Oxford University Centre for Business Taxation

Localization Economies and the Sensitivity of Firm Foundations to Changes in Taxation and Public Expenditures

December 2018

WP18/21

Christian Wittrock
Ruhr-University Bochum and TU Dortmund

Working paper series | 2018

SAID BUSINESS SCHOOL

UNIVERSITY OF OXFORD

Localization Economies and the Sensitivity of Firm Foundations to Changes in Taxation and Public Expenditures*

Christian Wittrock†

Abstract

This paper investigates the influence of tax rates and public expenditures on the number of firm foundations in West German municipalities in the presence of localization economies. Brülhart *et al.* (2012) use Swiss data to show that localization economies can mitigate the negative effects of taxation on firm foundation rates. Firms are more willing to accept higher tax rates if localization economies within their industry exist that generate beneficial spillover effects. These agglomeration rents can be taxed by municipalities (see Koh *et al.* 2013) and localities can use additional revenues for public spending. This work exploits information on the localization of German industries on a 2 digit level based on work by Koh and Riedel (2014). It is combined with detailed data on the number of firm foundations, the local business tax rate and public expenditures in West German municipalities to analyze the sensitivity of firm foundations to changes in the local tax rate and public spending with respect to localization economies. Similar to Brülhart *et al.* (2012) the results for Germany imply that increasing localization of an industry diminishes the negative effect of business taxation at a given location. On top, the results show that the positive effect of public expenditures (namely economic promotion and municipalities total capital stock) is mitigated by localization economies.

JEL classification: R12, R3, H25, H41

Keywords: Firm location; Agglomeration; Taxation; Regional Policy; Public Goods

*I am grateful to Martin Simmler, Nadine Riedel and Wolfram Richter for helpful comments and suggestions. Moreover, I gratefully acknowledge financial support from the German Research Foundation (Riedel: RI 2491/2-1).

†RGS Econ, TU Dortmund and U Bochum. E-mail: christian.wittrock@rub.de

I. Introduction

Economic activity is not equally distributed across space. Since Marshall (1890) economist are searching for answers about the determinants of firms location decision. Most notably, starting with Krugman's (1991) work on the "new economic geography" many contributions to the literature discussed the effects of agglomeration economies. Agglomeration creates incentives for mobile investment to seek proximity to benefit from spillovers. These spillovers can be classified into two main types (1) localization economies (see Marshall 1890, Arrow 1962, Romer 1986) and (2) urbanization economies (Jacobs 1969). Localization economies increase productivity of firms with increasing size of an industry in a geographical location e.g. by knowledge spillovers of firms within close distance that are spatially concentrated (see Audretsch and Feldman 1996, for R&D spillovers). Marshall (1890) and Krugman (1991) argue that these spillovers might be geographically bounded with the costs of transmitting information increasing with distance. Urbanization economies benefits firms locating in a region and increase with the size of the region e.g. by better access to a larger labor force (see Rosenthal and Strange 2004, for a discussion). The first is beneficial for firms in the same industry and the latter is beneficial for all firms (Maurel and Sédillot 1999). Depending on the dominance of a spillover either specialized areas or industrially diversified areas emerge (Jacobs 1969). More importantly, if firms benefit from locating close to each other this can affect the sensitivity of firms to location characteristics (see Brülhart *et al.* 2012) and create possibilities for municipalities to tax agglomeration rents (see Koh *et al.* 2013). The standard theory of tax competition states that increasing firm mobility results in a race to the bottom of corporate taxes (see Wilson 1999, for a review). Simultaneously, this result remains and open discussion in the empirical literature using localities in Germany (see e.g. Buettner 2003, Baskaran 2014). A number of theoretical contributions discuss the interacting effects of agglomeration and the local tax setting (see e.g Kind *et al.* 2000, Ludema and Wooton 2000, Andersson and Forslid 2003, Baldwin and Krugman 2004, Borck and Pflüger 2006, Baldwin and Okubo 2009). This paper aims to analyze the sensitivity of firms location decisions with respect to localization economies. More specific, following a recent contribution by Brülhart *et al.* (2012) this paper aims to analyze the effects of localization economies on the sensitivity of firm foundation rates to changes of the local business tax. On top, I will contribute adding an analysis of the localization sensitivity of firm foundation rates to public expenditures. Devereux *et al.* (2007) show for a model of plant location in Great-Britain that agglomeration externalities have an effect on the responsiveness of firms to fiscal incentives. In detail, they show that fiscal incentives have a greater impact in regions with a larger stock of existing plants. The authors do not explicitly model the effect of localization and fiscal incentives on firm births. Note that the literature on these interaction effects is scarce. This paper will contribute exploiting rich data on firm foundation rates, public expenditures and local business taxation in West German municipalities from 1998 to 2006. First, the data allows to replicate the results of Brülhart *et al.* (2012) for German data and to review their results. Second, the data allows to explicitly address the interaction effects of localization and public expenditures on the number of firm foundations.

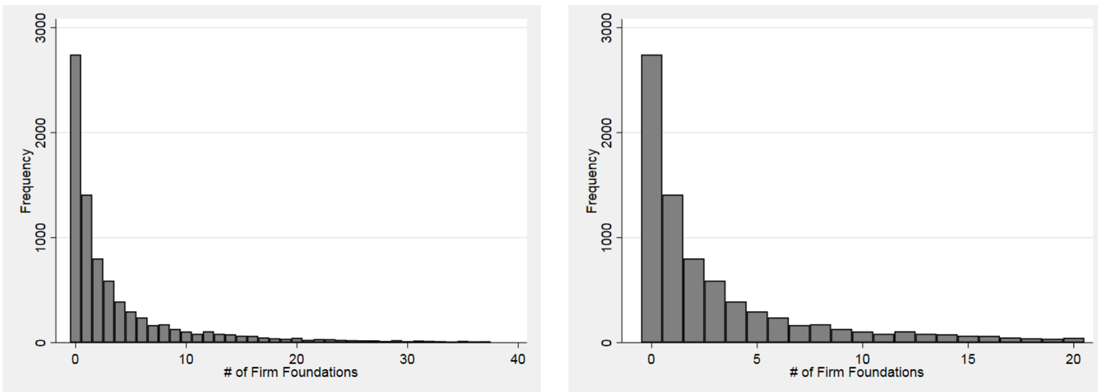
Following Brülhart *et al.* (2012) and Guimarães *et al.* (2003) the decision process of firms location choice can be modeled and estimated using a Poisson model. Hence, using detailed data on firm foundation, taxation and public expenditures in a Poisson model I can explicitly address the question to what extend local business taxes and public expenditures affect firm foundation rates. Moreover, it allows to analyze the sensitivity of both effects to localization economies. I identify a negative effect of a 1% increase of the mean local business tax on the expected number of firm foundations in non-localized industries by 4.4%. On top, the sensitivity of firm foundations to changes in the local business tax decreases significantly with increasing localization economies. Thus, a 1% increase of the average local business tax decreases the expected number of firm foundations in top-localized industries by 1.34%. In contrast, a 1% increase of mean public expenditures (represented by the capital stock for economic promotion) increases the expected number of firm foundations in non-localized industries by 0.13%. Again, this effect decreases significantly with increasing localization. A 1% increase of the average economic promotion capital stock increases the expected number of firm foundations in top-localized industries by 0.08%. Thus, the negative effects of taxation and the positive effects of public expenditures are supplanted by localization economies and firm foundations in strongly localized industries are less sensitive to changes of local taxation and public expenditures.

The remainder of this article is structured as follows. Section II presents the institutional background and data necessary to understand the research approach and the results. The coefficient of localization economies used in this article is explained in section III. The empirical model, empirical obstacles, results and some remarks on robustness are discussed in sections IV to VI. Section VII concludes.

II. Institutional Background and Data

The analysis to come will exploit rich data on municipalities in West Germany. Municipalities represent the lowest institutional level. They possess the right to govern themselves (Article 28 of the German constitution) and thus, can independently set policies to attract mobile capital. The latter will be represented by the number of firm foundations based on public data called '*Gewerbeanzeigenstatistik*'. Firms are

Figure 1: Histograms of the Number of Firm Foundations in Germany Municipalities in 2006.



(a) Number of Firm Foundations (Cut at the 95% Quantile).

(b) Number of Firm Foundations (Maximum 20).

mandatory to register if they set up a new firm or branch in Germany.[1] The data is available for the years 1998 to 2006. Figure (1) depicts the number of new firm foundations in 2006. A significant mass of municipalities have zero or only one firm foundation per year. This is based on the fact that many municipalities are small entities with a low probability of a firm locating there. This probability plays an important factor understanding the impact of changes in municipalities policies.

Municipalities are mainly funded by three sources. First, some revenues, e.g. the personal income tax, are collected on the federal state or country level and distributed among governmental levels (municipalities receive e.g. 15% of the overall income tax revenues). Second, municipalities set the local property tax and local business tax multipliers to generate own sources of revenues.[2] Third, other sources of revenues are generated via grants by the federal states or the German government.[3] Revenues are used for (1) mandatory and (2) voluntary public expenditures.

[1]Note that the *Gewerbeanzeigenstatistik* also includes self-employed firms. Our sample of firm foundations does include all registrations of corporations, partnerships and self-employed firms with at least 1 employee.

[2]Note that since 2004 the local business tax multiplier is bound from below by 200.

[3]Additionally, German municipalities set local taxes or collect fees for various services to generate

Mandatory expenditures (e.g. social security) is administered by the local government while laws regarding this expenditures are made on the federal or state level. Municipalities are governed by local councils and majors who can decide about the level of voluntary expenditures e.g. theaters, museums, public parks, local streets, economic promotion and public investment.

Data for public expenditures is based on detailed accounting information for municipalities (the so called '*Jahresrechnungsstatistik*') and available for the years 1992 to 2006. This data contains information about the size and target of public expenditures. Municipalities do not invest in public expenditures regularly over the years and expenditures show significant variance over time. Moreover, expenditures do not necessarily have a one-time impact and can take effect over several years. To capture these effects I calculate capital stock values using yearly expenditures and official information about the operating lives of public investment using the perpetual inventory method.

In detail, the capital stock of public expenditures (henceforth called C) is calculated based on disaggregated accounting data of German municipalities between 1992 to 2006.[4] The initial capital stock of a municipality is assumed to be equal to

$$K_0 = \frac{\overline{E}}{g_{gdp} + \frac{1}{T}} \tag{1}$$

with $\overline{E}$ the average expenditures for investment in and construction of public goods, g_{gdp} the GDP growth rate and T for the average publicly available operating life. I will assume a GDP growth rate of 2% and linear depreciation of the capital stock. The capital stock C in municipality i at time t is given by

revenues.

[4]The data set *Jahresrechnungsstatistik* is provided by the German statistical offices.

$$C_{i,t} = \sum_{k=0}^{T} E_{i,t-k}\left(1 - \frac{k}{T}\right) + AE_{i,t} \qquad (2)$$

with $E_{i,t}$ investment and construction expenditures and $AE_{i,t}$ administration expenditures. Note that I assume that administration expenditures depreciate within one year. Furthermore, expenditures in 1992 (the starting year of the data) are equal to the capital expenditures plus the initial capital stock K_0. Hence, expenditures before 1992 are assumed to be equal to 0.

