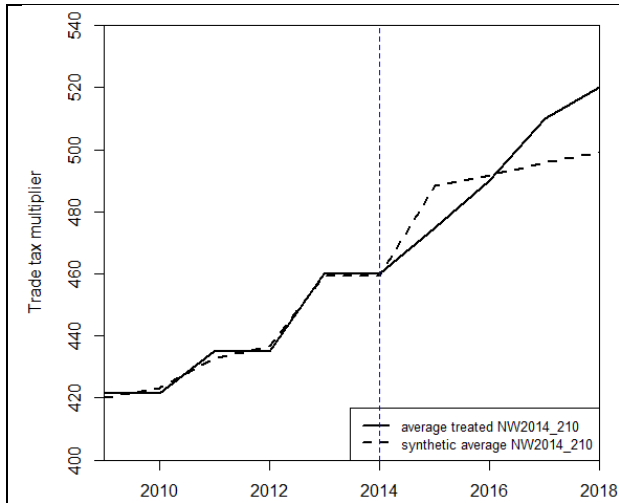


Year of foundation: 2013  
 ICP (IKG): 100  
 Municipalities (AGS): 5382004, 5382012  
 Tax effect: 10% significant  
 Drivers: Same strongest party, no neighbors with abundant land, land scarce, moderate tax capacity, BAB exist



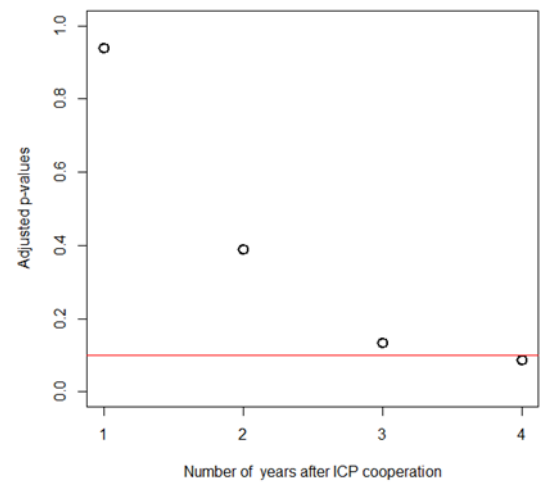
Significance on trade tax multiplier increase (ICP 100, NW 2013)



