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Vocational Schools as an Instrument of Interregional Competition – Empirical Evidence from German Counties

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Abstract

The German apprenticeship system is widely known throughout the world. We analyze expenditures on vocational schools on county level using data from 213 West-German counties between 2001 and 2006. We use spatial econometrics to test for spatial correlation in counties' expenditure on vocational schools but find no evidence that vocational schools serve as instrument in inter-county competition. While the theoretical literature suggests that spending should be higher for apprentices from small firms, we find a negative relationship between the share of apprentices from small firms and the expenditures per pupil. Expenditures are found to increase in the share of Christian Democrats in the county council.

Key-words: vocational schools, German apprenticeship system, local public finance, spatial econometrics.

JEL: (H75, R510, R580)

1. Introduction

The German system of apprenticeship and vocational training is widely known throughout the world. It offers an attractive alternative to university-education for young people. In the classical apprenticeship system, young people enter a trilateral contract with a firm that employs them and trains their firm-specific skills and a vocational school that provides them with more general training. The contract runs for two to three years. After having passed the necessary examinations, apprentices are awarded an official diploma by the chamber of commerce. Apprentices and firms can choose between more than 300 standardized professions (BIBB, 2014) or "occupational profiles". The syllabus for these professions are developed in a cooperation between the government, the labor unions and the potential employers (through the chambers of commerce). This ensures that apprentices develop a mix of general and firm-specific skills and thus are attractive for future employers. Compared to untrained workers, employees who successfully acquire apprenticeship training receive higher wages and are less likely to be unemployed (e.g. Schmidt, 2005).

The apprenticeship system has been the subject of many studies by German scholars and scholars from outside Germany. Some authors focus on its impact on the productivity and industry structure (e.g. Bradley and Taylor, 1996; Mason et al., 1992) while others address the more general question why some countries have a comparable system while others do not (e.g., Soskice, 1994; Acemoglu and Pischke, 1998; Harhoff and Kane, 1993). Scholars from countries that do not have a comparable system have also discussed the question whether a system of a similar sort should be introduced to their country (e.g. Harhoff and Kane, 1993).

So far, little attention has been paid to the political economy of this system. This paper contributes to closing this gap. It focusses on the mode of funding vocational schools. Funding comes from two sources: The state government provides teachers and pays for their salaries

while the county governments cover the costs for the so-called “external school affairs”. These comprise – among other things – the costs of building and maintaining school buildings and maintenance and administrative staff. In addition, counties provide the funding for the training facilities in vocational schools. Especially for technical professions, these facilities are quite expensive. In 2001, the average expenditures per pupil amounted to 802 Euros and the average total expenditures per county added up to almost 4.5 million Euros. On the one hand, well-equipped schools can provide higher quality training. In this sense, vocational schools may be an important location factor for firms. Thus, it seems reasonable to hypothesize that county governments use expenditures as an instrument in inter-regional competition for firms (e.g.,Tiebout, 1956; Wilson 1986; Brueckner, 2003). On the other hand, the counties’ expenditures on vocational schools may create utility spillovers similar to those created by the German states’ expenditures on higher education (e.g., Büttner/Schwager, 2004). In this case, counties face incentives to free ride on the expenditures of their neighboring counties. So far, there is surprisingly little research on the spatial interaction in expenditures on vocational schools. In this paper, we provide – to the best of our knowledge – the first comprehensive study on this issue. Our main focus rests on the question: are counties’ expenditures on vocational schools spatially related? Given the general lack of empirical studies on the political economy of vocational school funding, we take a somewhat explorative approach to learn more about factors driving county governments’ expenditures on vocational schools in general.

We use panel data from German counties between 2001 and 2006. In our analysis, we have to cope with unobserved heterogeneity between counties with respect to the portfolio of professions their vocational schools offer. We cope with this by applying a model with county fixed effects. Our results can be summarized as follows: We find no evidence for any spatial correlation in the counties expenditures for vocational schools, neither negative nor positive. While the theoretical literature suggests that spendings should be higher for apprentices from

small firms, we find a negative relationship between the share of apprentices from small firms and the expenditures per pupil. Expenditures per pupil increase in the share of Christian Democrats in the county council.

The paper proceeds as follows: Section 2 reviews the related literature. In section 3, we present the institutional background relevant for our study. Section 4 presents the data and the empirical strategy. Results are presented and discussed in section 5. In section 6, we provide concluding remarks and suggestions for future research.

2. Review of literature

There is a vast literature on the German apprenticeship system and vocational training in general, on regional (development) policies and on the factors driving local expenditures for primary and secondary schools. However, the literature emerged in three largely disjoint strands. Little has been written about the relationship between these fields. In this section, we briefly sketch the essential aspects of all three strands and point at possible links between them.

1) The German apprenticeship system

The German apprenticeship system has been analyzed by national but also by international scholars. Taking the existence of the system as given, some authors analyzed its contribution to the overall performance of the German economy. It is recognized to promote productivity especially in the industrial sector and to thereby play a significant role in making Germany attractive for industry settlements – despite its high wages and comparatively high degree of regulation (e.g. Thelen, 2007). The system is also recognized to shape the distribution of income because it lets workers participate in the overall productivity progress of society – thereby opening the middle-class of society for people without university degree (e.g. bank clerk, industrial management assistant, assistant tax consultant, electrician). Starting in the 1990s, a number of authors address the question why this system exists in some countries like Germany

or Austria while similar systems are missing in the UK or US (e. g. Harhoff/Kane, 1993, Soskice, 1994). They analyze the institutional and contractual arrangements of the system to learn more about the incentives of firms to train their employees. The essential question is: Why do firms pay for the vocational training of employees (while they usually do not pay for university education of their employees)? While it is not puzzling to have firms pay for firm-specific training, the question is: Why do they invest in the general skills of their apprentices and thereby reduce their monopsony power in negotiations with their apprentices?

Soskice (1994) addresses this question in a theoretical model and arrives at the following conclusion: Depending on the imperfections on the labor market and the institutional settings in general, there are two possible equilibria. In the low-skill low-education equilibrium, employees receive little training and frequently change employer. The high-skill high-education equilibrium is characterized by a high degree of training and a low frequency of quits. The level of labor market imperfections and other institutional settings in Germany led to high-skill high-education equilibrium (see also Harhoff and Kane, 1993). Acemoglu and Pischke (1998) build on Soskice (1994) and develop a more sophisticated theoretical model of the firms' incentives to train. Essentially, firms have monopsony power (because of superior information) and pay more for training if quits are rare. If quits are high, a low amount of training is provided in equilibrium. They test the essential prediction of their model empirically using the change in the duration of military service in Germany as a natural experiment and find it supported.

2) Regional development policies

New Economic Geography tells us that the location decision of firms is strongly driven by agglomeration rents and network externalities. This makes it very difficult for governments especially in rural regions to promote regional development and prevent the outflow of mobile capital and high-skilled labor (e.g., Pflüger and Südekum, 2008). Nevertheless, providing good infrastructure to firms is still one of the key instruments in regional development strategies. Good vocational schools are likely to be one element of this firm-related public infrastructure. While the importance of the apprenticeship system for regional economic development (labor market) is mentioned parenthetically, few authors place an emphasis on this relationship. One exception is a study by Bradley and Taylor (1996). They analyze interactions between the vocational training system and the local economy in a theoretical model: The model suggests that the output of vocational training and the stock of high-skilled workers form a positive feedback loop. In addition, the number of high-skilled workers has a positive influence on local competitiveness and economic performance. Last but not least, a high level of economic performance has a positive impact on the qualification of immigrants and therefore again on human capital. Bradley and Taylor (1996) find support for the existence of these positive feedback effects in their empirical analysis for local England. Di Gioacchino and Profeta (2014) develop a two-sector model on lobbying for education, arguing rather the other way round: They stress that the production structure and firms' political pressure activities influence education policy and therefore also the composition of human capital. The authors find that an optimal level of human capital can only be reached if lobbying is not too costly.