Following Devereux *et al.* (2007) I'm mainly interested in the effects of public expenditures for economic promotion (represented by the capital stock of economic promotion) on the number of firm foundations. I expect economic promotion to have the greatest impact on firm births as they are directly targeted towards firms. The literature on the effects of public expenditures on firms uses a variety of proxies (see e.g. Fisher 1997, Sturm *et al.* 1998, Romp and De Haan 2007). Hence, to control for the robustness of the results I additionally estimate the effect of the total capital stock on firm foundations. The total capital stock is the sum of voluntary public expenditures.[5] Additionally, to control for the validity of the capital stock proxy I moreover estimate the effect of overall current (voluntary) public expenditures on firm foundations. Both robustness checks do not change the results.

The data is augmented by socio-economic control variables such as population, the share of low, medium or high qualified employees as well as the tax multiplier of the local business tax based on the *Statistik Lokal* or *Inkar* databases. Overall, the sample comprises about 8,500 West-German municipalities for the years 1998 to

[5]Voluntary public expenditures comprise of expenditures for (1) public security, (2) schools, (3) culture and public education, (4) child- and youth care, (5) health, sport and recreation, (6) public transportation and parking facilities, (7) public streets, (8) economic promotion, (9) public construction and housing.

Table 1: Descriptive Statistics for 2006

	Mean	Std. Dev.	Pctl(25)	Pctl(75)
# of Firm Foundations (Full Sample)	7.86	24.49	0.00	6.00
# of Firm Foundations (Log Sample)	11.69	29.03	2.00	10.00
Population in 1000	6.49	16.55	0.72	5.74
Unemployment Rate in %	5.34	1.82	4.00	6.40
Share of Low Skilled Workers in %	17.54	2.95	15.20	19.70
Share of Medium Skilled Workers in %	63.33	3.73	60.60	65.90
Share of High Skilled Workers in %	5.58	2.28	4.20	6.10
Students per 1,000 Inhabitants	5.71	14.56	1.00	3.20
Doctors per 100,000 Inhabitants	131.71	22.57	121.40	138.40
Local Business Tax Multiplier in Points	339.25	31.17	320.00	352.00
Economic Promotion in 1 Million Euro	1.41	5.97	0.06	0.78
Total Stock in 1 Million Euro	29.43	67.44	3.18	29.00

Source: Own data collection and calculations. *Notes:* The table depicts the sum of firm foundations over all industries in 2006. The sample covers 8418 municipalities in the full sample and 5612 municipalities in the log-sample.

2006 and 41 industry classes.[6] Descriptive statistics for the year 2006 are provided in Table (1). The average municipality has approximately 7,500 inhabitants and 8 new firm foundations (in 2006). The average local business tax multiplier is 339 points and the average total capital stock is 30 Million Euro. Approximately 5% is due to economic promotion. Note that the variation in the total capital stock and capital stock of economic promotion is high among municipalities.[7]

III. Localization Index

Localization will be measured using the agglomeration index for Germany proposed by Koh and Riedel (2014). The index (henceforth called LOC) is calculated using the method proposed by Duranton and Overman (2005). Based on the Duranton and

[6] Data for East Germany is available. I concentrate on West-Germany because the sample period is to close to reunification and economic conditions differ substantially between West- and East Germany.

[7] To exclude outliers I drop observations with more than 300,000 inhabitants as well as the city states Bremen and Hamburg from the analysis.

Overman (2005) framework an industry is defined as being localized or dispersed if the distribution of bilateral distances within an industry significantly deviates from a random distribution of distances. By using a continuous scale to determine agglomeration the LOC index avoids disadvantageous of other indexes e.g. the Gini Index or the Ellison and Glaeser (EG) index (for the later see Ellison and Glaeser 1997). In contrast to the EG index the LOC index does not assume ex ante allocation of firms. Following Duranton and Overman (2005), EG *transforms dots on a map into units in boxes* and deletes large amounts of information while creating aggregation problems. Among these problems is the restriction to one spatial scale. While this limits comparability of the agglomeration index between different scales and hence, differing institutional settings (e.g. countries), scales are normally defined based on administrative and not economic relevance. Furthermore, the EG index creates a downward bias if agglomeration crosses administrative boundaries. Additionally, as noted by Ellison and Glaeser (1997) agglomeration indexes have to control for industrial concentration. Because the number of firms is not arbitrary large, a random location process cannot generate regular location patterns. The calculation of the LOC index can be separated into four steps (see Koh and Riedel 2014, for a detailed description).

Step 1: Calculation of the kernel density estimate

Information on the location of companies is used to calculate bilateral euclidean distances.[8] Distances are then used to calculate the density of bilateral distances

[8]Note that due to confidentiality issues of the data the locations of companies within a municipality are assumed to be equal to the centroid of the municipality. Hence, distances of firms within the same municipality are zero. Koh and Riedel (2014) do not expect the calculated LOC index to be systematically biased. First, the measurement error does occur when calculating distances as well as counterfactuals. Secondly, the assumption does add unsystematic noise to the LOC index as distances within a municipality are underestimated and distances between firms of different

$\hat{K}_m(d)$ at any point (distance) d using

$$\hat{K}_m(d) = \frac{1}{n(n-1)h} \sum_{i=1}^{n-1} \sum_{j=i+1}^{n} f\left(\frac{d - d_{i,j}}{h}\right) \tag{3}$$

with n the number of firms in the industry and f the Gaussian kernel function with bandwidth (smoothing parameter) h.

Step 2: Constructing counterfactuals

A counterfactual kernel density estimate for each industry m is calculated to be compared with the estimate of equation (3) to identify significance deviation from randomness. Koh and Riedel (2014) use the population of all plants located in Germany and calculate the density estimate given by equation (3) with 1000 draws to generate 1000 counterfactuals for every industry m.

Step 3: Global confidence bands

For each distance d a $\hat{K}^s_{\tilde{m}}(d)$ is picked such that 95% of all randomly generated distance density functions lie above or below this band generating an upper $\overline{\hat{K}_{\tilde{m}}(d)}$ and lower $\underline{\hat{K}_{\tilde{m}}(d)}$ bound of kernel density estimates.

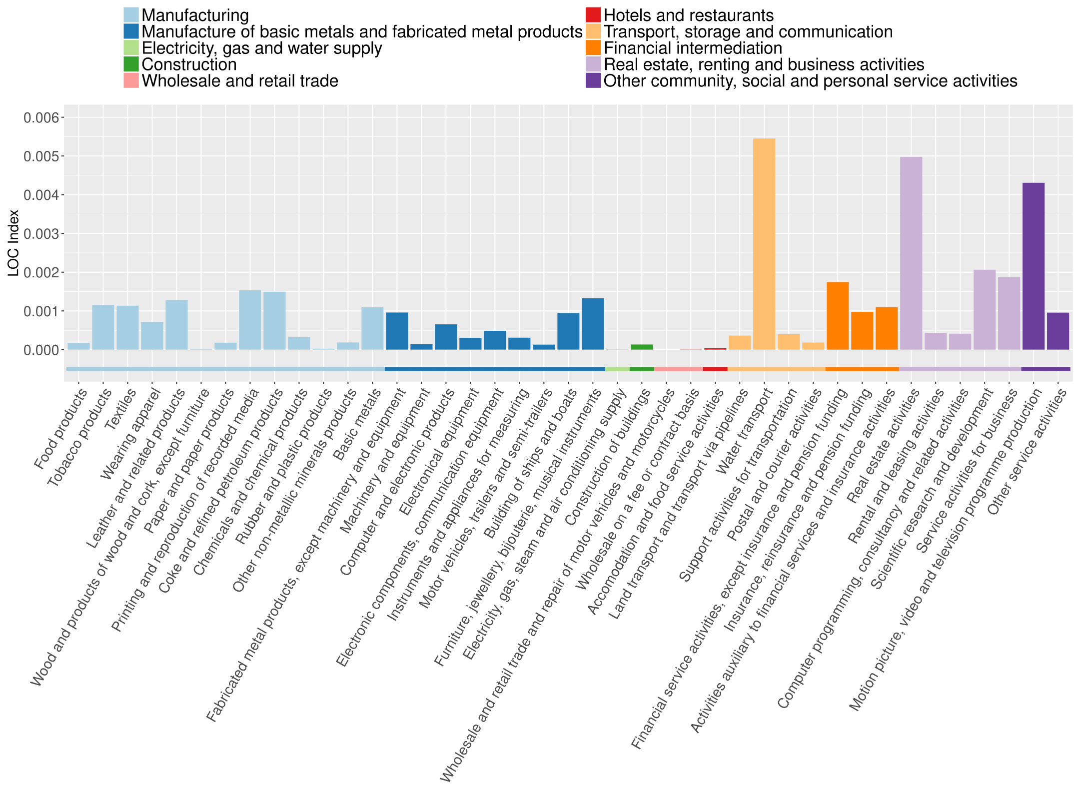
Step 4: Identification of localized industries

An industry is assumed to be localized if $\hat{K}_m(d) > \overline{\hat{K}_m(d)}$ or dispersed if $\hat{K}_m(d) < \underline{\hat{K}_m(d)}$ for at least one distance d. The localization index is defined as

$$\Gamma_m(d) \equiv \max\left(\hat{K}_m(d) - \overline{\hat{K}_m(d)}, 0\right) \tag{4}$$

municipalities are under- or overestimated.

Figure 2: Weighted DO Index for Two-Digit Industries.



A larger index indicates stronger localization of industry m. As I'm mostly interested in the effect of taxation and public expenditures on firm foundation rates within a municipality the following analysis will use the localization index with distance $d = 0$. The localization index calculated by Koh and Riedel (2014) is based on data for the year 1999 while the panel used for estimating firm foundation rates ranges from 1998 to 2006. Hence, (although unlikely) the results do not capture variation in the localization due to significant changes in the number of firm foundations within a municipality. Dumais *et al.* (2002) report that geographical concentration is stable despite industry mobility. Therefore, I assume that the localization index is stable over the sample period.[9] Furthermore, the localization index is calculated

[9]Moreover, to exclude significant variation in localization between the year 1998 and 1999 I repeated the estimations on the subsample from 1999 onwards. The results are basically unaffected.

using 4 digit industry classes. To calculate a localization index on a 2 digit industry level I calculate the weighted average of the 4-digit localization index weighted with the number of firms in every industry.[10] Figure (2) depicts the localization index used for the main part of the analysis. Table (2) lists the 5 most and least localized industries.

Table 2: Most and Least Localized Industries and Weighted LOC Index for Two-Digit Industries.

Industry	Weighted LOC Index
Wholesale and retail trade and repair of motor vehicles and motorcycles	0.00000
Electricity, gas, steam and air conditioning supply	0.00001
Wood and products of wood and cork, except furniture	0.00002
Wholesale on a fee or contract basis	0.00002
Rubber and plastic products	0.00003
Service activities for business	0.00187
Scientific research and development	0.00206
Motion picture, video and television programme production	0.00431
Real estate activities	0.00498
Water transport	0.00545

Source: Own data collection and calculations.