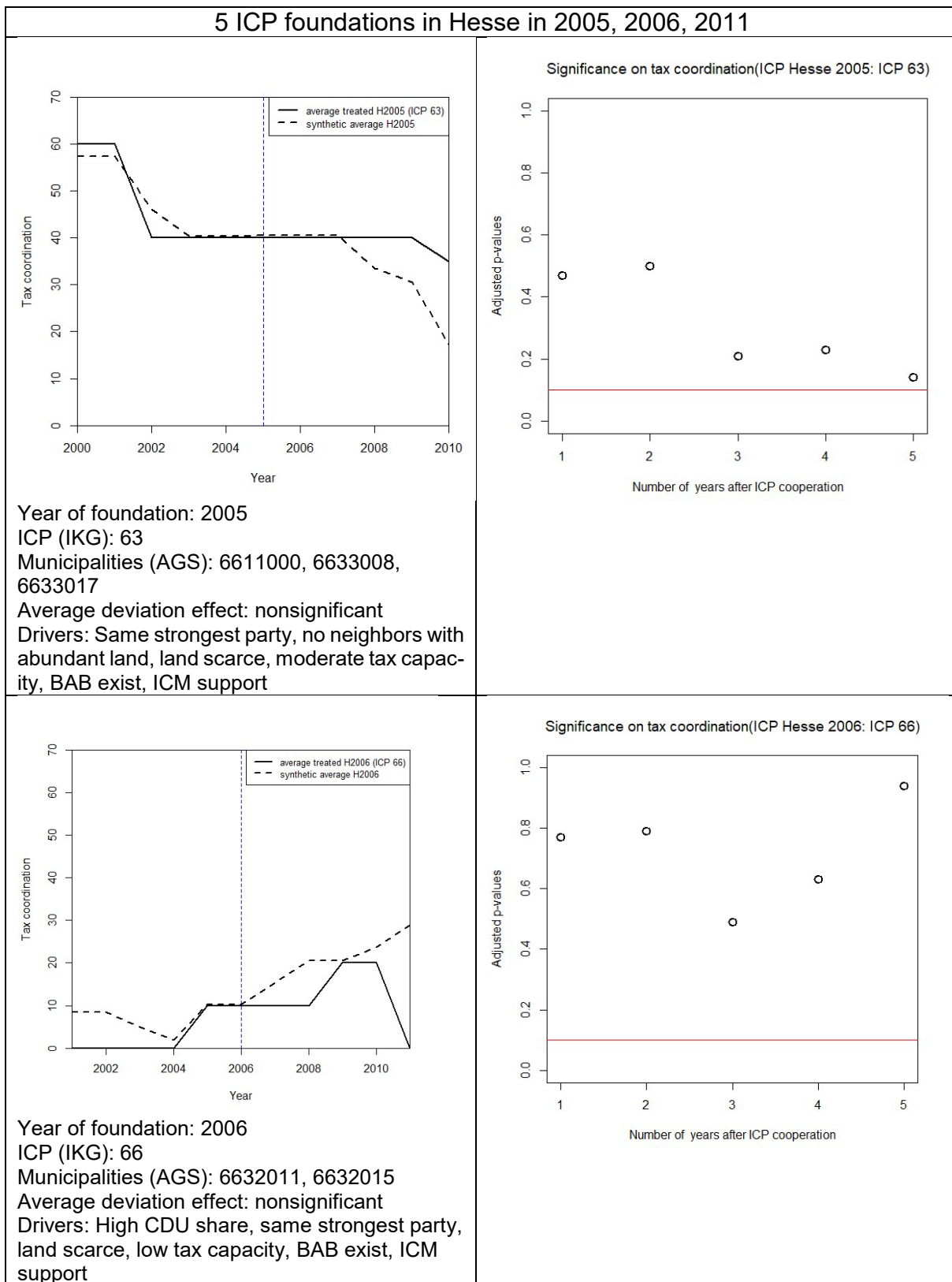


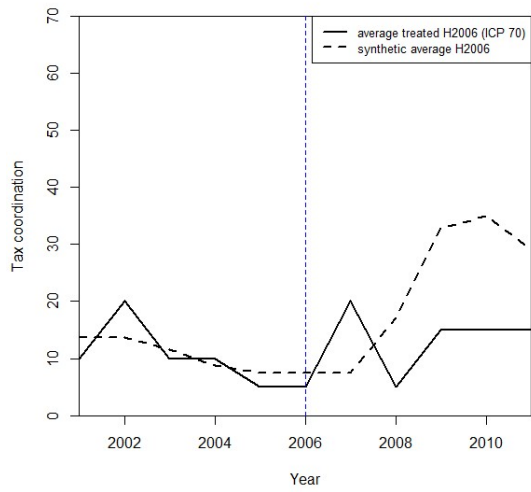
Year of foundation: 2014  
 ICP (IKG): 210  
 Municipalities (AGS): Inden (5358020),  
 Eschweiler (5334012)  
 Tax effect: 10% significant  
 Drivers: High CDU share, same strongest party,  
 land scarce

new  
 Significance on trade tax multiplier increase (ICP 210, NW 2014)

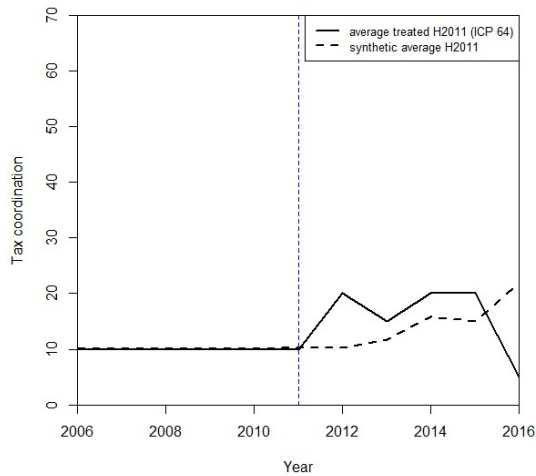
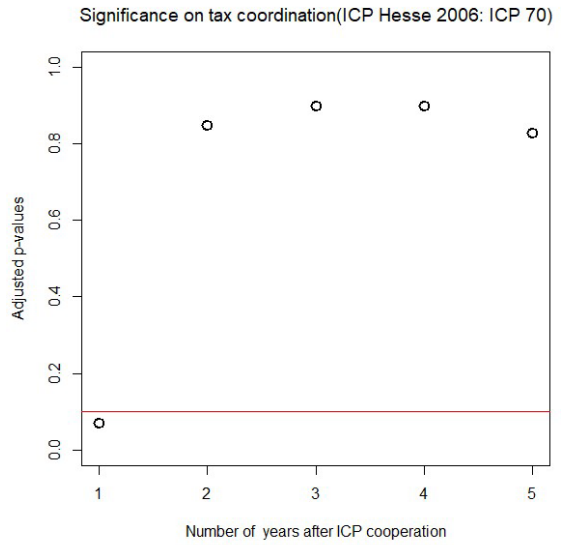