3) Local expenditures for primary and secondary education

There is a large body of literature on local/regional expenditures for primary and secondary education. Starting in the 1970s, a number of authors have analyzed the differences in per capita spending across US states and school districts (e.g., Denzau, 1975; Denzau and Grier, 1984; Poterba 1997). These studies find empirical support for the notion that the interest group model of public spending holds for education expenditures: Public spending is lower if the share of population older than 65 years is higher (e.g., Miller, 1996; Fernandez and Rogerson, 1996). In addition, expenditures per capita are found to depend on the per capita income (e.g., Fernandez and Rogerson, 1996). Colburn and Horowitz (2003) analyze the impact of political fragmentation on educational spending in Virginia. They analyze fragmentation in different dimensions (age, income, race, political parties) and find racial fragmentation to reduce public expenditures on education. In addition, expenditures are found to increase with political fragmentation, local crime rates and the share of people who voted for the Democratic Party.

For Germany, Potrafke (2011) addresses the question whether the allocation of expenditures on education and cultural affairs is influenced by government ideology. Empirically analyzing Western German states from 1974-2006, he provides evidence that conservative governments spend a bit more on universities and cultural affairs. For left-wing governments, on the other hand, higher expenditures for schools are found.

For German counties, Schwarz and Weishaupt (2013) provide an analysis on the determinants of per student expenditures for primary schools. The variation between *Länder* can mostly be explained by differences concerning the school system and all-day care. In North Rhine-Westphalia, the unemployment rate has a significant negative effect on these expenditures. The expenditures are shown to be significantly and positively affected by the population density and the tax revenues of the communes in Bavaria whereas in Hesse, the population density seems

to affect the latter negatively. All in all, the federal state is the most significant factor here. Their study does not account for spatial analysis, nor for political variables.

There is a number of studies on subnational education expenditures in European countries. Freitag and Bühlmann (2003) try to explain the high variance in education expenditures among cantons in Switzerland in the 80s and 90s. Among other things, expenditures per capita positively depend on a high degree of urbanization, a low share of employment in the first sector, economic strength, a high graduation rate from *Gymnasien* and universities. The degree of decentralization (autonomy of municipalities) within the canton is found to have a negative impact.

4) Regional spillovers in funding education

Recently, a number of authors have addressed the question whether there is spatial interdependence in the expenditures on education. The theoretical literature suggests that these expenditures should be spatially correlated because public education creates spillovers. One strand of literature concentrates on higher education. Büttner and Schwager (2004) analyze the higher education spending decision of German states. They develop a theoretical model showing that students' mobility results in underinvestment. Using data on higher education expenditures by German states, they find a negative correlation between the expenditures of one state and those of its neighboring states. Poutvaara (2004) argues that the national incentives to invest in public education decrease as a result of labor mobility. He shows that graduate taxes or income-contingent loans (also from migrants) improve welfare compared to a situation where employment- based taxes are used to fund education All in all, the existing studies agree that decentralization in higher education financing leads to underinvestment and therefore underprovision if there is no private financial contribution at all (see also Justmann

and Thisse, 1997). As vocational schools in Germany do not take any user fees, the same argument may apply to the expenditures for vocational education in Germany.

There is a number of studies that apply spatial econometrics to test for existence of spatial correlation in local expenditures on primary and secondary education. Spillovers are expected to be especially strong if parents are free in the choice of school for their children and they can choose to send them to another school district (see Rincke, 2006; Ghosh, 2010). Ghosh (2010) uses a dataset for Massachusetts school districts and applies a Spatial Autoregressive Model and a Spatial Error Model. He takes expenditures per pupil, pupil- teacher ratio as well as a measure for the teachers' qualification as dependent variables. For expenditures per pupil, he finds positive neighborhood spillover effects. Negative spillovers from direct neighbors are found concerning the student-teacher ratio whereas no significant spillovers are found for the third dependent variable. Gu (2012) analyzes disparities and spatial interactions in local public education expenditure per capita in 1520 Chinese counties. He uses a Spatial Error Model as well as a standard Spatial Lag Model and finds significant spillovers of school expenditures by neighboring counties. Besides, coastal areas and inland areas are shown to respond asymmetrically to their neighbors' education expenditures. In this paper, we apply similar estimation techniques to test whether the counties expenditures on vocational schools are spatially related.

3. Institutional Background

3.1 The German apprenticeship system

The apprenticeship system in Germany is internationally (almost) unique. It offers the possibility for young people who finished secondary school to acquire a formal qualification certified in a Diploma without going to college or university. They can choose between more than 300 different professions like bank clerk, construction worker, mechanic, electrician, IT-

technician etc. (BIBB, 2014). For each profession, a nationwide curriculum settles the essential content of the apprenticeship education. The curricula of existing professions and the introduction of new professions are settled in a formalized process involving the chambers of commerce (Handelskammern), labor unions and the German national and federal government as well as the Federal Ministry of Education and Research (Kuppe et al. 2015).

The standard way for a young person to acquire an apprenticeship qualification is to fill a position as apprentice in a firm that is qualified to train him in the desired profession. Apprentices sign a special contract with their employer. In this contract, the firm agrees to provide the apprentice with the necessary training in the practical parts of the profession and to give him the time off to visit the vocational school. The largest part of vocational schools are state-run schools. They offer courses in general skills and in the theoretical skills underlying his profession (e.g., material sciences, programming skills). The apprentice agrees to go through the training and to work for the firm in the rest of the time. Apprentices receive some pay but the amount is much lower than the pay of untrained workers.

Visiting the vocational schools is obligatory and costless. Apprentices usually attend a vocational school (Berufsschule) for 1-2 days per week. In most cases, they visit vocational schools that are located in the county where their firm is located or in neighboring counties. For some rather rare vocational programs, however, students may have to travel considerable distances for theoretical training. In this case, they usually receive block training. Depending on prior school education and profession, the time of apprenticeship is two to three years. The chambers of commerce are in charge of supervising the practical training within the firm and make sure that it complies with the agreed standards. They are also in charge of the final examination of apprentices in the practical elements of their education (Hippach-Schneider et al., 2007). The apprenticeship contract usually ends after successfully completing the

apprenticeship. Some apprentices are offered the prospect of a regular labor contract after successfully completing their training. The retention rate varies across firms and industries (e.g. Pfeifer et al., 2009). In general, the retention rate is low in small firms and high in large firms (e. g. Pfeifer et al., 2009). Given that labor market regulation in Germany is more restrictive for large firms than for small firms, this pattern of retention rates is in line with the logic put forth by Acemoglu and Pischke (1998).