As depicted by figure (2) the localization index varies significantly among industries with water transport showing the highest localization. I control for the robustness of my results by dropping potential outliers (the top 3 localized industries (1) water transport, (2) real estate activities and (3) motion picture, video and television program production) and varying the distance of the localization index as well as weighting the 4 digit index with industry revenues based on information on the full set German firms.[11]

[10] The number of firms in every industry is based on information of the DAFNE data set provided by Bureau van Dijk. The data is not available on a municipality level.

[11] Revenues per industry are based on the DAFNE data set for the year 2009 provided by Bureau van Dijk.

IV. Empirical Setup

A. Empirical Model

Following the setup proposed by Brülhart *et al.* (2012), the process of firm foundations can be modeled as a random profit maximization problem of firm managers searching for the perfect location to set up a new firm among a given set of locations. Given the profit π_{fijt} of firm f in industry j, location i at time t a firm will locate in municipality m if

$$\pi_{fmjt} > \pi_{fijt} \;\forall\; i, i \neq m \tag{5}$$

The profit may be defined by a deterministic part U_{ijt} and a random error ϵ_{fijt}

$$\pi_{fijt} = U_{ijt} + \epsilon_{fijt}. \tag{6}$$

The deterministic part of the model captures location and industry specific factors. I assume that the deterministic part is given by a linear relationship of taxes T_{it}, public expenditures C_{it} and socio-economic variables $\mathbf{X}_{ijt}$. Additionally, in the spirit of the "new economic geography" literature, firms of an industry j locating in a specific municipality benefit from localization L_j of industry j which effects profits directly and via the interaction with the tax rate and capital stock.[12] In summary, the profit function (6) can be written as

$$\pi_{fijt} = U_{ijt} + \epsilon_{fijt} = \alpha_1 T_{it} + \alpha_2 T_{it} L_j + \beta_1 C_{it} + \beta_2 C_{it} L_j + \gamma L_j + \delta \mathbf{X}_{ijt} + \epsilon_{fijt}. \tag{7}$$

The coefficients of interest are α_1, α_2, β_1 and β_2. Based on previous research on the effects of taxation on firm foundations I expect α_1 to be negative (see Devereux

[12]Note that I assume that localization affects the sensitivity of firm foundations to changes of the tax rate or public expenditures. This assumption will be tested in the empirical model. If point estimates are significant the assumption is valid.

and Maffini (2007) for a survey). Furthermore, I expect the effect of public expenditures on firm foundations to be positive. Generally speaking, if expenditures have a positive effect on firms productivity, firms benefit by locating in municipalities with an optimal amount of expenditures for their operation. Hence, I would identify a positive and significant point estimate. The coefficients α_2 and β_2 capture the interaction effect of localization and the business tax rate or public expenditures. Given a negative effect of taxation on firm foundations, a positive coefficient α_2 represents a decreasing tax effect with stronger localization. Thus, the sensitivity of firm foundations to changes of the local business tax would be mitigated by increasing localization. This result has been confirmed by Brülhart *et al.* (2012) using a sample of firm foundations in Switzerland. The direction of the interaction effect of localization and expenditures is previously unknown.A positive interaction effect would indicate that localization effects increase the benefits of the capital stock on firm productivity. Hence, firm foundations in strongly localized industries would be more sensitive to changes in public expenditures. A negative interaction effect implies a decreasing positive effect of public expenditures (if $\beta_1 > 0$) with increasing localization economies.

Following McFadden (1974) assuming that the stochastic error follows an extremvalue type 1 distribution gives the probability of choosing location m as

$$P_{mjt} = e^{U_{mjt}} \left(\sum_j e^{U_{ijt}} \right)^{-1}. \tag{8}$$

Furthermore, define

$$d_{fijt} = \begin{cases} 1 & \text{if } f \text{ chooses } i \\ 0 & \text{otherwise} \end{cases} \tag{9}$$

and the log-likelihood of the conditional-logit model is given by

$$ln(L) = \sum_f \sum_i \sum_j \sum_t d_{fijt} ln(p_{ijt}) = \sum_i \sum_j \sum_t n_{ijt} ln(p_{ijt}) \tag{10}$$

with $n_{ijt} = \sum_f d_{fijt}$ the number of firms in municipality i and industry j at time t.[13] The log-likelihood of a Poisson regression on the number of firm foundations gives the same (up to a constant) log-likelihood function as the conditional-logit model (see Guimarães *et al.* (2003) for details). Therefore, the location choice can be represented by a Poisson regression of

$$E\left[n_{ijt}|R_{ijt}\right] = exp\left(\alpha_1 T_{it} + \alpha_2 T_{it} L_j + \beta_1 C_{it} + \beta_2 C_{it} L_j + \delta \mathbf{X}_{ijt} + \lambda_i + \nu_j + \kappa_t\right) \tag{11}$$

with λ_i municipality, ν_j industry and κ_t time fixed effects (absorbing γL_j in equation (7)).[14]

Following Becker and Henderson (2000) or Figueiredo *et al.* (2002) the model of firm birth could also be represented by a model where entrepreneurs are spatially immobile and repeatedly decide if they want to set up a new firm. Note that the latter can also be represented by a Poisson model.[15]

B. Empirical Obstacles

When estimating the empirical model at hand I'm faced with similar obstacles as Brülhart *et al.* (2012). Estimating the empirical model assumes exogeneity of all explanatory variables. The focus of this article is on the (interaction) effects of

[13]Equation (10) assumes that firm decisions are solely based on industry and location specific characteristics that are common to all firms.

[14]$R_{ijt} = [T_{it}, E_{it}, L_j, \mathbf{X}_{ijt}]$ being the set of explanatory variables.

[15]According to Brülhart *et al.* (2012) this is a considerable advantage given that with limited information finding the best model for the actual data-generating process is infeasible.

taxation, public expenditures and localization on firms' location choice. While tax rates and public expenditures are likely to affect the number of firm foundations, the number of firms in a municipality is also likely to effect the tax rate and the level of expenditures through the local tax base. Moreover, anecdotal evidence suggests that the size and number of firms may influence localities' policies, e.g. by stronger investments in lobbying. So far, only scarce work testing this hypothesis exist (see e.g. Brülhart and Simpson 2018, for a recent discussion). By using the count of new firms registering in a municipality concerns of simultaneity bias with regard to municipalities policies and thus, the tax rate and expenditures can be mitigated. It is unlikely that new firms who have not earned any revenues and thus haven't paid taxes at the time of birth have a direct effect on the tax rate and expenditures. On top, lobbying is more likely to occur among established corporations. Nevertheless, as the count of new firms is dependent on the count of existing firms an indirect effect might create biased results. This concern is addressed using an instrumental variable approach instrumenting the local business tax rate and public expenditures.

Moreover, localization is a direct function of the number of firms that are geographically located. As stated in section III the measure of localization is based on the stock of firms in 1999 and constant over time. Thus, this obstacle is addressed as the localization index used for the empirical analysis is independent of the number of firm foundations.

Equation (11) assumes that the change in the sensitivity to taxation and public expenditures of the number of firm foundations is linear and continuous. In contrast, models in the tradition of Krugman (1991) mostly assume a discontinuous relation between agglomeration and taxation (or public expenditures). If localization exceeds a specific threshold all firms of a mobile industry locate in one location. Note that explicitly controlling for non-linearities of the interaction is beyond the scope of this article. Nevertheless, the reader should be aware that these non-linearities might distort the results of the empirical setup.

Additionally, I control for violations of the equidispersion assumption of the underlying Poisson distribution calculating robust standard errors (see Wooldridge 2010, for a discussion). Specifically, if the equidispersion assumption ($E(n_{ijt}) = Var(n_{ijt})$) of the dependent variable is violated the Poisson model generates a false covariance matrix and hypotheses tests are invalid. By using robust standard errors this assumption is relaxed and the estimated covariance matrix is valid.

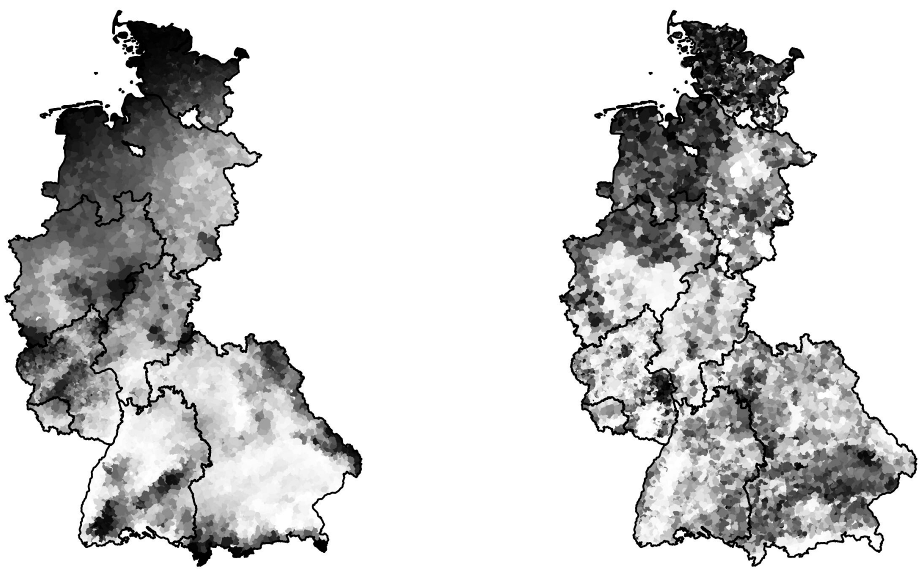
C. Instruments

I will instrument the capital stock using two instruments.

The first exploits variation generated by the 'Renewable Energy Sources Act' (RES Act) of 2000. This Act was initiated by the German state to promote energy production from renewable sources. Among others, the law created heavy subsidies for firms constructing wind power plants resulting in a substantial increase in the number of plants across Germany. Wind power plants are subject to local taxation and directly increase local trade tax and property tax revenues. Note that to maximize energy output wind power plants are build in areas with high wind strength and sufficient free/unpopulated space. The guideline for approving the construction of wind power plants in Germany formulates that the typical distance of an energy production area with 7 wind power plants from the next local town should be at least 1500 meters.

Figure 3: Quantiles of Mean Wind Strength in 80 Meters Height and Mean Share of Agricultural Land

(a) Mean Wind Strength in 80m Height (b) Mean Share of Agricultural Land



Notes: The figure depicts the 1% quantiles of wind strength in 80m height and share of agricultural land in West Germany (federal states are outlined with black lines). Calculations are based on the year 2006. Darker colors are associated with higher quantiles. There exists a clear difference between North and South Germany with more wind and agricultural land in Lower Saxony and Schleswig-Holstein. To address concerns about the differences between federal states I include state times year fixed effects in the regressions.