**Figure 6: Real and synthetic average deviation in business tax multiplier for inter-local industrial parks in Hesse**

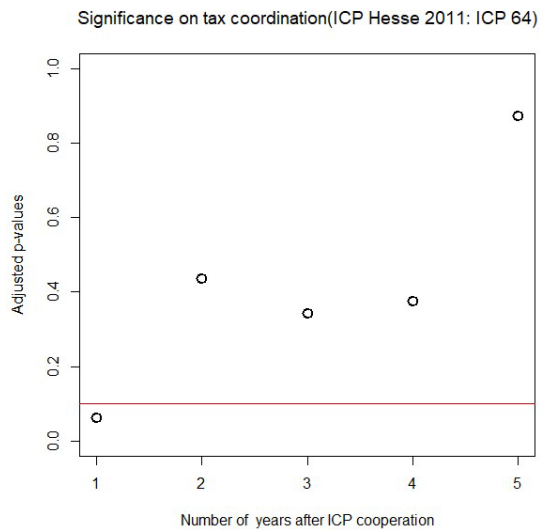


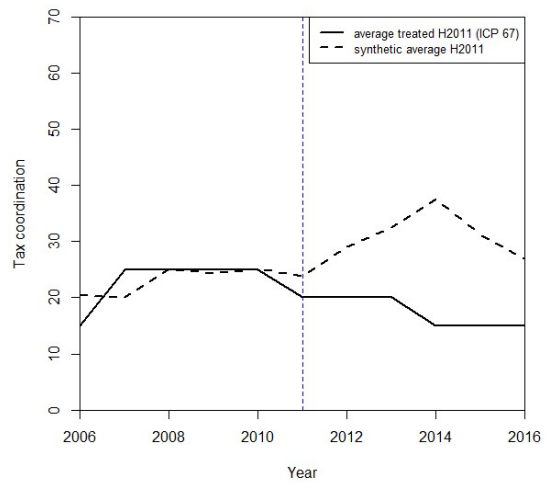


Year of foundation: 2006  
 ICP (IKG): 70  
 Municipalities (AGS): 6632013, 6636005, 6636011  
 Average deviation effect: 10% significant  
 Lack of drivers: No high share of established parties, small municipalities, neighbors with abundant land, no ICM support



Year of foundation: 2011  
 ICP (IKG): 64  
 Municipalities (AGS): 6435006, 6435007  
 Average deviation effect: 10% significant  
 Drivers: High CDU share, no neighbors with abundant land, land scarce, moderate tax capacity, BAB exist, ICM support