For some professions, e.g. in the field of health care, the share of theoretical training is substantially larger. In these professions, apprentices usually do not have individual contracts with a training firm or other institution. Instead, they undergo three years of schooling in so-called Berufsfachschule (BFS) and receive practical training during internships outside schools. The Berufsfachschule also offers full-time programs as well as preparatory classes for young people who did not manage to acquire an apprenticeship contract but hope to receive one in the future. The system of vocational schools in Germany is completed by the vocational grammar schools. These are basically full-time grammar schools where some (minor) subjects include vocational aspects. The successful graduation from this type of school gives the students a general university entrance qualification (KMK, 2014).

3.2 The role of German counties

The German constitution assigns the task of education to the states (*Länder*) while it delegates some of the tasks to the county level. Therefore it is necessary to take a closer look at the counties in Germany. As of 2001, 118 German cities served as municipality and county at the same time (so-called cities with county rights). Next to them, there are 367 rural counties (*Landkreise)* with an average population of 178.448 and an average number of 42 municipalities on their territory (in 2001). Hereafter, we will use the term county as generic term for both cities with county rights and rural counties. The German Constitution grants municipalities and

counties the right to self-government (GG, art. 28(2)). Municipalities are granted substantial autonomy in their decision about how to fulfill their tasks and they have the right to raise local taxes (including the right to set a local tax multiplier). They account for 16.5 percent of total public expenditures (*Statistisches Bundesamt*, 2016). The German counties have much less autonomy. They are assigned a "twin role" placing them in charge of a) executing numerous *Länder* laws (such as the exterior school issues for vocational schools or local social security benefits) and b) providing supra-municipal goods and services (e.g. county hospitals, county roads, waste management etc.). Furthermore, they give support to financially weak local municipalities to guarantee an equal provision of local public goods and services within the county. Sometimes, administrative tasks are assigned to them by the state (e. g. building and trade control). Besides, there are some voluntary tasks, especially concerning cultural issues like museums etc. (see e. g. Seele 1990; Scherf and Hofmann 2003).

The county parliament (*Kreistag*) is elected by the citizens of the county to represent them in all affairs settled on county level. It is enabled to enact statutes and can be seen as the legislative body of the county (Jann /Bogumil 2009). The so-called *Landra*t is the head of the county's government and administration at the same time (e.g., Jann and Bogumil; Fuchs 2012). He is accountable to the *Kreistag* when it comes to fulfilling tasks assigned to the county level and accountable to the state government when it comes to delegated tasks. Finally, there is the *Kreisausschuss* which is basically a committee created by the *Kreistag* as supervisory authority.

On the revenue side, counties rely to some extend on vertical grants while they do not have tax autonomy. However, they have one source of revenues for which they can influence the size by setting a rate. This is the so-called *Kreisumlage*. The *Kreisumlage* defines a share of "regular municipal revenues" that the county can extract from the budgets of its municipalities. The taxrate (so-called *Umlagesatz*) is set by the county council in a simple majority vote. The

municipalities' approval is not needed. The higher the *Kreisumlage*-rate, the more municipal fiscal capacity the county is taxing away (see also Seele 1990, Fuchs 2012, Henneke 2012).

The formal responsibility for vocational schools rests with the German *Länder*. They are in charge of the so-called interior school issues. I.o.W. they employ the teaching staff and pay for their salaries. In addition, they develop the curricula (in accordance with the nationwide regulations negotiated with the chambers of commerce). The counties are in charge of the exterior school issues and have to provide funding for non-teaching staff, after school care, buildings, school equipment, administrative costs etc.

In most counties, vocational training is concentrated in a few, large school centers. These school centers often encompass different types of vocational schools that share facilities and staff. For this reason, it is impossible to determine how much resources flow into which branch of vocational schooling. Hereafter, we will use the term vocational pupils as umbrella term for all pupils in the system of vocational schools, regardless of school branch. The term apprentice is used for those pupils with a labor and training contract with a private firm who visit a *Berufsschule*. In 2001, the share of pupils in vocational grammar school (*Fachgymnasiasten*) among all vocational pupils was about 4 percent on average, whereas the share of pupils in BFS accounted for 17 to 18 percent. The share of the remaining types of vocational students is negligibly small. Thus, the by far largest part of pupils in the vocational system are apprentices trained in the classical apprenticeship system described above. Our primary focus rests on these apprentices.

Given the large number of more than 300 professions for which apprenticeship contracts can be signed, it is obvious that not all counties can offer the relevant vocational school classes in all these professions (so-called *Fachklassen*). Instead, most counties only offer a limited amount of *Fachklassen*. Firms and apprentices in a certain county i can still sign an apprenticeship

contract for a profession not offered by the vocational schools of their county. In this case, the apprentice has to visit a vocational school in a different county. For frequent professions, it is often possible to find the adequate *Fachklasse* in the neighboring county. Apprentices of rare professions may have travel substantial distances for vocational school training. The regional distribution of *Fachklassen* is settled by the state – after consulting the regional chambers of commerce and the counties'. It seems reasonable to assume that some types of vocational training are more expensive per student than others. For instance, technical apprenticeships which include apprenticeship workshops cause higher (material) costs than those without apprenticeship workshops (Pfeifer et al., 2009). We will control for these differences by introducing county fixed effects.

The cities with county rights play an important role in providing vocational training for the less densely populated counties in the region. Frequently, the counties also open their training classes to apprentices from these cities. Generally speaking, however, the exchange is unbalanced with the cities receiving more outside students than they send to the surrounding counties. In most states, vocational schools receive a fixed grant per student from outside covering some of the variable costs (see Avenarius and Heckel 2000).

[Table 1: about here]

Table 1 provides information on the number of schools and the structure students for the West-German *Landkreise* and cities with county rights which are included in our dataset. The average number of *Berufsschulen* is 6.5 in the *Landkreise* and 8.7 in the cities with county rights. The vocational schools in *Landkreise* have only about 10 percent guest students while this share is close to 30 percent for the cities with county rights. On the other hand, the share of *Berufsfachschüler* and *Fachgymnasiatse*n is substantially larger in the *Landkreise*. The share of non-German pupils in vocational schools is higher in cities with county rights.

4. Data and hypotheses

We use data on all counties in the West-German *Länder* for 2001 -2006. The restriction to the years 2001 – 2006 is due to restrictions in budgetary data after 2006. In our analysis, we will differentiate between Bavaria and the other West-German *Länder*. The rationale behind this is that the division of labor between state level and subsidiary jurisdictions is different, namely the degree of decentralization is substantially larger in Bavaria. In some Bavarian counties, teachers' salaries are also (partially) paid for by the county. This leaves us with 193 observations per year comprising 149 *Landkreise* and 44 cities with county rights in West Germany (excluding Bavaria). For Bavaria, we use 89 counties, 25 of them cities with county rights. The descriptive statistics in table 2 show that there is substantial heterogeneity in population size, population growth, industry structure, county council composition as well as in economic and fiscal indicators. Bavarian counties are substantially smaller on average while the average population size is similar in *Landkreise* and cities with county rights (220.000 respectively 125.000 inhabitants on average). At the same time, we find substantial differences between *Landkreise* and cities with county rights in other categories. Cities with county rights have higher unemployment rates and more debt per capita. In addition, the share of non-German population is larger. Regarding industry structure, cities with county rights have a higher share of employees in the service and production sector while the construction sector is larger in the *Lankreise*. In addition, the share of employees working in large firms (>250 employees) is substantially larger in cities with county rights while *Landkreise* have a higher share of employees working in small firms (< 10 employees). A similar pattern is observed for the distribution of apprentices across firms of different size: The share of apprentices working in large firms (>250 employees) is substantially larger in cities with county rights while *Landkreise* have a higher share of apprentices working in small firms (< 10 employees). It is

important to note that these shares refer to the location of the apprentices' firms rather than the location of the vocational schools they visit.