To construct the instrument I will use the mean wind strength (from 1981 to 2000) in a height of 80 meters and the total agricultural land in *ha* of a municipality. Figure 3 depicts 1% quantiles of both variables. Darker colors are associated with higher quantiles. The figure suggests that wind strength and agricultural land vary substantially between localities. The figures imply that localities in the north of the country (especially in Lower-Saxony and Schleswig-Holstein) are more likely to host wind power plants. To construct the instrument, the two variables (wind and agricultural land) are multiplied with a dummy taking the value 1 after the year 2000. Further I construct the interactions between both variables. I expect municipalities with suitable wind power and agricultural land to have benefited from the renewable energy sources act and hence, the two way interaction serves as the instrument while I control for mean wind strength after the reform. Additionally, the instrument is multiplied with a time trend to capture delayed effects.

The local business tax is instrumented using a dummy indicating deviations from a so-called reference tax rate. Public revenues are redistributed among municipalities within federal states to equalize funds per capita and to harmonize the availability of public goods. Redistribution is based on a complicated system. In short, the system calculates the financial requirements and the financial potential of every municipality based on various statistical indicators. Differences between financial requirements and potentials are then mitigated by fiscal redistribution. Among other indicators, federal states calculate a reference business tax rate based on the potential taxable capacity for every municipality. Hence, if municipalities set a low business tax rate to attract mobile capital the potential loss in business tax revenues is not necessarily negated with fiscal redistribution as the federal government assumes that the local business tax rate could have been higher and the difference between financial requirement and potential can be mitigated by a higher tax rate. The instrument is a dummy indicating if the local business tax in 1998 was below or above the actual reference tax rate. If the reference tax rate exceeds (falls short from) the local business tax in 1998, local business tax rates are expected to have increased (fallen) to mitigate the difference between financial requirement and potential. I control for the robustness of the instrument by adding state times year fixed effects to validate if variation within states and year of the dummy is sufficient to instrument the business tax rate.

V. Empirical Results

In what follows I will present the empirical results. As outlined in section IV the process of firm foundations can be represented by a log-linear relationship that can be estimated using a Poisson model. Coefficients generate by a Poisson model can't be directly interpreted as elasticities. Hence, I additionally estimate the log-linear relationship using simple OLS estimation after log-transforming the dependent variable for interpretability and to be able to compare the estimated coefficients to the results derived by Brülhart *et al.* (2012). Note that this approach creates missing observations for municipalities, industries and years with zero firm births which leads to a substantial loss in usable data points.[16] Moreover, interpretation is conditional on the sample of municipalities with at least one firm of a given industry and year locating in this municipality. Hence, as firm entry comes at fixed costs and are lost if the firm exits or relocates in subsequent years, I expect point estimates for a sample of existing firms to be smaller compared to the full sample. On the other hand, using a linear relationship allows to control for the relevance of the instruments.

A. Log-Linear Models

Table (3) depicts the results using a log-linear model regressing the log number of new firms on the (log) local business tax and (log) capital stock of economic promotion. Specification (1) shows the OLS estimate. The effect of taxation and economic promotion is insignificant. On top, the point estimate for economic promotion is negative and basically zero. Specification (2) shows the two-stage-least-squares es-

[16] Approximately 3,000 municipalities are dropped from the regression when taking the logarithm of firm foundations.

timates of the variables of interest. First stage results are reported in Table (7) in Appendix A. The point estimate of the reference tax dummy is positive and significant. On top, the capital stock for economic promotion increases with higher wind strength and agricultural land.[17] Using the Kleibergen and Paap (2006) rank F-statistic for weak instruments supports the assumption of valid excluded instruments (in all specifications) as it exceeds a rule-of-thumb value of 10. Moreover, the Hansen test for over-identifying restrictions cannot be rejected, which means the exogeneity of one instrument given the exogeneity of the other cannot be rejected. Increasing the local business tax multiplier by 1% decreases the number of firm foundations (in municipalities with at least one firm foundation) by 1.8%. A 1% increase of the capital stock of economic promotion increases the number of new firms by 0.24%. The interaction effects are positive but insignificant. To address potential concerns regarding the validity of both instruments I include state times year fixed effects in specification (3). The point estimates for economic promotion and the interaction effects are barely affected while the point estimate for the tax rate drops to 1.07%. As depicted in section III the localization index for the top three localized industries differ substantially from the average localization. To address concerns whether the estimates are biased by these potential outliers and to check for discontinuity of localization I exclude the top 3 and top 5 localized industries from the analysis. Specifications (4) and (5) depict the results including state times year fixed effects. The tax effect is negative and significant ranging from -1.25% to -1.55%. Economic promotion is positive and significant around 0.25%. Most

[17]Note that the first stage results show that the positive effect of wind strength and agricultural land is mitigated over time. This is based on the fact that the log-sample does not include small municipalities and the increase of economic promotion in larger municipalities after 2000 does not persist over time. Using the same instrumentation in the Poisson sample including all municipalities gives a positive effect over time.

notably the interaction effect of the tax rate and localization index increases and turns significant. Hence, with increasing localization the negative effects of taxation are mitigated. This results are in line with Brülhart *et al.* (2012). Note that the interaction effect of economic promotion turns negative but stays insignificant.

Table 3: Log-Linear Models

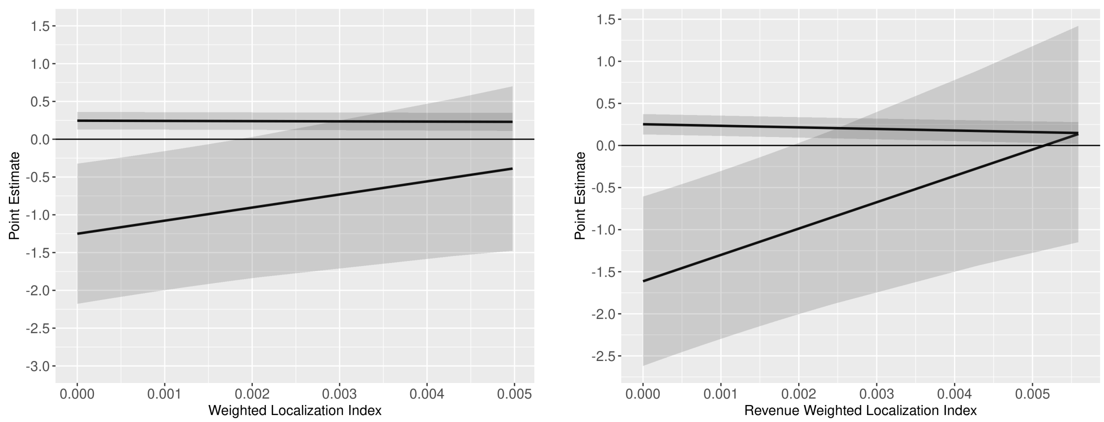
	Dependent Variable: ln(Number of Firm Foundations)						
	Weighted Localization Index					Revenue Weighted Localization Index	
				Cut Top 3	Cut Top 5		Cut Top 5
	OLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln(Local Business Tax)	-0.027	-1.800***	-1.070*	-1.251**	-1.550***	-1.134**	-1.613***
	(0.041)	(0.466)	(0.563)	(0.564)	(0.589)	(0.564)	(0.612)
LOC X ln(Local Business Tax)		73.782	71.932	173.236**	341.106***	95.564	313.029***
		(88.011)	(86.418)	(85.426)	(117.083)	(62.873)	(103.271)
ln(Economic Promotion)	-0.001	0.238***	0.230***	0.245***	0.223***	0.252***	0.252***
	(0.003)	(0.061)	(0.070)	(0.071)	(0.071)	(0.071)	(0.073)
LOC X ln(Economic Promotion)		1.896	1.930	-3.056	-5.500	-8.927**	-18.626***
		(4.878)	(4.797)	(4.771)	(6.391)	(3.519)	(5.616)
N	257030	257030	257030	256556	241833	257030	230790
log-likelihood	-206567.58	-211770.83	-209453.26	-208962.69	-197089.07	-210333.83	-190433.84
F	6.12***	11.54***	10.33***	12.65***	11.63***	8.99***	7.54***
Underidentification LM		346.06	320.48	316.45	298.49	313.68	283.03
Weak Instrument Test†		56.20	53.15	52.52	49.43	52.03	46.76
Hansen p-value		0.61	0.24	0.09	0.52	0.20	0.33
Municipality Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State X Year Fixed Effects			Yes	Yes	Yes	Yes	Yes

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. *Source:* Own data collection and calculations. *Notes:* Economic promotion in one million. Eicker-White robust standard errors are in parentheses. †Kleibergen and Paap (2006) rank F-statistic for stationary data.

Using an alternative weighting scheme for the localization index (specifications (6) and (7)) gives comparable results. However, weighting the localization by revenues gives a significant and negative point estimate for the interaction effect of economic promotion and localization. Hence, the positive effect of economic promotion decreases with localization. Based on the point estimates I conclude that while the local business tax has a negative and economic promotion has a positive effect on the number of firm foundations, the sensitivity decreases with increasing localization economies.

Figures (4a) and (4b) depict the effects of specification (4) and (7) graphically over the range of localization. As can be seen, for both specifications the negative tax rate effect decreases with increasing localization and turns insignificant around

Figure 4: Tax Rate and Economic Promotion Effect (2SLS Estimates)



(a) Weighted Localization Index without the top 3 localized industries.

(b) Revenue Weighted Localization Index without the top 5 localized industries.

Notes: The figures depict the effects of a 1% increase in a locations tax rate (bottom line) and capital stock of economic promotion (top line) on the number of firm foundations in an industry and year using a log-linear regression. The coefficients are based on the estimates and standard errors of table (3), speficiations (4) and (7). The shaded areas represent 90% confidence intervals.

0.00175. The point estimate for economic promotion stays positive and significant over the whole range of localization.

B. Poisson Model

The log-linear models do not use the full sample as municipalities and years with zero firm foundations are dropped from the regression. Moreover, section IV shows that firm foundation rates can be adequately modeled using a Poisson model. Therefore, I estimate the effects of taxation, public expenditures and localization using a Poisson estimation. Table (4) depicts the estimation results. Specification (1) depicts the point estimates without instrumenting the endogenous regressors. I identify a positive and significant effect of economic promotion with a point estimate of 0.003 and a negative and significant effect of the local business tax rate of 0.001. Thus, both effects behave as expected with an increase in local taxation reducing the expected number of firm foundations while additional expenditures for economic promotion increase the latter. Poisson estimates cannot, unlike the OLS coefficients, interpreted as marginal effects. However, they can be interpreted as semielasticities or proportional changes of the expected number of firm foundations. Taking the estimation equation given by equation (11) and calculating the derivative with respect to the tax rate T_{ijt} gives[18]

$$\begin{aligned} \frac{\partial n_{ijt}}{\partial T_{ijt}} &= (\alpha_1 + \alpha_2 L_j)\, n_{ijt} \\ \Rightarrow \frac{\partial n_{ijt}/n_{ijt}}{\partial T_{ijt}} &= (\alpha_1 + \alpha_2 L_j)\,. \end{aligned} \tag{12}$$

Thus, the effect of an increase of the local business tax rate depends on the strength of localization in the industry. I find a positive but insignificant effect of the localization index and tax rate. On top, I identify a positive and significant point estimate of the interaction effect of localization and economic promotion. Thus, using simple Poisson estimation I would conclude that the positive effect of economic promotion increases with localization. An increase in the mean local business tax rate by 1% in an industry without localization decreases the expected number of new firm foundations proportional by 0.339% ($3.39 \times 0.1\%$). Simultaneously, an increase of the capital stock of economic promotion by 1% increases the expected number of new firms in an industry without localization by 0.00423% ($0.0141 \times 0.3\%$) which is close to zero.