Year of foundation: 2011

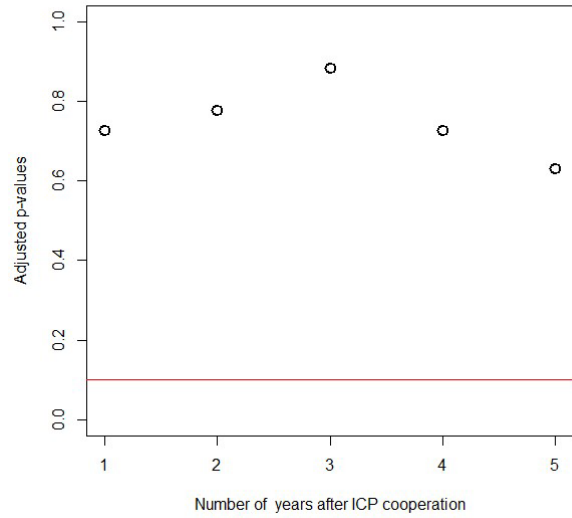
ICP (IKG): 67

Municipalities (AGS): 6435013, 6440004,  
6440014

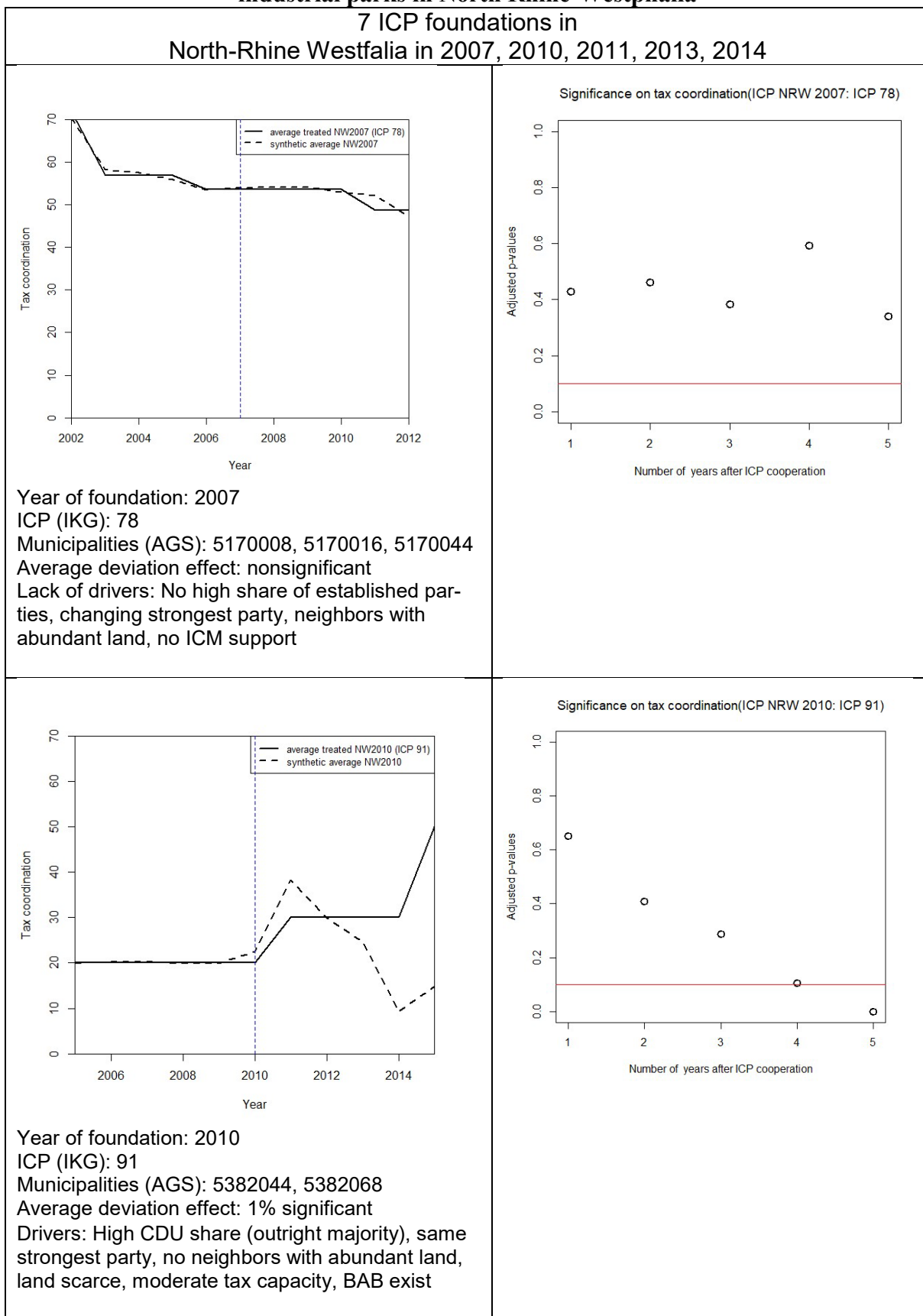
Average deviation effect: nonsignificant

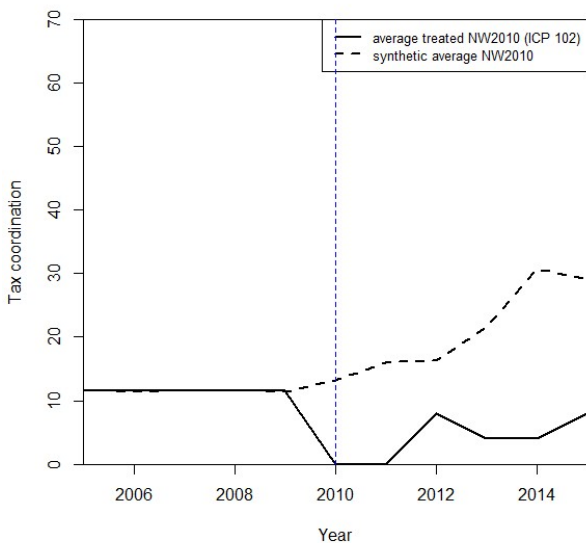
Lack of drivers: No high share of established parties, relevance of local initiatives, changing strong party, low share of neighbors with abundant land

Significance on tax coordination(ICP Hesse 2011: ICP 67)