[Table 2 here]

Looking at the counties' annual expenditures on vocational schools per pupil, we find substantial differences between *Landkreise* and cities with county rights. Due to the higher degree of decentralization, the figures are three to four times larger in Bavaria than in the other West-German counties. At the same time *Landkreise* spend substantially more (950 € per pupil and year in West-Germany excluding Bavaria, 4950 € in Bavaria), the figure for cities with county rights is substantially lower (550 € and 1550 €). In addition, we find substantial variation in per pupil expenditures within both groups. Similar within- and between- variations exist for the expenditures per inhabitant. Figure 1 shows that there is no trend in the average expenditures.

[Figure 1 here]

County governments have limited influence on the number of schools on their territory or the educational program these schools offer. These facts are negotiated with the state government. On the other hand, county governments can influence the quality of vocational schooling by spending more on equipment and activities. We argue that spending more funds on vocational schools is not a sign of inefficiency or waste but rather an indication that a county is investing more in the general skills of their vocational pupils. Our main research question focusses on the spatial interaction of counties. The literature on interjurisdictional competition suggests that local and regional governments compete for mobile capital. Offering well-equipped vocational schools may be one instrument in this competition. The empirical literature has compiled evidence for the existence of both tax competition and expenditure competition (e.g., Brueckner, 2003). In addition, the big stake-holders in vocational training in Germany –

governments, labor unions and the chambers of commerce – argue that the existence of a well-equipped vocational school nearby is an essential argument in firm's location choice. We test for spatial correlation in the counties' expenditures on vocational schools. Thus, hypothesis H1 reads:

H1: The spatial correlation in countries' expenditures on vocational schools is positive.

On the other hand, some of the studies literature reviewed in section 2 suggest that good vocational schools may generate positive utility spillovers for the neighboring jurisdictions just like higher education institutions on state level do. These in turn may create the incentives to free ride on the expenditures of their neighboring municipalities. Thus, hypothesis H1A reads:

H1A: The spatial correlation in countries' expenditures on vocational schools is negative.

5. Empirical analysis

5.1 Empirical models

Our main aim is to test for the existence of spatial correlation in the counties' expenditures for vocational schools. Following the literature on education expenditures, we use the expenditures per pupil as dependent variable. This is the most direct way to capture possible differences in the quality of vocational schools – as influenced by the county government.

Moran's I-test provides a first indication for the existence of special correlation (e.g.,Anselin et al. 1996). The tests are performed year-wise for the years 2003 to 2006 using a row-standardized contiguity matrix as well as a contiguity matrix with relative weights proportional to the inverse geographical distances (see table 3). The significantly positive coefficients for West-Germany suggest that there is positive spatial correlation between counties' expenditures on vocational schools as hypothesized in H1. However, the coefficient may also reflect the

presence of common factors such as state regulation driving the counties' expenditures. Therefore, a more thorough empirical analysis is needed.

[Table 3]

We will apply Spatial Autoregressive Models (SAR), Spatial Error Models (SER) and Spatial Durbin Models (e.g., Le Sage 2014). We start by using the SAR Model specification assuming that spatial dependencies are totally captured by a spatial lag in the endogenous variable Y. The SAR assumes that local decision makers focus directly on neighboring counties' expenditures for vocational schools when choosing their own expenditures program.

So the empirical model can be written as follows:

$$\ln\left(\frac{exp\,voc.\,schools}{pupils}_{it}\right) = \alpha_i + pW_{ij}\ln\left(\frac{exp\,voc.\,schools}{pupils}_{jt}\right) + \delta\left(X_{it}\right) + \theta_i + \lambda_t + \varepsilon_{it} \qquad (1)$$

We use the two different spatial weighting matrices (W) mentioned above to capture the spatial relations between counties: First, we use the conventional row-standardized contiguity matrix. Second, we use the contiguity matrix with relative weights proportional to the inverse geographical distances.

Next, we have to specify the matrix X of covariates driving the counties' per capita expenditures on vocational schools. As this is the first large-scale empirical study on vocational education expenditures in Germany, it is worthwhile to pay some attention to their influence despite the fact that the primary focus rests elsewhere. First, the literature on vocational training suggests that the demand for vocational training outside the firm is different for firms of different size (see section 2). Small firms have less capacity to provide their apprentices with a wide range of necessary skills in-house. On the other hand, only a small share of apprentices in small firms are offered a follow-up contract to their successful apprentices. Thus, small firms have lower

incentives to train their apprentices. For the county government, this implies that high-quality training – especially regarding general skills – cannot and/or will not be provided by the training firms. Thus, the county government has to exert more effort into training in public vocational schools. The situation is substantially different for large firms. Large firms have much superior in-house training capacity. At the same time, they are much more likely to keep their apprentices as future employees. Therefore, the apprentices in large firms are likely to receive comprehensive training even if the county does not spend much effort on their training. On the other hand, large firms may be interested in the quality of training for the apprentices of their local business partners. In this case, vocational schools have the role of teaching technical and organizational standards. In addition, the vocational school is the place where some of their own future employees meet the apprentices of their future business partners. Joint schooling may help to build up trust between the employees of different firms. Thus, we have no clear prediction regarding the impact of large firms. To capture the effect of firm size structure on the expenditures for vocational schools, we include the share of apprentices in the county working in firms with less than 20 as well as the share of apprentices in firms with more than 100 employees. We expect a positive sign for the first variable. Again, note that these variables refer to the apprentices working in firms located within the county borders. If counties compete for firms through vocational training expenditures, the expenditures should depend on the firm structure within the county. The same holds if the county governments react to political pressure from their resident firms.

Second, differences in political ideology may influence expenditure levels. As the German Christian Democrats are generally considered to be firm-friendly, one may argue that the expenditures for vocational training per capita should increase in the influence of Christian Democrats in the county. On the other hand, Acemoglu and Pischke (1998) imply that high-quality *general* training strengthens the outside options of the apprentice. Thus, large budgets

for vocational schools may be favored particularly by left-wing parties. The net-effect is unclear. To capture the impact of political ideology, we use the share of seats in the local assembly held by Christian Democratic Parties (Christian Social Party in Bavaria). In addition, we introduce a dummy election-year on county level to control for the possibility of opportunistic spending cycles.

Third, we control for the share of non-German pupils in the counties' vocational schools. The need for training among these apprentices may be higher because of deficiencies e.g. in the knowledge of the German language and to help these pupils overcome possible discrimination of non-Germans in the job market. These arguments point at a positive relationship between the share of non-German pupils and the expenditures per pupil. On the other hand, one might argue that non-German pupils have less voting power than German pupils because they themselves and their parents are often not allowed to vote in local elections. This points at a negative relationship. The net effect is unclear ex ante.

Fourth, we account for the share of guest-students, i.e. students coming from other counties to visit the resident vocational schools. We expect the county government to be less interested in providing good education to guest students compared to their own resident students.