Drawing conclusions on this results are hazardous as expenditures and taxation are unlikely to be exogenous in the empirical setup. Therefore, from specification (2) onwards I continue using a control function approach to address the estimation obstacles of endogenous regressors outlined in section IV. Equations (13) show

[18]Calculations for the capital stock are analogous.

the general idea with Y_1 the dependent variable, Y_2 an endogenous variable, Z the excluded instruments and X a set of exogenous control variables. Hence, in the first step I separately regress the local business tax rate, public expenditures and the interaction effects on the set of excluded instruments and exogenous variables using simple ordinary least squares regressions and calculate the residuals. In a second step, I estimate the Poisson model including the endogenous and exogenous variables as well as the calculated (first stage) residuals. Following Wooldridge (2010) this method generates unbiased estimates of the point estimates. Standard errors are bootstrapped with 50 draws to obtain valid standard errors and clustered on the municipality and industry level to control for violations of the underlying Poisson distribution.

$$\begin{aligned} &\text{First Stage (OLS):} && Y_2 = \mathbf{X}\beta + \mathbf{Z}\gamma + \nu \\ &\text{Second Stage (Poisson):} && E\left[Y_1|\mathbf{X}, Y_2\right] = \exp\left(X\beta + \delta Y_2 + \nu\right) \end{aligned} \tag{13}$$

First stage results of equation (13) can be found in Table (8) of Appendix A.[19] The point estimates of the excluded instruments behave as expected. Municipalities with a higher average wind strength and sufficient agricultural land to host wind power plants show higher expenditures after the RES Act of 2000. On top, the dummy for the reference tax multiplier is positive. Hence, if municipalities have a higher taxable capacity compared to 1998 they are more likely to have increased the current local business tax.

Instrumenting the tax rate increases the point estimate approximately by the factor 8. An increase of the average local business tax rate by 1% decreases the expected number of firm foundations in non-localized industries by approximately

[19] I only report the first stage results of specification (3) of table (4). Note that the results do not significantly differ between specifications.

Table 4: Poisson Models

	Dependent Variable: Number of Firm Foundations						
	Weighted Localization Index					Revenue Weighted Localization Index	
			Cut Top 5			Cut Top 5	
	Poisson	CF	CF	CF	CF	CF	CF
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Local Business Tax	-0.001***	-0.008***	-0.013***	-0.013***	-0.011***	-0.014***	-0.015***
	(0.000)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
LOC X Local Business Tax	0.020	-0.241	4.931***	5.111***	5.172***	5.365***	5.404***
	(0.069)	(1.428)	(1.642)	(1.725)	(1.658)	(1.819)	(0.948)
Economic Promotion	0.003**	0.072**	0.099***			0.085**	
	(0.001)	(0.035)	(0.038)			(0.039)	
LOC X Economic Promotion	0.318***	4.088	-22.773***			- 24.233***	
	(0.082)	(5.369)	(5.598)			(6.450)	
Total Capital Stock				0.013*			0.008
				(0.007)			(0.006)
LOC X Total Capital Stock				-1.518***			-1.475***
				(0.396)			(0.192)
Expenditures					0.015**		
					(0.006)		
LOC X Expenditures					-3.892***		
					(0.960)		
N	2,866,802	2,866,802	2,577,383	2,577,383	2,577,087	2,575,829	2,575,829
Municipality Fixed Effects	✓	✓	✓	✓	✓	✓	✓
Industry Fixed Effects	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓
State X Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓
Controls		✓	✓	✓	✓	✓	✓
Bootstrapped SE		✓	✓	✓	✓	✓	✓
# of Bootstraps		50	50	50	50	50	50

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. *Source:* Own data collection and calculations. *Notes:* Bootstrapped and clustered standard errors are in parentheses.

2.7%. The interaction effect turns negative but stays insignificant. An increase in average expenditures for economic promotion increase the expected number of firm foundations in non-localized industries by 0.1%. This is a substantial increase compared to the uninstrumented specification. The interaction effect stays positive but turns insignificant. As outlined before, outliers in the localization index are likely to distort the results of the interaction effects. Therefore, I drop the top 5 localized industries from the analysis. Results are depicted in specification (3). The point estimates of the local business tax rate and economic promotion are only marginally affected. On top, the interaction effects increase substantially and turn significant. Hence, stronger localization mitigates the negative tax effect and the positive effect of economic promotion. While the expected number of industries without localization decrease by 4.4% for a 1% increase of the average tax rate the decrease in industries with strong localization (e.g. 0.001871) is 1.34%. A 1%

increase of (average) economic promotion increases the expected number of firm foundations in non-localized industries by 0.13% and in strongly localized industries by 0.08%. Hence, the stronger the localization within an industry the less sensitive are firm foundations to an increase in the tax rate or the capital stock of economic promotion. These results are robust against using a revenue weighted localization index (see specification (6)).

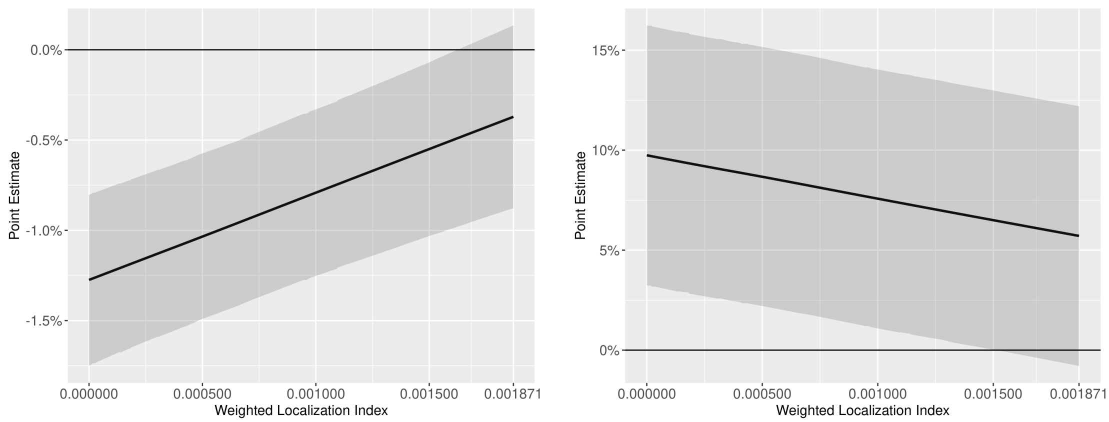
Additionally, I estimate the effects of the total capital stock using both localization indexes (see specifications (4) and (7)). While the point estimates for the local business tax are unaffected, the point estimates for the total capital stock are somewhat smaller compared to economic promotion. Both are positive and significant. Hence, a 1% increase of the mean total capital stock increases the expected number of new firm foundations in a non-localized industry proportional by approximately 0.35% (or 0.24% for a revenue weighted localization index). Both effects decrease with increasing localization. Thus, as in the regression with economic promotion, the sensitivity of firm foundations to changes in the total capital stock decreases with stronger localization in an industry.

To assess the robustness of the empirical setup with respect to my definition of the capital stock I estimate the model using overall current (voluntary) expenditures (see specification (5)). The results and implications are comparable to the estimates using the total capital stock.

Using the conditional-logit interpretation of the Poisson model the estimates can also be used to predict changes in the probability that a firm chooses municipality i in industry j at time t if municipalities increase the local business tax or economic promotion activities. Using the first derivative of the probability given by equation

Figure 5: Implied Tax and Economic Promotion Effect using a Poisson Model

(a) Local Business Tax Multiplier (b) Economic Promotion



(8) with respect to the local business tax rate (or capital stock) gives

$$
\begin{aligned}
\frac{\partial P_{ijt}}{\partial T_{it}} &= \frac{(\alpha_1 + \alpha_2 L_j)\, e^{U_{ijt}} \sum_i e^{U_{ijt}} - (\alpha_1 + \alpha_2 L_j)\left(e^{U_{ijt}}\right)^2}{\left(\sum_i e^{U_{ijt}}\right)^2} \\
&= (\alpha_1 + \alpha_2 L_j)\, P_{ijt}\,(1 - P_{ijt})\,. \qquad (14)
\end{aligned}
$$

Hence, the change in the probability that new firms locate in municipality i at time t does not only depend on the estimated coefficients α_1 and α_2 (or β_1 and β_2) and the localization index L_j but also on the choice probability that a firm of industry j is willing to locate in municipality i at time t. Figure (5) depicts (using the point estimates of specification (3)) the calculated probability changes for different localization values in a representative municipality and year if the local business tax rate (figure (5a)) or capital stock of economic promotion (figure (5b)) increase by 1%.[20] A 1% increase in the local business tax rate in Thedinghausen decreases the probability that a firm of the wholesale and retail trade industry locates in this

[20]The representative municipality is Thedinghausen (Lower-Saxony) in 2000. It is representative such that the exogenous variables for this municipality and year are close to the sample mean of every variable.

municipality by 1.25%. On the other hand, a 1% increase of the capital stock of economic promotion increases the probability of a firm in this industry to locate in Thedinghausen by almost 10%. Although these effects seems substantial at first glance note that in 2000 no firms of the wholesale and retail trade industry (and only 20 firms in total) located in Thedinghausen. The calculated probability that a firm of this industry located in this municipality is approximately 0.015%. Both effects are mitigated by increasing localization economies. The effect on an industry with strong localization e.g. on firms that provide service activities for business (with a localization index of 0.001871) is −0.3% or 5.7% receptively. Note that both effects are insignificant (using a 95% confidence interval).

To sum up, while Poisson regressions do identify a negative effect of an increase in the local business tax and a positive effect of an increase in economic promotion activities, both effects decrease with increasing localization economies.[21] On top, both effects turn insignificant for the top localized industries. Thus, localization can mitigate the negative effects (positive effects) of taxation (public expenditures) as spillover effects between localized industries become more important and firms react less sensitive to changes of municipalities policies. In addition, these results imply that localization creates possibilities for municipalities to tax agglomerations rents as discussed by Koh *et al.* (2013).

VI. Results with varying agglomeration indices

As presented in section III the localization index can be constructed for any distance d. So far, the empirical results use a localization index based on distances of firms in an industry that lie within the same municipality.[22] Hence, it assumes that localization economies are limited by administrative boundaries. However, the

[21] The effects are identified if the top 5 localized industries are excluded from the analysis.

[22] The distance of firms that locate in the same municipality is zero by construction.

institutional setting in West Germany comprises of many small municipalities and spillover effects are likely to cross those boundaries.[23] The following results estimate log-linear models (like specification (5) of table (3)) and Poisson models (like specification (3) of table (4)) using a localization index within distances up to 30km to control for boundary crossing localization economies.