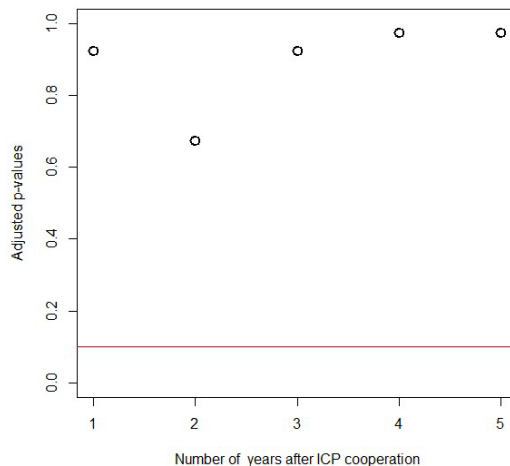


**Figure 7: Real and synthetic average deviation in business tax multiplier for inter-local industrial parks in North Rhine-Westphalia**

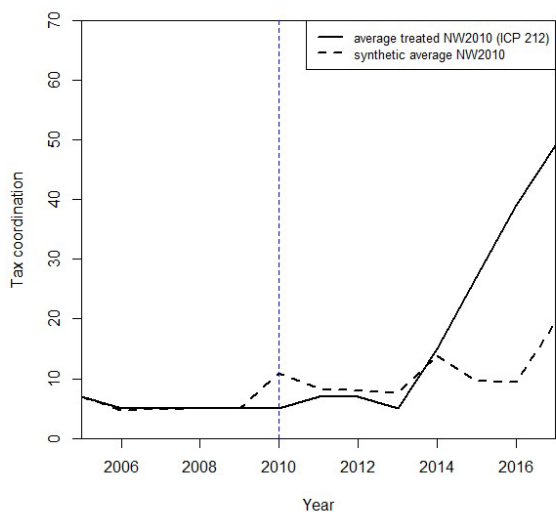




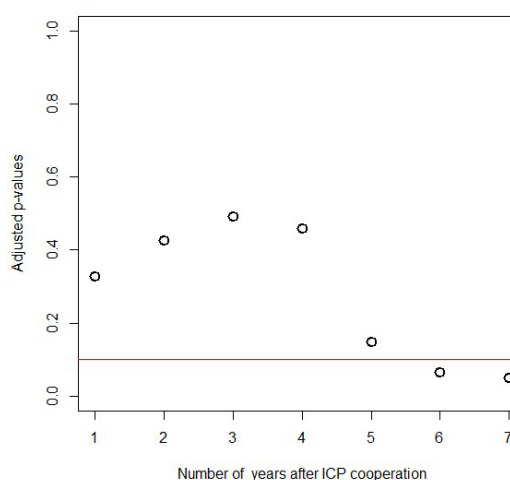
Significance on tax coordination(ICP NRW 2010: ICP 102)