In addition, we introduce a number of additional control variables. To capture differences in the counties' general economic and fiscal situation, we include the disposable income per capita and the unemployment rate (based on the whole civilian labor force)] and accumulated public debt per capita. Following the literature on expenditures for primary and secondary schooling (see section 2), we control for share of non-German population and for the county's age composition. The larger the share of old persons, the higher the demand for consumption expenditures as opposed to investment (including human capital formation). We also control

for possible economies of scale or scope by introducing the number of apprentices per 1000 inhabitants directly.

Finally, we have to account for the fact that the counties differ in relative importance of school types and they also differ in the specific professions their vocational schools offer training in (*Fachklassen*, see section 3.2). We have to control for these sources of heterogeneity in the costs of vocational training. To cover differences in the share of pupils in different school branches, we control for the share of pupils in *Berufsfachschulen* and the share of pupils in *Fachgymnasien* (see table 1, section 3.2). Controlling for these shares allows us to place our focus on expenditures per apprentice in the classical apprenticeship system, namely the students with a formal labor contract who train for a profession and receive part of the training in the *Berufsschule* while the largest share of training takes place outside the school. For all the independent variables, lagged values from the previous year are used. We take the natural logarithm of all continuous variables (except for dummy variables and variable representing percentage shares).

Finally, we introduce county fixed effects to control for the remaining unobserved heterogeneity. Most importantly, this controls for the likely difference in expenditures that result from differences in the necessary training facilities needed for training particular professions. These differences may be substantial because there is a significant degree of division of labor between counties (see section 3.2). Fixed effects are an adequate way of coping with the unobservable differences in training facilities needed across counties because the structure of schools and classes is quite stable in our period of observation. Year fixed effects control for common changes across time.

5.2 Result for West Germany (excluding Bavaria)

We start by analyzing the panel of West German counties excluding Bavaria. The results are presented in table 4. The first column presents regression results using the full set of variables described above and the conventional contiguity matrix. In column 2, we rerun the regressions from column 1 using a contiguity matrix with spatial weights inversely proportional to the distance to the neighboring counties. Column 3 and 4 use the same covariates and W-matrices as columns 1 and 2 respectively but apply a Spatial Error Model (SEM). Unlike the SAR-model, the SEM-model contains a spatially autocorrelated error term instead of a spatially- lagged dependent variable.

[Table 4 about here]

The results in all four columns are qualitatively identical. Contrary to our prediction, we find the share of apprentices in small firms to be significantly negative. Per capita expenditures on vocational schools increase in the share of Christian Democratic council members but decrease in the share of guest students. We find a negative relationship between the share of apprentices in total population and the expenditures on vocational schools per pupil. Regardless of the specification, we find no evidence that there is any spatial correlation. The corresponding parameter λ is far from significant.

In a sensitivity analysis, we use a Spatial Durbin Model (SDM, see Table 5). It is less restrictive in its assumptions and allows for spatially lagged explanatory variables in addition to the spatially lagged dependent variable (see e.g., Le Sage 2014, Ajilore 2013). This allows for the possibility that counties also take into account other characteristics of neighboring counties aside from their expenditures on vocational schools when making their own expenditure decisions. The results are qualitatively identical to those of the SAR-model (see column 5-8). Most importantly, it provides no evidence for spatial correlation in expenditures on vocational schools. The fact that most coefficients in the column Wx are insignificant provides additional

support for the notion that the politics and the general situation in neighboring counties have little influence on the expenditures on vocational schools in German counties.[1]

[Table 5 about here]

5.3 Result for Bavaria

We replicate the empirical analysis above using a panel on Bavaria only (see Appendix for full descriptive statistics). Despite the considerable institutional differences mentioned above, many of our results hold for Bavaria as well (see table 6/ 7): Per capita expenditures also increase in the share of Christian Social council members and decrease in the share of guest students. Furthermore, we do not find any evidence of spatial correlation either. Nevertheless, there are some notable differences: The share of apprentices in small companies is insignificant for Bavaria. The share of apprentices in big companies, on the other hand, is found to have a significantly positive effect on per capita expenditures for vocational schools. Moreover, we find no significant impact of the share of apprentices in total population. Last but not least, expenditures per pupil increase in the share of foreigners in total population, but seem to decrease in the share of foreign apprentices.

[Table 6 and 7 about here]

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[1] As another sensitivity analysis, we also controlled for the square of the apprentices' share of population to test if economies of scale exist. However, the latter specification does not change our results qualitatively. Moreover, we once included a dummy variable on whether any far-right party (NPD, DVU or Republicans) has at least one seat in the county council - not significantly changing any of our results. The same holds true for an introduction of sectoral dummy variables.

6. Concluding remarks

The German system of apprenticeship has been analyzed in numerous theoretical and empirical studies. So far, the focus rests on the impact of the system on labor market outcomes, industry performance and income distribution. The political economy of this system has been largely ignored. In this paper, we provide – to the best of our knowledge – the first large-scale empirical analysis of the factors driving local expenditures on education in public vocational schools. Our results indicate that political factors matter. We find expenditures to be higher in counties with a large share of Christian Democrats (or Christian Social Party members) in the county council. The counties' firm structure drives the counties' expenditures for vocational schools. While the results differ for Bavaria and the rest of West-Germany, they support the same bottom line: Small firms seem to have less political influence than large firms. All models reported above show a negative relationship between the share of guest students and per capita expenditures. This supports the notion that county governments care less for their apprentices from firms located outside their constituency. Somewhat surprisingly, the fiscal or economic situation is not found to matter. Nor do we find evidence for an opportunistic budged cycle in vocational school expenditures.

Above all, we are interested in the relationship between vocational expenditures in neighboring counties: Is there any evidence for inter-county competition? Moran's I test suggests that this may be the case for the West-German sample (excluding Bavaria). We apply spatial econometric regression techniques to test for spatial correlation in counties' expenditures for vocational schools. Regardless of the specification, we find no evidence that hints at spatial correlation. This indicates that there is no inter-county competition for mobile capital in the field of vocational schooling. Alternatively, one may argue that there are two spatial effects neutralizing each other. On the one hand, counties may compete with each other for mobile

capital and jobs through the provision of good vocational training. On the other hand, counties may free ride on the vocational schools provided by the neighboring counties. In particular, the proximity to a city with county rights may provide incentives for counties to free ride on their vocational schools – a strategy that is not available for counties far away from cities with county rights. With the given data set, it is impossible to differentiate between the absence of spatial interaction and the existence of two countervailing spatial effects. Further research is needed.

Any further research in this field faces one essential challenge: the division of labor between counties in training the regional apprentices. This division of labor means that different counties may have different per capita costs of providing vocational training just because some specialize on professions that require more expensive training than others. We control for this by introducing county fixed effects. While this largely solves the main challenge, it bears a high price because several interesting questions regarding the funding of vocational training cannot be answered. For instance, it is impossible to test whether the internal composition of counties – i.e. their municipal structure – drives their funding decisions. These analyses have to be left for the future when a suitable proxy for the heterogeneity in profession-specific training costs is found. Once this data is available, it may also be possible to test another explanation for the absence of spatial correlation: Accordingly, the lack of spatial correlation may result from the fact that the division of labor between counties is deliberately designed as a form of collusion that prevents inter-county competition. The recent paper by Di Liddo and Giuranno (2016) suggests that this may be the case.

References

Acemoglu, D., & Pischke, J.-S. (1998). Why Do Firms Train? Theory and Evidence. *Quarterly Journal of Economics, 113(1)*, 79-119.