Table 5: Log-Linear Models with Varying Localization Distance from 5km to 30km.

	Dependent Variable: ln(Number of Firm Foundations)					
	Weighted Localization Index			Revenue Weighted Localization Index		
	5km (1)	10km (2)	30km (3)	5km (4)	10km (5)	30km (6)
ln(Local Business Tax)	-1.469**	-1.544**	-1.701***	-1.505**	-1.506**	-1.495**
	(0.607)	(0.609)	(0.612)	(0.609)	(0.610)	(0.610)
LOC X ln(Local Business Tax)	65.118*	53.640**	39.227***	49.089***	28.411***	12.175***
	(34.331)	(22.278)	(11.922)	(17.491)	(9.917)	(4.631)
ln(Economic Promotion)	0.205***	0.219***	0.265***	0.240***	0.247***	0.268***
	(0.072)	(0.073)	(0.074)	(0.073)	(0.073)	(0.074)
LOC X ln(Economic Promotion)	5.704***	0.793	-2.947***	-3.025***	-2.431***	-1.857***
	(1.744)	(1.161)	(0.639)	(0.948)	(0.544)	(0.258)
N	229370	229370	229370	229370	229370	229370
log-likelihood	-187594.23	-188155.17	-189783.38	-188807.70	-189007.27	-189368.59
F	25.48***	14.07***	10.38***	7.44***	9.60***	26.24***
Weak Instrument Test†	48.71	48.86	49.15	48.03	48.01	47.96
Hansen p-value	0.55	0.52	0.46	0.32	0.36	0.48
Controls	✓	✓	✓	✓	✓	✓
Municipality Fixed Effects	✓	✓	✓	✓	✓	✓
Industry Fixed Effects	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
State X Year Fixed Effects	✓	✓	✓	✓	✓	✓

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. *Source:* Own data collection and calculations. *Notes:* Economic promotion in one million. Eicker-White robust standard errors are in parentheses. †Kleibergen and Paap (2006) rank F-statistic for stationary data.

Table (5) depicts the results with specification (1) to (3) using a (simple) weighted average localization index and specifications (4) to (6) using a revenue weighted localization index applying log-linear regressions (without the top 5 localized industries). The point estimates for the local business tax and economic promotion are overall robust against increasing the distance and comparable to the results of Table (3). A 1% increase of the local business tax rate decreases the expected number of firm foundations between 1.5% and 1.7% for an industry with no localization. A 1%

[23] The average area of German municipalities is 29 km^2. Assuming that institutional boundaries are circular, the average municipality has a diameter of 6km. Note however, that this varies greatly with federal states as the municipality area in my sample ranges from 0.39 km^2 (Martinstein) at the minimum to 357.5 km^2 (Neustadt am Rübenberge) at the maximum.

increase of the stock of economic promotion increases the number of firm foundations in industries without localization by 0.21% to 0.27%. The interaction effect of localization and the tax rate is positive and significant for all localization indexes. Hence, firms of an industry with strong localization are less sensitive to changes of the local business tax. The interaction effect of localization and economic promotion is positive and significant for the weighted localization index within 5km distance. It turns negative with increasing distance and is negative and significant for all distances using a revenue weighted localization index. Thus, the robustness checks find evidence for both increasing and decreasing sensitivity of firms to expenditures for economic promotion. However, note that the size of the interaction effect is small such that the differences in the sensitivity to expenditures for economic promotion are negligible between weakly and strongly localized industries.

Table 6: Poisson Models with Varying Localization Distance from 5km to 30km without the top 5 localized industries

	Dependent Variable: Number of Firm Foundations					
	Weighted Localization Index			Revenue Weighted Localization Index		
	5km (1)	10km (2)	30km (3)	5km (4)	10km (5)	30km (6)
Local Business Tax	-0.014***	-0.015***	-0.011***	-0.014***	-0.015***	-0.011***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)
LOC X Local Business Tax	0.995***	0.732***	0.158	0.976***	0.651***	0.104
	(0.286)	(0.214)	(0.158)	(0.234)	(0.146)	(0.134)
Economic Promotion	0.100**	0.090**	0.079*	0.088***	0.083***	0.066*
	(0.048)	(0.040)	(0.044)	(0.031)	(0.031)	(0.034)
LOC X Economic Promotion	-4.581***	-3.311***	-0.887*	-4.365***	-2.881***	-0.611
	(0.998)	(0.662)	(0.501)	(0.889)	(0.569)	(0.383)
N	2,507,724	2,577,383	2,512,080	2,505,564	2,505,564	2,579,973
Municipality Fixed Effects	✓	✓	✓	✓	✓	✓
Industry Fixed Effects	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
State X Year Fixed Effects	✓	✓	✓	✓	✓	✓
Instrument Controls	✓	✓	✓	✓	✓	✓
Control Function Residuals	✓	✓	✓	✓	✓	✓
Bootstrapped SE	✓	✓	✓	✓	✓	✓
# of Bootstraps	50	50	50	50	50	50

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. *Source:* Own data collection and calculations. *Notes:* Economic promotion in one million. Bootstrapped and clustered standard errors are in parentheses.

Additionally, I do control for the robustness of the results using different distances of the localization index (without the top 5 localized industries) in the Poisson model. The results are depicted in table (6). Increasing the distance of the localization index for the Poisson models supports the results of the baseline regression.

All specifications identify a negative effect of the local business tax and a positive effect of economic promotion (for less localized industries). On top, both effects decrease with increasing localization. Not that the decrease is smaller the larger the distance and turns insignificant for localization economies within 30km. The latter is based on the fact that localization economies within 30km are beneficial for firms in multiple municipalities. Hence, firms who are willing to set up a firm or move their existing establishment in another municipality as a reaction to changes in the local business tax rate or public expenditures still benefit from the same localization economies. Thus, boundaries crossing localization economies affect the sensitivity to changes in public policies in the considered locality to a smaller extant.

VII. Conclusion

The aim of this paper is to investigate the sensitivity of firm foundations to changes of the local business tax and public expenditures (represented by the capital stock for economic promotion) with respect to the presence of localization economies. Firms location choice can be modeled using a Poisson model for the number of firm foundations. This work uses a control function approach to address concerns about the exogeneity of the tax rate and public expenditures. I do identify a negative effect of taxation and a positive effect of economic promotion activity (or the total capital stock). The results imply that for weakly localized industries, a 1% increase of the average local business tax reduces the expected number of firm foundations by 4.4%. Simultaneously, a 1% increase of economic promotion activity increases the expected number of firm foundations by 0.13%. Both effects are mitigated by increasing localization. The effect of a 1% increase of the tax rate or public expenditures in top localized industries is 1.34% or 0.08% respectively. Calculating the changes in the probability of firm foundations in a representative municipality for non-localized industries I identify a decrease of 1.25% for a 1% increase of the local business tax and a 10% increase for a 1% increase in economic promotion activity. Both effects decrease and turn insignificant for strongly localized industries. Hence, I conclude that the sensitivity to changes of the local business tax and public expenditures decrease with increasing localization economies. These results confirm the hypotheses tested by Brülhart *et al.* (2012).

This work contributes to the open discussion on strategic tax setting of local governments. Theoretical work predicts a "race to the bottom" of local tax rates if jurisdictions compete for mobile capital (see Wilson 1999, for a review). While many empirical tests of this theory find contradicting results (Buettner 2003, Baskaran 2014), the literature on "new economic geography" might provide answers. This work contributes as it quantifies the reduction in the sensitivity of firms to changes of local tax rates and public expenditures. If the sensitivity decreases significantly and turns insignificant for strongly localized industries competition among local governments for mobile capital is suspended. Hence, further reduction of the tax rate does not necessarily increase the number of firm foundations and stops the race. Moreover, the positive effects of public expenditures are limited by localization economies and thus might set a natural limit to the effectiveness of public investment to foster regional growth.

References

Andersson, F. and Forslid, R. (2003). Tax competition and economic geography. *Journal of Public Economic Theory*, **5** (2), 279–303.

Arrow, K. J. (1962). The economic implications of learning by doing. *The Review of Economic Studies*, **29** (3), 155–173.

Audretsch, D. B. and Feldman, M. P. (1996). R&D spillovers and the geography of innovation and production. *The American Economic Review*, **86** (3), 630–640.

Baldwin, R. and Okubo, T. (2009). Tax reform, delocation, and heterogeneous firms. *Scandinavian Journal of Economics*, **111** (4), 741–764.

Baldwin, R. E. and Krugman, P. (2004). Agglomeration, integration and tax harmonisation. *European Economic Review*, **48** (1), 1 – 23.

Baskaran, T. (2014). Identifying local tax mimicking with administrative borders and a policy reform. *Journal of Public Economics*, **118**, 41–51.

Becker, R. and Henderson, V. (2000). Effects of air quality regulations on polluting industries. *Journal of Political Economy*, **108** (2), pp. 379–421.

Borck, R. and Pflüger, M. (2006). Agglomeration and tax competition. *European Economic Review*, **50** (3), 647 – 668.

Brülhart, M., Jametti, M. and Schmidheiny, K. (2012). Do agglomeration economies reduce the sensitivity of firm location to tax differentials? *The Economic Journal*, **122** (563), 1069–1093.

Brülhart, M. and Simpson, H. (2018). Agglomeration economies, taxable rents and government capture: evidence from a place-based policy. *Journal of Economic Geography*, **18** (2), 319–353.

Buettner, T. (2003). Tax base effects and fiscal externalities of local capital taxation: evidence from a panel of german jurisdictions. *Journal of Urban Economics*, **54** (1), 110 – 128.

Devereux, M., Griffith, R. and Simpson, H. (2007). Firm location decisions, regional grants and agglomeration externalities. *Journal of Public Economics*, **91** (3-4), 413 – 435.

— and Maffini, G. (2007). *The impact of taxation on the location of capital, firms and profit: A survey of empirical evidence*. Tech. Rep. 07/02, Oxford University Centre for Business WP.

Dumais, G., Ellison, G. and Glaeser, E. L. (2002). Geographic concentration as a dynamic process. *The Review of Economics and Statistics*, **84** (2), 193–204.

Duranton, G. and Overman, H. G. (2005). Testing for localization using micro-geographic data. *The Review of Economic Studies*, **72** (4), 1077–1106.

Ellison, G. and Glaeser, E. L. (1997). Geographic concentration in u.s. manufacturing industries: A dartboard approach. *Journal of Political Economy*, **105** (5), 889–927.

Figueiredo, O., Guimarães, P. and Woodward, D. (2002). Home-field advantage: location decisions of portuguese entrepreneurs. *Journal of Urban Economics*, **52** (2), 341 – 361.

Fisher, R. C. (1997). The effects of state and local public services on economic development. *New England Economic Review*, **March/April**.

Guimarães, P., Figueirdo, O. and Woodward, D. (2003). A tractable approach to the firm location decision problem. *Review of Economics and Statistics*, **85** (1), 201–204.

Jacobs, J. (1969). *The Economies of Cities*. New York: Vintage.

Kind, H. J., Knarvik, K. H. M. and Schjelderup, G. (2000). Competing for capital in a 'lumpy' world. *Journal of Public Economics*, **78** (3), 253 – 274.