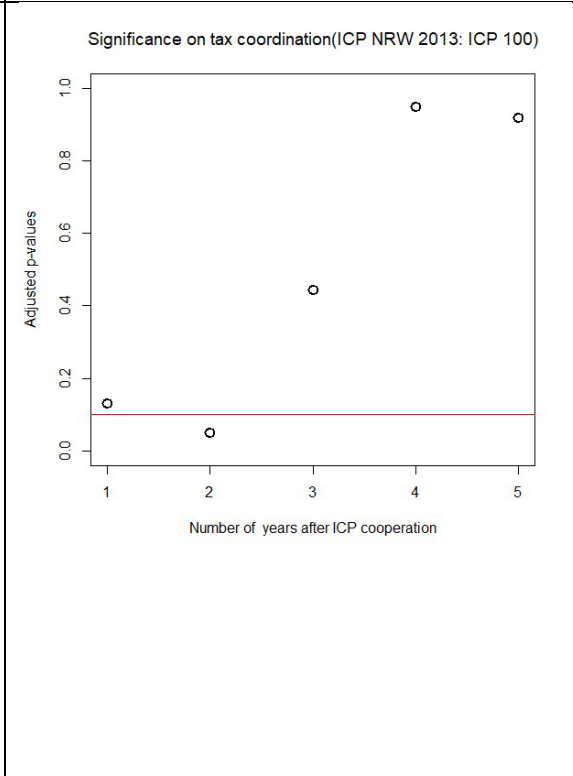
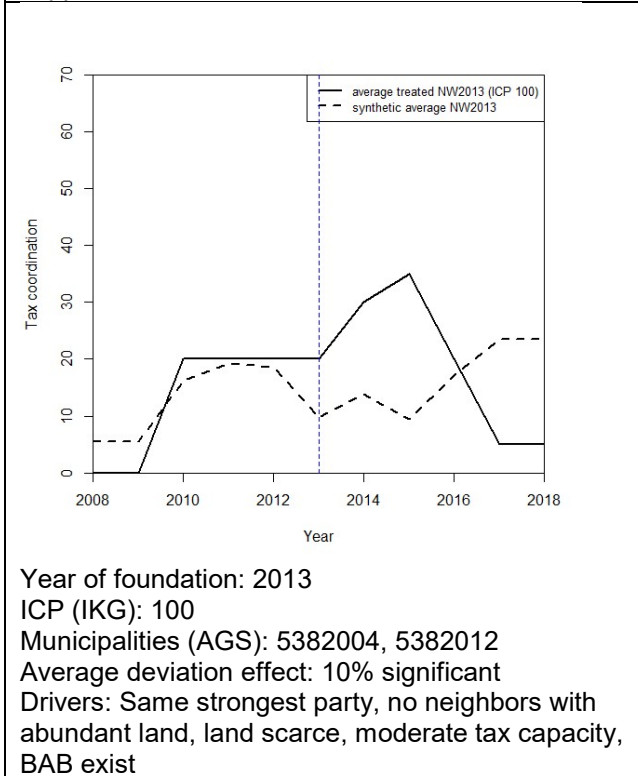
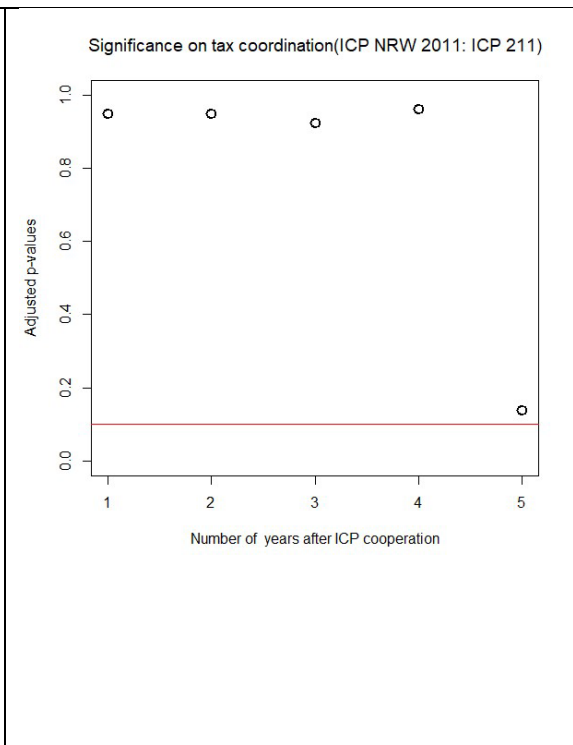
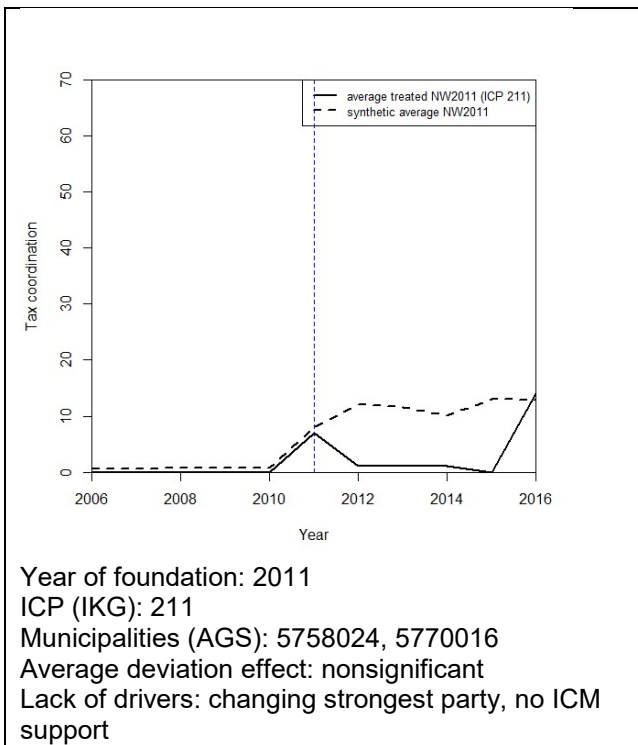
Year of foundation: 2010  
 ICP (IKG): 102  
 Municipalities (AGS): 5754008, 5754012, 5754052  
 Average deviation effect: nonsignificant  
 Lack of drivers: no high share of established parties, already high tax capacity, no ICM support