Ajilore, O. (2013). Estimating the Spillover Effects of School District Demographics on PerPupil Spending. *Journal of education finance*, *39*(2), 101-114.

Anselin, L., Bera, A. K., Florax, R., & Yoon, M. J. (1996). Simple diagnostic tests for spatial dependence. *Regional science and urban economics*, *26*(1), 77-104.

Avenarius, H., & Heckel, H. (2000). *Schulrechtskunde: Ein Handbuch für Praxis, Rechtspchung und Wissenschaft*. Luchterhand.

BIBB, (2014). „BIBB Datenreport / A4.1.1 Anzahl und Struktur anerkannter Ausbildungsberufe nach BBiG/HwO“. Bibb.de. Abgerufen am 09. 05. 2017 von https://www.bibb.de/datenreport/de/2014/19504.php.

Bradley, S., & Taylor, J. (1996). Human capital formation and local economic performance. *Regional Studies*, *30*(1), 1-14.

Brueckner, J. K. (2003). Strategic Interaction among Governments: An Overview of Empirical Studies. International Regional Science Review 26 (2): 175-188.

Büttner, T., & Schwager, R. (2004). Regionale Verteilungseffekte der Hochschulfinanzierung und ihre Konsequenzen. In *Bildung, 33. Wirtschaftswissenschaftliches Seminar Ottobeuren, Tübingen* , 251-278.

Colburn, C. B., & Horowitz, J. B. (2003). Local politics and the demand for public education. *Urban Studies*, *40*(4), 797-807.

Denzau, A. T. (1975). An empirical survey of studies on public school spending. *National Tax Journal*, 241-249.

Denzau, A., & Grier, K. (1984). Determinants of local school spending: Some consistent estimates. *Public Choice*, *44*(2), 375-383.

Di Gioacchino, D., & Profeta, P. (2014). Lobbying for Education in a Two-Sector Model. *Economics & Politics*, *26*(2), 212-236.

Di Liddo and Giuranno (2016). Asymmetric yardstick competition and municipal cooperation. *Economics Letters* 141, 64-66.

Fernandez, R., & Rogerson, R. (1996). Income distribution, communities, and the quality of public education. *The Quarterly Journal of Economics*, 135-164.

Freitag, M., & Bühlmann, M. (2003). Die Bildungsfinanzen der Schweizer Kantone. Der Einfluss sozioökonomischer Bedingungen, organisierter Interessen und politischer

Institutionen auf die Bildungsausgaben im kantonalen Vergleich. *Swiss Political Science Review*, *9*(1), 139-168.

Fuchs, G. (2012). *Der Landrat: Karrierewege, Stellung, Amtsführung und Amtsverständnis*. Springer-Verlag.

Ghosh, S. (2010). Strategic interaction among public school districts: Evidence on spatial interdependence in school inputs. *Economics of Education Review*, *29*(3), 440-450.

Gu, J. (2012). Spatial dynamics and determinants of county-level education expenditure in China. *Asia Pacific Education Review*, *13*(4), 617-634.

Harhoff, D., & Kane, T. J. (1993). *Financing apprenticeship training: Evidence from Germany* (No. w4557). National Bureau of Economic Research.

Henneke, H. G. (2012). *Die Kommunen in der Finanzverfassung des Bundes und der Länder: Darstellung*. 5. Aufl. Wiesbaden: Kommunal-und Schul-Verlag.

Hippach-Schneider, U., Krause, M., & Woll, C. (2007). *Berufsbildung in Deutschland: Kurzbeschreibung*. Office for Official Publications of the Europ. Communities.

Jann, W., & Bogumil, J. (2009). Verwaltung und Verwaltungswissenschaft in Deutschland. *Wiesbaden: VS-Verlag*.

Justman, M., & Thisse, J. F. (1997). Implications of the mobility of skilled labor for local public funding of higher education. *Economics Letters*, *55*(3), 409-412.

Kuppe, A. M., Lorig, B., Schwarz, H., & Stöhr, A. (Eds.). (2015). *Ausbildungsordnungen und wie sie entstehen*. Bundesinstitut für Berufsbildung.

Kultusministerkonferenz (KMK) (2014). Definitionenkatalog zur Schulstatistik 2015. abgerufen am 12.07.2016 von http://www.kmk.org/fileadmin/Dateien/pdf/Statistik/Defkat2015_2.pdf.

LeSage, J. P. (2014). What regional scientists need to know about spatial econometrics. *Available at SSRN 2420725*.

Mason, G., Prais, S. J., & Van Ark, B. (1992). Vocational education and productivity in the Netherlands and Britain. *National Institute Economic Review*, *140*(1), 45-63.

Miller, C. (1996). Demographics and spending for public education: a test of interest group influence. *Economics of Education Review*, *15*(2), 175-185.

Pflüger, M., & Südekum, J. (2008). A synthesis of footloose-entrepreneur new economic geography models: when is agglomeration smooth and easily reversible? *Journal of Economic Geography*, *8*(1), 39-54.

Pfeifer, H., Dionisius, R., Schönfeld, G., Walden, G., & Wenzelmann, F. (2009). Kosten und Nutzen der betrieblichen Berufsausbildung. *Forschungsprojekt des Bundesinstituts für Berufsbildung, Bonn*.

Poterba, J. M. (1997). Demographic Structure and the Political Economy of Public Education. *Journal of Policy Analysis and Management 16(1)*: 48-66.

Potrafke, N. (2011). Public expenditures on education and cultural affairs in the West German states: does government ideology influence the budget composition?. *German Economic Review*, *12*(1), 124-145.

Poutvaara, P. (2004). Educating Europe: should public education be financed with graduate taxes or income-contingent loans?. *CESifo Economic Studies*, *50*(4), 663-684.

Rincke, J. (2006). Competition in the public school sector: Evidence on strategic interaction among US school districts. *Journal of Urban Economics*, *59*(3), 352-369.

Scherf, W., & Hofmann, K. (2003). Die kommunale Finanzverfassung in Deutschland. In *Kommunalpolitik in den deutschen Ländern* (pp. 313-334). VS Verlag für Sozialwissenschaften.

Schmidt, S. (2005). Bildung schützt vor Erwerbslosigkeit. *Statistisches Monatsheft Baden-Württemberg*, *7*(2005), 14-17.

Schwarz, A., & Weishaupt, H. (2013). Regionale Disparitäten der Bildungsfinanzierung. In *Bildungskontexte* (pp. 483-510). Springer Fachmedien Wiesbaden.

Seele, G. (1990). Die Kreise in der Bundesrepublik Deutschland. *Verfassung, Organisation und Aufgabenstellung einer Institution. Köln*.

Soskice, D. (1994). Reconciling markets and institutions: The German apprenticeship system. In *Training and the private sector: International comparisons* (pp. 25-60). University of Chicago Press.

Statistisches Bundesamt (2016). Finanzen und Steuern – Vierteljährige Kassenergebnisse des Öffentlichen Gesamthaushalts. Fachserie 14, Reihe 2.Wiesbaden.

Thelen, K. (2007). Contemporary challenges to the German vocational training system. *Regulation & Governance 1, 247-260.*

Tiebout, C. M. (1956). A pure theory of local expenditures. *The journal of political economy*, 416-424.