Kleibergen, F. and Paap, R. (2006). Generalized reduced rank tests using the singular value decomposition. *Journal of Econometrics*, **133** (1), 97 – 126.

Koh, H.-J. and Riedel, N. (2014). Assessing the localization pattern of german manufacturing and service industries: A distance-based approach. *Regional Studies*, **48** (5), 823–843.

—, — and Böhm, T. (2013). Do governments tax agglomeration rents? *Journal of Urban Economics*, **75** (Supplement C), 92 – 106.

Krugman, P. (1991). Increasing returns and economic geography. *Journal of Political Economy*, **99** (3), 483–499.

Ludema, R. D. and Wooton, I. (2000). Economic geography and the fiscal effects of regional integration. *Journal of International Economics*, **52** (2), 331 – 357.

Marshall, A. (1890). *Principles of Economics*. London: Macmillan and Co., Ltd.

Maurel, F. and Sédillot, B. (1999). A measure of the geographic concentration in french manufacturing industries. *Regional Science and Urban Economics*, **29** (5), 575 – 604.

McFadden, D. (1974). *Conditional logit analysis of qualitative choice behavior*, Frontiers in econometrics, New York: Academic Press, pp. 105–142.

Romer, P. M. (1986). Increasing returns and long-run growth. *Journal of Political Economy*, **94** (5), 1002–1037.

Romp, W. and De Haan, J. (2007). Public capital and economic growth: A critical survey. *Perspektiven der Wirtschaftspolitik*, **8** (S1), 6–52.

Rosenthal, S. S. and Strange, W. C. (2004). Chapter 49 - evidence on the nature and sources of agglomeration economies. In J. V. Henderson and J.-F. Thisse (eds.), *Cities and Geography*, *Handbook of Regional and Urban Economics*, vol. 4, Elsevier, pp. 2119 – 2171.

Sturm, J.-E., De Haan, J. and Kuper, G. H. (1998). *The Welfare State, Public Investment, and Growth: Selected Papers from the 53rd Congress of the International Institute of Public Finance*, Tokyo: Springer Japan, chap. Modelling Government Investment and Economic Growth: A Review and Some New Evidence, pp. 61–83.

Wilson, J. D. (1999). Theories of tax competition. *National Tax Journal*, **52** (2), 269–304.

Wooldridge, J. (2010). *Econometric Analysis of Cross Section and Panel Data*. Econometric Analysis of Cross Section and Panel Data, MIT Press.

Appendix A: First Stage Regressions

Table 7: First Stage of the Log-Linear Regression

Dependent Variable	ln(Tax)	LOC X ln(Tax)	ln(EP)	LOC X ln(EP)
	(1)	(2)	(3)	(4)
Wind X ln(AGR) X Reform	0.0003**	-0.0000***	0.0031***	-0.0001***
	(0.0001)	(0.0000)	(0.0005)	(0.0000)
LOC X Wind X ln(AGR) X Reform	0.0681	0.0044***	0.0520	0.1111***
	(0.0425)	(0.0004)	(0.1820)	(0.0030)
Wind X ln(AGR) X Reform X Trend	-0.0001***	-0.0000**	-0.0023***	-0.0000**
	(0.0000)	(0.0000)	(0.0001)	(0.0000)
LOC X Wind X ln(AGR) X Reform X Trend	-0.0231	0.0000	-0.0119	-0.0010
	(0.0151)	(0.0001)	(0.0496)	(0.0008)
Reference Tax Dummy	0.0265***	0.0001***	0.0248***	0.0010***
	(0.0009)	(0.0000)	(0.0084)	(0.0001)
LOC X Reference Tax Dummy	0.1009	-0.0697***	-0.8597	-0.9617***
	(0.3197)	(0.0017)	(1.4779)	(0.0215)
ln(Population in 1000)	0.0094	0.0000	0.0761*	0.0003
	(0.0361)	(0.0001)	(0.0457)	(0.0003)
ln(Unemployment Rate)	0.0042***	0.0000	0.1500***	0.0002***
	(0.0006)	(0.0000)	(0.0092)	(0.0001)
Share Low Qualified Workers in %	-0.0009***	-0.0000	0.0457***	0.0000***
	(0.0001)	(0.0000)	(0.0018)	(0.0000)
Share Medium Qualified Workers in %	0.0005	0.0000	0.0289***	0.0000**
	(0.0004)	(0.0000)	(0.0014)	(0.0000)
Share High Qualified Workers in %	-0.0015***	-0.0000	0.0518***	0.0000**
	(0.0002)	(0.0000)	(0.0032)	(0.0000)
ln(Students)	-0.0030***	-0.0000**	-0.0183***	-0.0000
	(0.0002)	(0.0000)	(0.0029)	(0.0000)
ln(Doctors)	-0.0266***	-0.0000**	-0.0505*	-0.0003
	(0.0027)	(0.0000)	(0.0263)	(0.0002)
Wind X Reform	-0.0169***	0.0000	0.0087	0.0008***
	(0.0039)	(0.0000)	(0.0060)	(0.0000)
Wind X Reform X Trend	0.0042***	0.0000***	0.0070***	-0.0000**
	(0.0005)	(0.0000)	(0.0012)	(0.0000)
LOC X Wind X Reform	-0.5816	-0.0348***	-0.7469	-0.8334***
	(0.3679)	(0.0037)	(1.4469)	(0.0231)
LOC X Wind X Reform X Trend	0.1946	0.0014*	0.1603	0.0254***
	(0.1240)	(0.0008)	(0.3905)	(0.0061)
N	257,030	257,030	257,030	257,030
F-Statistic	175.21***	269.21***	93.47***	526.35***
Municipality Fixed Effects	✓	✓	✓	✓
Industry Fixed Effects	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓
State X Year Fixed Effects	✓	✓	✓	✓

$*p < 0.10$, $**p < 0.05$, $***p < 0.01$. *Source:* Own data collection and calculations. *Notes:* The results depict the point estimates of the first stage of specification (3) of Table 3. Economic promotion (EP) is expressed in one million and local business tax (Tax) in points. Eicker-White robust standard errors are in parentheses.

Table 8: First Stage of the Poisson Regression

Dependent Variable:	Tax	LOC X Tax	EP	LOC X EP
	(1)	(2)	(3)	(4)
Reference Tax Dummy	10.8093***	0.0232***	0.0181***	0.0009***
	(0.0562)	(0.0003)	(0.0048)	(0.0001)
LOC X Reference Tax Dummy	-0.0000	-12.9794***	0.0000	-0.8793***
	(7.4788)	(0.0365)	(0.6385)	(0.0074)
Wind X AGR X Reform	-0.0331***	-0.0003***	0.0071***	-0.0001***
	(0.0017)	(0.0000)	(0.0001)	(0.0000)
Wind X AGR X Reform X Trend	-0.0076***	-0.0000***	0.0015***	-0.0000
	(0.0003)	(0.0000)	(0.0000)	(0.0000)
LOC X Wind X AGR X Reform	-0.0000	0.2599***	0.0000	0.1209***
	(0.6987)	(0.0034)	(0.0597)	(0.0007)
LOC X Wind X AGR X Reform X Trend	0.0000	0.0275***	-0.0000	0.0018***
	(0.1903)	(0.0009)	(0.0162)	(0.0002)
Wind X Reform	-128.5501***	0.6037***	-15.5336***	0.1898***
	(26.0739)	(0.1272)	(2.2261)	(0.0259)
Wind X Reform X Trend	285.8619***	-0.0175	-15.0772***	-0.0170***
	(4.8437)	(0.0236)	(0.4135)	(0.0048)
LOC X Wind X Reform	0.0001	-747.5128***	-0.0000	-210.1636***
	(2177.1000)	(10.6208)	(185.8736)	(2.1641)
LOC X Wind X Reform X Trend	-0.0000	303.8484***	0.0000	2.3588***
	(464.5249)	(2.2661)	(39.6596)	(0.4618)
Population in 1000	-0.0133	-0.0000	-0.0727***	-0.0001***
	(0.0197)	(0.0001)	(0.0017)	(0.0000)
Unemployment Rate	0.2182***	0.0002***	-0.0057***	-0.0000
	(0.0091)	(0.0000)	(0.0008)	(0.0000)
Share Low Qualified Workers in %	-0.0976***	-0.0001	0.0007	0.0000
	(0.0119)	(0.0001)	(0.0010)	(0.0000)
Share Medium Qualified Workers in %	0.0995***	0.0001**	0.0055***	0.0000
	(0.0091)	(0.0000)	(0.0008)	(0.0000)
Share High Qualified Workers in %	0.3486***	0.0003***	0.1799***	0.0002***
	(0.0190)	(0.0001)	(0.0016)	(0.0000)
Students	0.0118***	0.0000	0.0149***	0.0000***
	(0.0026)	(0.0000)	(0.0002)	(0.0000)
Doctors	-0.0322***	-0.0000***	0.0025***	0.0000*
	(0.0013)	(0.0000)	(0.0001)	(0.0000)
N	2,866,802	2,866,802	2,866,802	2,866,802
F-Statistic	2789.44***	14912.60***	2122.52***	8875.69***
Municipality Fixed Effects	✓	✓	✓	✓
Industry Fixed Effects	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓
State X Year Fixed Effects	✓	✓	✓	✓

$*p < 0.10$, $**p < 0.05$, $***p < 0.01$. *Source:* Own data collection and calculations. *Notes:* The results depict the point estimates of the first stage of specification (2) of Table 4. Economic promotion (EP) is expressed in one million and local business tax (Tax) in points. Eicker-White robust standard errors are in parentheses.