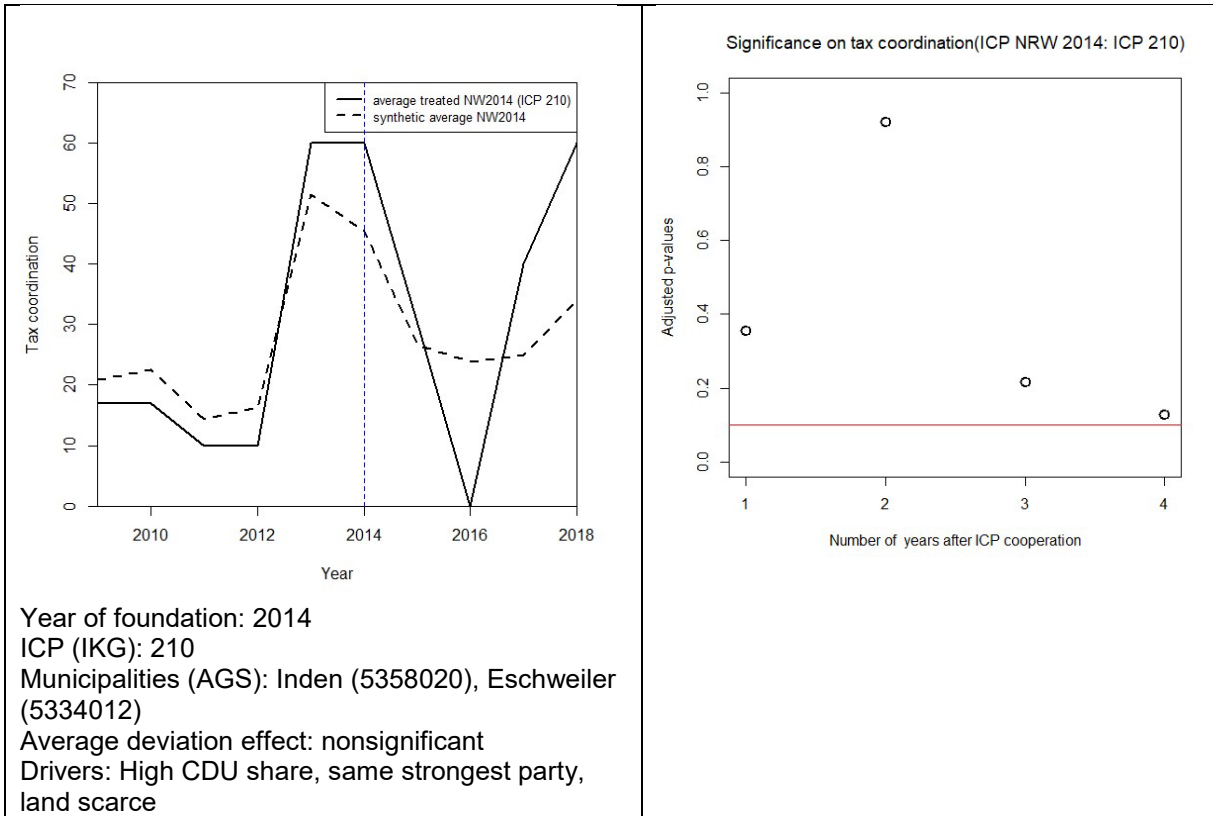


Significance on tax coordination(ICP NRW 2010:ICP 212)



Year of foundation: 2010  
 ICP (IKG): 212  
 Municipalities (AGS): 5382036, 5382040  
 Average deviation effect: nonsignificant (significant, if treatment period is extended 6th and 7th treatment period)  
 Drivers: High CDU share (outright majority), same strongest party, no neighbors with abundant land, land scarce, low tax capacity







**Table 1: Descriptive statistics for treatment group and donor pool in year 2004**

Variable	treatment group					donor pool				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
population	29	33078	42601	3101	194464	495	23550	50419	0	646889
share of pop < 18 years [%]	29	19.36	1.51	16.20	22.77	491	19.59	2.06	14.21	28.40
land scarce	29	0.93	0.26	0	1	494	0.75	0.44	0	1
motorway access	29	0.45	0.51	0	1	495	0.25	0.43	0	1
urban cluster	29	0.41	0.50	0	1	495	0.23	0.42	0	1
tax capacity	29	661	157	367	1010	491	677	289	77	2687
business tax multiplier	29	382	55	300	490	495	354	58	0	490
share Christian democrats [%]	28	39	9	22	57	483	41	13	0	74
share local initiatives [%]	28	8	8	0	26	483	14	13	0	100
Neighbors' population (median)	29	24973	21798	3389	79286	493	18837	27698	533	361856
Neighbors' share of pop < 18 (median)	29	0.19	0.01	0.17	0.22	492	0.20	0.02	0.16	0.24
Neighbors with abundant land	29	0.95	0.20	0	1	493	0.79	0.39	0	1
Neighbors with motorway access	29	2.90	1.47	1	6	494	1.64	1.57	0	11
Neighbors' tax capacity (median)	29	683	165	377	1004	492	643	211	168	2257
Neighbors' business tax multiplier (median)	29	379	55	300	460	493	355	45	190	470
Neighbors with same strongest party	26	3.92	2.40	0	11	455	3.45	2.08	0	13
Neighbors in the same county	29	3.88	1.37	0	6	495	3.72	1.58	0	8