Wilson, J. D. (1986). A theory of interregional tax competition. *Journal of urban Economics*, *19*(3), 296-315.

Tables and Figures

Table 1: Vocational schools and student structure (2002)

Landkreise

Variable	Obs	Mean	Std. Dev.	Min	Max
No. Voc. Schools	213	5	4517262	0	25
Share Berufsfachschüler	213	0.1891064	0.1052637	0	0.5399113
Share Fachgymnasiasten	213	0.0442726	0.0589719	0	0.1951959
Share foreign students	213	0.0717941	0.0905833	0	0.3505838
Share foreign students	213	0.070838	0.045891	0	0.2540029

Cities with county rights

Variable	Obs	Mean	Std. Dev.	Min	Max
No. Voc. Schools	69	726.087	7.595.765	1	40
Share Berufsfachschüler	69	0.1366236	0.0772182	0	0.3703125
Share Fachgymnasiasten	69	0.0188949	0.0356661	0	0.1408451
Share foreign students	69	0.3166737	0.1526696	0	0.5871989
Share foreign students	69	0.0876168	0.0499784	0	0.2282822

Table 2: Descriptive statistics of West-German counties 2002
Table 2a) Landkreise

	West-German counties without Bavaria					Bavaria				
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
pop	149	221217.6	115712.4	57587	654276	64	124667.6	42136.88	70984	302750
Unemployment rate	149	7.180.537	1.868.685	4.1	12.8	64	5.65	16.755	3.3	11.4
Public debt/capita	149	0.9206283	0.3172315	0.3187464	1.738.453	64	0.9686177	0.3522678	0.3264743	2.258.499
Share employment big	149	0.3996625	0.0761296	0.2162554	0.6256923	64	0.3773875	0.0705714	0.2395048	0.5417331
Share employment small	149	0.3254703	0.0553167	0.1923931	0.4851637	64	0.3514882	0.0525068	0.2383635	0.4611539
Share apprentices big	149	0.1935818	0.0715064	0.0328337	0.3752914	64	0.1696221	0.0597096	0.0479574	0.3275408
Share apprentices small	149	0.2892998	0.05071	0.1717172	0.4150675	64	0.3114664	0.0477662	0.2162162	0.4017991
Share agriculture	149	0.0278096	0.0185011	0.0042589	0.0859539	.	.	.	.	.
Share construction	149	0.0697549	0.0136621	0.0403035	0.1088647	64	0.08298	0.0165061	0.0502513	0.1264957
Share production	149	0.2456108	0.0803447	0.0916553	0.4853147	64	0.2568577	0.0698449	0.0979021	0.4557292
Share manufacture	149	0.2957136	0.0559733	0.1633182	0.4262126	64	0.2651543	0.040001	0.1744361	0.3988658
Share bank	149	0.1072793	0.0284658	0.0609756	0.2674308	64	0.0973922	0.0235593	0.0614525	0.202005
CDU/CSU seats share	149	0.4566496	0.0980262	0	0.74	64	0.4877307	0.0534705	0.3666667	0.5857143
Share Non-German citizens	149	.074269	.0293778	.0287345	.1768629	64	.0618192	.026354	.0250391	.1289216
pop_growth	149	-0.0020869	0.014182	-0.0448705	0.0296846	64	-0.0002004	0.0167639	-0.0482703	0.0362724

Table 2b) Cities with county rights

	West-German counties without Bavaria					Bavaria				
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
pop	44	219826.4	185725.5	35846	968639	25	138666.1	247783	38633	1234692
Unemployment rate	44	10.42273	2.140079	6.9	16	25	8.184	1.934916	5.6	13.6
Public debt/capita	44	1.40104	0.6501552	0.0455809	2.849.207	25	1.37331	0.5898104	0.465477	2.848.652
Share employment big	44	0.5329374	0.0888675	0.2676806	0.8016956	25	0.5234832	0.0955355	0.3377285	0.7028652
Share employment small	44	0.2337458	0.0485391	0.0937687	0.3907478	25	0.2276655	0.0508919	0.1397642	0.3632805
Share apprentices big	44	0.3336689	0.0993991	0.1467577	0.5828305	25	0.3007943	0.0846298	0.1588969	0.457119
Share apprentices small	44	0.2079837	0.0438342	0.0885902	0.3097113	25	0.1933614	0.0307209	0.1457819	0.2613497
Share agriculture	44	0.0038327	0.0042178	0.0005435	0.0220588	.	.	.	.	.
Share construction	44	0.0484297	0.0153617	0.0237417	0.0837867	25	0.0400738	0.0106876	0.025974	0.0694864
Share production	44	0.2040634	0.103262	0.0849813	0.5611729	25	0.2245841	0.0736004	0.1184089	0.4224138
Share manufacture	44	0.3316145	0.0667295	0.1668352	0.4753087	25	0.3276828	0.0558697	0.2295259	0.4370861
Share bank	44	0.1468599	0.0398232	0.0897436	0.2733217	25	0.1396114	0.0376141	0.0993976	0.2489705
Share Non-German citizens	44	.1189119	.0373928	.0472856	.2216257	25	.124867	.0405135	.060461	.237784
CDU/CSU seats share	44	0.444244	0.0606166	0.3	0.5689655	25	0.4453665	0.0725031	0.3181818	0.6
pop_growth	44	-0.0048763	0.0200479	-0.0457256	0.0525493	25	0.0041905	0.0191051	-0.0406507	0.0462812

Figure 1: Counties' expenditures on vocational schools per pupil (2001-2006)