Appendix B: Full Estimation Tables

Table 9: Complete Log-Linear Models

	Dependent Variable: ln(Number of Firm Foundations)						
	Weighted Localization Index					Revenue Weighted Localization Index	
				Cut Top 3	Cut Top 5		Cut Top 5
	OLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln(Local Business Tax)	-0.027	-1.800***	-1.070*	-1.251**	-1.550***	-1.134**	-1.613***
	(0.041)	(0.466)	(0.563)	(0.564)	(0.589)	(0.564)	(0.612)
LOC X ln(Local Business Tax)		73.782	71.932	173.236**	341.106***	95.564	313.029***
		(88.011)	(86.418)	(85.426)	(117.083)	(62.873)	(103.271)
ln(Economic Promotion)	-0.001	0.238***	0.230***	0.245***	0.223***	0.252***	0.252***
	(0.003)	(0.061)	(0.070)	(0.071)	(0.071)	(0.071)	(0.073)
LOC X ln(Economic Promotion)		1.896	1.930	-3.056	-5.500	-8.927**	-18.626***
		(4.878)	(4.797)	(4.771)	(6.391)	(3.519)	(5.616)
ln(Population in 1000)	-0.049	-0.082	-0.053	-0.059	-0.062	-0.048	-0.066
	(0.059)	(0.084)	(0.070)	(0.073)	(0.079)	(0.071)	(0.082)
ln(Unemployment Rate)	-0.007	-0.067***	-0.020	-0.021	-0.014	-0.020	-0.019
	(0.012)	(0.019)	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)
Share of Low Skilled Workers in %	-0.002	-0.015***	-0.012***	-0.013***	-0.013***	-0.013***	-0.015***
	(0.003)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Share of Medium Skilled Workers in %	0.008***	-0.002	-0.003	-0.003	-0.004	-0.003	-0.004
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Share of High Skilled Workers in %	-0.009**	-0.023***	-0.019***	-0.020***	-0.020***	-0.019***	-0.022***
	(0.004)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
ln(Students)	-0.007	-0.002	-0.001	-0.001	-0.002	-0.001	0.000
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)
ln(Doctors)	-0.029	-0.080*	-0.019	-0.022	-0.028	-0.021	-0.029
	(0.041)	(0.045)	(0.045)	(0.045)	(0.046)	(0.045)	(0.048)
Wind X Ref		-0.036***	-0.015	-0.015	-0.020	-0.015	-0.021*
		(0.011)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Wind X Ref X Trend		0.013***	0.011***	0.012***	0.012***	0.011***	0.012***
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
LOC X Wind X Ref		0.091	0.188	0.279	2.460***	0.525	3.581***
		(0.446)	(0.436)	(0.438)	(0.624)	(0.326)	(0.639)
LOC X Wind X Ref X Trend		-0.689***	-0.708***	-0.851***	-1.280***	-0.398***	-0.915***
		(0.097)	(0.095)	(0.093)	(0.131)	(0.070)	(0.134)
N	257030	257030	257030	256556	241833	257030	230790
log-likelihood	-206567.58	-211770.83	-209453.26	-208962.69	-197089.07	-210333.83	-190433.84
F	6.12***	11.54***	10.33***	12.65***	11.63***	8.99***	7.54***
Underidentification LM		346.06	320.48	316.45	298.49	313.68	283.03
Weak Instrument Test†		56.20	53.15	52.52	49.43	52.03	46.76
Hansen p-value		0.61	0.24	0.09	0.52	0.20	0.33
Municipality Fixed Effects	✓	✓	✓	✓	✓	✓	✓
Industry Fixed Effects	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓
State X Year Fixed Effects			✓	✓	✓	✓	✓

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. *Source:* Own data collection and calculations. *Notes:* Economic promotion in one million. Eicker-White robust standard errors are in parentheses. †Kleibergen and Paap (2006) rank F-statistic for stationary data.

Table 10: Complete Poisson Models

	Dependent Variable: Number of Firm Foundations						
	Weighted Localization Index					Revenue Weighted Localization Index	
			Cut Top 5			Cut Top 5	
	Poisson	CF	CF	CF	CF	CF	CF
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Local Business Tax	-0.001***	-0.008***	-0.013***	-0.013***	-0.011***	-0.014***	-0.015***
	(0.000)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
LOC X Local Business Tax	0.020	-0.241	4.931***	5.111***	5.172***	5.365***	5.404***
	(0.069)	(1.428)	(1.642)	(1.725)	(1.658)	(1.819)	(0.948)
Economic Promotion	0.003**	0.072**	0.099***			0.085**	
	(0.001)	(0.035)	(0.038)			(0.039)	
LOC X Economic Promotion	0.318***	4.088	-22.773***			- 24.233***	
	(0.082)	(5.369)	(5.598)			(6.450)	
Total Capital Stock				0.013*			0.008
				(0.007)			(0.006)
LOC X Total Capital Stock				-1.518***			-1.475***
				(0.396)			(0.192)
Expenditures					0.015**		
					(0.006)		
LOC X Expenditures					-3.892***		
					(0.960)		
Population in 1000	0.006**	0.010**	0.010**	-0.011	-0.001	0.009*	-0.004
	(0.003)	(0.005)	(0.004)	(0.011)	(0.005)	(0.005)	(0.010)
Unemployment Rate	0.023***	0.024***	0.023***	0.023***	0.017***	0.023***	0.023***
	(0.005)	(0.005)	(0.006)	(0.007)	(0.005)	(0.006)	(0.005)
Share Low Qualified Worker in %	0.012**	0.010	0.005	0.003	0.001	0.006	0.003
	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)
Share Medium Qualified Worker in %	0.005	0.004	0.003	0.005	0.004	0.004	0.006
	(0.004)	(0.004)	(0.005)	(0.006)	(0.004)	(0.005)	(0.005)
Share High Qualified Worker in %	-0.008	-0.016	-0.027*	-0.019	-0.011	-0.024*	-0.016
	(0.012)	(0.012)	(0.015)	(0.015)	(0.011)	(0.012)	(0.012)
Students	0.002***	0.001	0.001	0.002**	0.001	0.001	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Doctors	0.002***	0.002***	0.002**	0.001*	0.001*	0.002***	0.002**
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	2,866,802	2,866,802	2,577,383	2,577,383	2,577,087	2,575,829	2,575,829
Municipality Fixed Effects	✓	✓	✓	✓	✓	✓	✓
Industry Fixed Effects	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓
State X Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓
Instrument Controls		✓	✓	✓	✓	✓	✓
Control Function Residuals		✓	✓	✓	✓	✓	✓
Bootstrapped SE		✓	✓	✓	✓	✓	✓
# of Bootstraps		50	50	50	50	50	50

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. *Source:* Own data collection and calculations. *Notes:* Economic promotion in one million. Bootstrapped and clustered standard errors are in parentheses.

Table 11: Complete Log-Linear Models with Varying Localization Distance from 5km to 30km.

	Dependent Variable: ln(Number of Firm Foundations)					
	Weighted Localization Index			Revenue Weighted Localization Index		
	5km (1)	10km (2)	30km (3)	5km (4)	10km (5)	30km (6)
ln(Local Business Tax)	-1.469**	-1.544**	-1.701***	-1.505**	-1.506**	-1.495**
	(0.607)	(0.609)	(0.612)	(0.609)	(0.610)	(0.610)
LOC X ln(Local Business Tax)	65.118*	53.640**	39.227***	49.089***	28.411***	12.175***
	(34.331)	(22.278)	(11.922)	(17.491)	(9.917)	(4.631)
ln(Economic Promotion)	0.205***	0.219***	0.265***	0.240***	0.247***	0.268***
	(0.072)	(0.073)	(0.074)	(0.073)	(0.073)	(0.074)
LOC X ln(Economic Promotion)	5.704***	0.793	-2.947***	-3.025***	-2.431***	-1.857***
	(1.744)	(1.161)	(0.639)	(0.948)	(0.544)	(0.258)
ln(Population in 1000)	-0.078	-0.078	-0.082	-0.067	-0.068	-0.073
	(0.079)	(0.080)	(0.082)	(0.080)	(0.080)	(0.080)
ln(Unemployment Rate)	-0.019	-0.018	-0.018	-0.019	-0.019	-0.020
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Share of Low Skilled Workers in %	-0.014***	-0.014***	-0.015***	-0.014***	-0.015***	-0.015***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Share of Medium Skilled Workers in %	-0.003	-0.003	-0.004	-0.004	-0.004	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Share of High Skilled Workers in %	-0.020***	-0.021***	-0.022***	-0.021***	-0.022***	-0.023***
	(0.006)	(0.006)	(0.007)	(0.006)	(0.007)	(0.007)
ln(Students)	0.000	0.000	0.000	0.000	0.000	0.000
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
ln(Doctors)	-0.024	-0.026	-0.030	-0.029	-0.029	-0.030
	(0.047)	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)
Wind X Reform	-0.019	-0.019	-0.019	-0.018	-0.018	-0.019
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Wind X Reform X Trend	0.013***	0.012***	0.012***	0.012***	0.012***	0.012***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
LOC X Wind X Reform	0.848***	0.622***	0.409***	0.599***	0.347***	0.164***
	(0.212)	(0.136)	(0.071)	(0.109)	(0.062)	(0.029)
LOC X Wind X Reform X Trend	-0.490***	-0.276***	-0.112***	-0.154***	-0.073***	-0.018***
	(0.045)	(0.029)	(0.015)	(0.023)	(0.013)	(0.006)
N	229370	229370	229370	229370	229370	229370
log-likelihood	-187594.23	-188155.17	-189783.38	-188807.70	-189007.27	-189368.59
F	25.48***	14.07***	10.38***	7.44***	9.60***	26.24***
Weak Instrument Test†	48.71	48.86	49.15	48.03	48.01	47.96
Hansen p-value	0.55	0.52	0.46	0.32	0.36	0.48
Municipality Fixed Effects	✓	✓	✓	✓	✓	✓
Industry Fixed Effects	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
State X Year Fixed Effects	✓	✓	✓	✓	✓	✓

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. *Source:* Own data collection and calculations. *Notes:* Economic promotion in one million. Eicker-White robust standard errors are in parentheses. †Kleibergen and Paap (2006) rank F-statistic for stationary data.

Table 12: Complete Poisson Models with Varying Localization Distance from 5km to 30km without the top 5 localized industries

	Dependent Variable: Number of Firm Foundations					
	Weighted Localization Index			Revenue Weighted Localization Index		
	5km (1)	10km (2)	30km (3)	5km (4)	10km (5)	30km (6)
Local Business Tax	-0.014***	-0.015***	-0.011***	-0.014***	-0.015***	-0.011***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)
LOC X Local Business Tax	0.995***	0.732***	0.158	0.976***	0.651***	0.104
	(0.286)	(0.214)	(0.158)	(0.234)	(0.146)	(0.134)
Economic Promotion	0.100**	0.090**	0.079*	0.088***	0.083***	0.066*
	(0.048)	(0.040)	(0.044)	(0.031)	(0.031)	(0.034)
LOC X Economic Promotion	-4.581***	-3.311***	-0.887*	-4.365***	-2.881***	-0.611
	(0.998)	(0.662)	(0.501)	(0.889)	(0.569)	(0.383)
Population in 1000	0.010**	0.009**	0.009*	0.009**	0.008**	0.008**
	(0.005)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Unemployment Rate	0.024***	0.023***	0.023***	0.023***	0.023***	0.023***
	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)
Share Low Skilled Workers	0.003	0.005	0.007	0.005	0.005	0.009
	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Share Medium Skilled Workers	0.003	0.004	0.003	0.004	0.004	0.005
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Share High Skilled Workers	-0.027**	-0.024	-0.017	-0.024*	-0.022*	-0.014
	(0.012)	(0.015)	(0.012)	(0.014)	(0.013)	(0.010)
Doctors	0.002***	0.002**	0.002***	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Students	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
N	2,507,724	2,577,383	2,512,080	2,505,564	2,505,564	2,579,973
Municipality Fixed Effects	✓	✓	✓	✓	✓	✓
Industry Fixed Effects	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓
State X Year Fixed Effects	✓	✓	✓	✓	✓	✓
Instrument Controls	✓	✓	✓	✓	✓	✓
Control Function Residuals	✓	✓	✓	✓	✓	✓
Bootstrapped SE	✓	✓	✓	✓	✓	✓
# of Bootstraps	50	50	50	50	50	50

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. *Source:* Own data collection and calculations. *Notes:* Economic promotion in one million. Bootstrapped and clustered standard errors are in parentheses.