**Table 2: Overview of case-based SCM results**

state	Year of Treatment (# of business park)	Effect on tax rate	Effect on average de- viation in tax rates
Hesse	2005 (63)	10% sign.	not sign.
Hesse	2006 (70)	not sign.	10% sign.
Hesse	2006 (66)	5% sign.	not sign.
Hesse	2011 (64)	10% sign.	10% sign.
Hesse	2011 (67)	not sign.	not sign.
North Rhine Westphalia	2007 (78)	not sign.	not sign.
North Rhine Westphalia	2010 (102)	not sign.	not sign.
North Rhine Westphalia	2010 (91)	5% sign.	1 % sign
North Rhine Westphalia	2010 (212)	5% sign	5% sign.
North Rhine Westphalia	2011 (211)	not sign.	not sign.
North Rhine Westphalia	2013 (100)	10% sign	10% sign.
North Rhine Westphalia	2014 (210)	10% sign.	not sign.

**Table 3: Ex post comparison of inter-local industry parks with and without significant effect****3a. Three cases with significant effect on tax multiplier vs. nine cases without significant effect**

Variable	insignificant		significant	
	Mean	Std. Dev.	Mean	Std. Dev.
year = 2003				
population (average)	30948	24031	25984	26152
population (st. dev.)	31817	34165	10787	14244
population (max.)	62078	63060	33611	36139
CDU seats (% average)	40.89	8.03	49.75	8.57
CDU seats (% st. dev.)	6.88	4.84	7.07	3.54
seats local initiative (% average)*	7.59	5.26	0.67	1.15
tax capacity (average)	656.06	142.54	606.97	110.48
tax capacity (st. dev.)	75.87	50.19	67.42	72.50
business tax multiplier (average)	380.92	52.34	378.83	68.60
business tax multiplier (st. dev.)	14.01	10.87	7.78	11.68
year = 2015				
CDU seats (% st. dev.)	4.05	2.68	3.97	3.40
CDU seats (% average)*	32.97	5.50	42.04	6.30
seats local initiative (% average)**	11.08	4.07	2.84	2.62
year = 2018				
CDU seats (% st. dev.)	4.45	2.95	10.25	8.03
CDU seats (% average)	32.25	5.18	40.27	9.27
seats local initiative (% average)	13.69	3.88	8.75	7.84
time-invariant				
motorway access (average)	0.45	0.14	0.50	0.50
number of neighbors (average)	6.27	0.49	5.83	0.29
members of joint industry parks	2.67	0.71	2	0
number of situs municipalities	2.00	0.71	1.33	0.58

\*\* Wilcoxon rank-sum test, significant at the 5 percent level

\* Wilcoxon rank-sum test, significant at the 10 percent level

**3b. Two cases with significant effect on average deviation in business tax multiplier vs. nine cases without significant effect**

Variable	insignificant		significant	
	Mean	Std. Dev.	Mean	Std. Dev.
year = 2003				
population (average)	28328	24124	36601	26295
population (st. dev.)	28407	33556	15616	16305
population (max.)	56425	62083	47644	37824
CDU seats (% st. dev.)	7.34	4.73	5.09	1.32
CDU seats (% average)**	40.81	7.58	54.60	2.35
seats local initiative (% average)	6.83	5.51	1.00	1.41
tax capacity (average)	642.00	141.55	652.74	108.80
tax capacity (st. dev.)	69.54	50.64	91.66	83.59
business tax multiplier (average)	372.83	55.58	418.25	9.55
business tax multiplier (st. dev.)	12.46	11.19	11.67	13.50
year = 2015				
CDU seats (% st. dev.)	3.69	2.77	5.70	2.26
CDU seats (% average)**	33.18	5.23	45.50	2.79
seats local initiative (% average)	9.97	5.19	4.26	1.28
year = 2018				
CDU seats (% st. dev.)	5.94	5.47	5.70	2.26
CDU seats (% average)**	32.00	4.95	45.50	2.79
seats local initiative (% average)*	14.09	3.88	4.26	1.28
time-invariant				
motorway access (average)	0.51	0.22	0.25	0.35
number of neighbors (average)	6.19	0.52	6	0
members of joint industry parks	2.60	0.70	2	0
number of situs municipalities	1.90	0.74	1.50	0.71

\*\* Wilcoxon rank-sum test, significant at the 5 percent level

\* Wilcoxon rank-sum test, significant at the 10 percent level