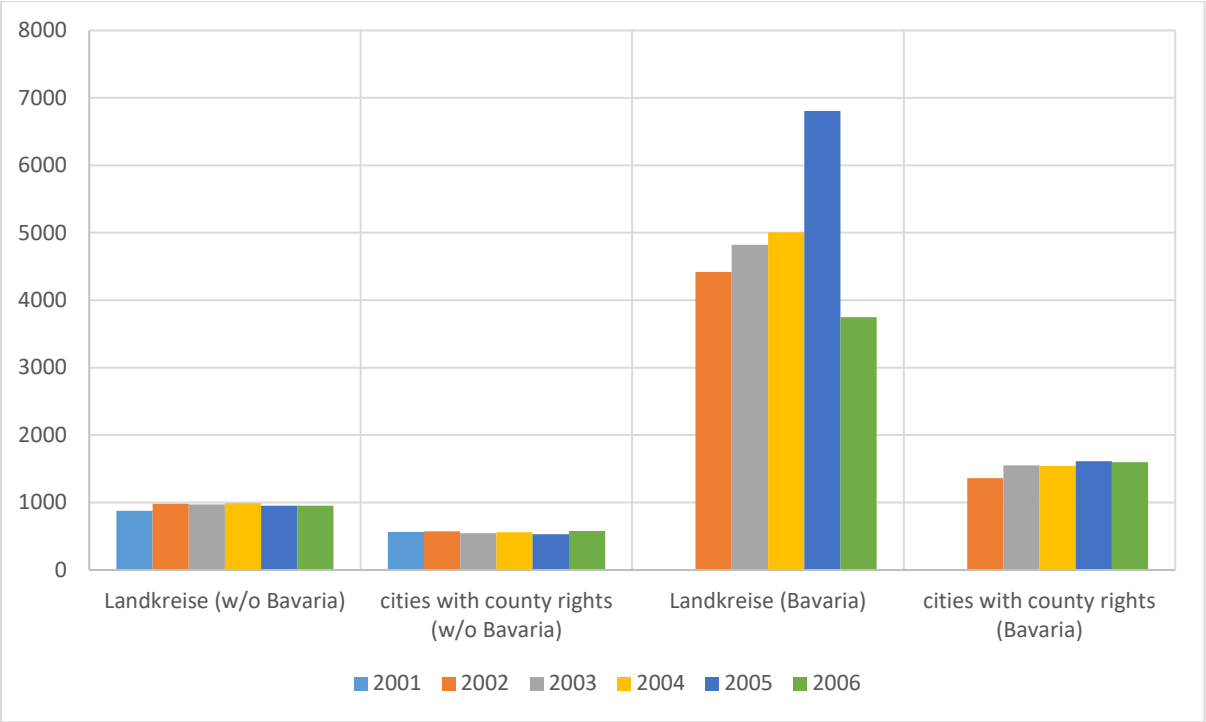

Table 3: Regression results using a SAR-Model

Year	West-Germany excl. Bavaria	Bavaria
2003	**0.276*** / 0.236*** **	**-0.035 /-0.056**
2004	**0.322*** / 0.302*** **	**-0.021 / -0.033**
2005	**0.379*** / 0.359*** **	**0.006 / -0.002**
2006	**0.372*** / 0.353*** **	**-0.046 / -0.084**

Table 4: Regression results using SAR- and SER-Model

VARIABLES	(1)	(2)	(3)	(4)
Share Apprentices (t-1)	-33.03**	-33.26**	-33.51**	-33.56**
	(16.75)	(16.73)	(16.77)	(16.73)
Share Apprentices Big (t-1)	-0.121	-0.122	-0.122	-0.122
	(0.443)	(0.443)	(0.443)	(0.443)
Share Apprentices Small (t-1)	-2.552***	-2.567***	-2.584***	-2.587***
	(0.920)	(0.919)	(0.925)	(0.921)
Share Guest Students (t-1)	-1.274***	-1.275***	-1.277***	-1.279***
	(0.412)	(0.412)	(0.412)	(0.412)
Share Foreign Pupils (t-1)	-1.426	-1.427	-1.430	-1.429
	(1.113)	(1.113)	(1.113)	(1.113)
Log Disposable Income/Capita (t-1)	0.582	0.581	0.579	0.581
	(0.694)	(0.694)	(0.694)	(0.693)
Log Public Debt/Capita (t-1)	-0.0390	-0.0389	-0.0389	-0.0390
	(0.0598)	(0.0598)	(0.0598)	(0.0598)
Unemployment Rate (t-1)	0.0290*	0.0292*	0.0293*	0.0293*
	(0.0153)	(0.0152)	(0.0152)	(0.0152)
CDU Seats Share (t-1)	1.110***	1.110***	1.112***	1.113***
	(0.283)	(0.284)	(0.283)	(0.282)
Election year	0.0137	0.0138	0.0139	0.0138
	(0.0240)	(0.0240)	(0.0239)	(0.0239)
Share elderly (t-1)	-3.307	-3.295	-3.275	-3.263
	(5.347)	(5.350)	(5.345)	(5.346)
Foreign share (t-1)	-1.320	-1.380	-1.465	-1.517
	(4.819)	(4.820)	(4.836)	(4.848)
Pupils' structure (t-1)	yes	yes	yes	yes
rho	0.0125	0.00480		
	(0.0466)	(0.0429)		
lambda			-0.00362	-0.00617
			(0.0487)	(0.0444)
No. of Obs.	965	965	965	965
R-squared	0.007	0.007	0.007	0.007

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Regression results using SDM-Model

VARIABLES	(5)	(6) Wx	(7)	(8) Wx
Share Apprentices (t-1)	-29.39	-37.48	-30.39*	-22.30
	(18.03)	(31.51)	(18.16)	(26.72)
Share Apprentices Big (t-1)	-0.135	-0.332	-0.0940	-0.299
	(0.457)	(0.996)	(0.456)	(0.781)
Share Apprentices Small (t-1)	-2.356**	-4.070**	-2.442***	-2.502
	(0.941)	(1.785)	(0.943)	(1.659)
Share Guest Students (t-1)	-1.218***	-0.662	-1.159***	-0.496
	(0.424)	(0.799)	(0.423)	(0.712)
Share Foreign Pupils (t-1)	-1.120	-1.163	-1.056	-0.00469
	(1.135)	(2.205)	(1.138)	(2.006)
Log Disposable Income/Capita (t-1)	1.093	-0.980	0.835	-0.317
	(0.776)	(1.261)	(0.771)	(1.158)
Log Public Debt/Capita (t-1)	-0.0396	-0.164	-0.0477	-0.0576
	(0.0608)	(0.147)	(0.0606)	(0.108)
Unemployment Rate (t-1)	0.0193	0.0122	0.0192	0.00976
	(0.0173)	(0.0269)	(0.0172)	(0.0243)
CDU Seats Share (t-1)	1.167***	0.0898	1.218***	-0.113
	(0.367)	(0.545)	(0.362)	(0.512)
Election year	0.108	-0.101	0.105	-0.0991
	(0.0662)	(0.0729)	(0.0714)	(0.0776)
Share elderly (t-1)	-5.789	4.868	-5.425	5.028
	(5.635)	(8.813)	(5.691)	(8.054)
Foreign share (t-1)	3.600	-19.61*	3.908	-21.16**
	(5.332)	(10.62)	(5.280)	(8.429)
Pupils' structure (t-1)	yes	yes	yes	yes
rho	-0.0196		-0.0122	
	(0.0481)		(0.0438)	
No. of Obs.	965	965	965	965
R-squared	0.012	0.012	0.022	0.022

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Bavaria: Regression results using SAR- and SER-Model

VARIABLES	(1)	(2)	(3)	(4)
Share Apprentices (t-1)	-21.53	-21.83	-21.86	-21.78
	(14.09)	(14.05)	(13.95)	(13.89)
Share Apprentices Big (t-1)	1.857***	1.879***	1.883***	1.888***
	(0.647)	(0.647)	(0.645)	(0.643)
Share Apprentices Small (t-1)	-0.652	-0.692	-0.685	-0.724
	(1.007)	(1.005)	(1.002)	(1.001)
Share Guest Students (t-1)	-0.799**	-0.767**	-0.793**	-0.771**
	(0.311)	(0.312)	(0.310)	(0.312)
Share Foreign Pupils (t-1)	-4.844***	-4.842***	-4.890***	-4.822***
	(0.800)	(0.799)	(0.802)	(0.798)
Log Disposable Income/Capita (t-1)	-0.325	-0.338	-0.380	-0.396
	(0.630)	(0.629)	(0.628)	(0.621)
Log Public Debt/Capita (t-1)	0.0217	0.0219	0.0236	0.0229
	(0.113)	(0.113)	(0.113)	(0.113)
Unemployment Rate (t-1)	-0.0216	-0.0217	-0.0214	-0.0210
	(0.0193)	(0.0193)	(0.0191)	(0.0190)
CSU Seats Share (t-1)	1.338**	1.349**	1.379**	1.425**
	(0.665)	(0.664)	(0.666)	(0.665)
Share elderly (t-1)	-1.849	-2.110	-1.723	-1.987
	(5.471)	(5.474)	(5.449)	(5.434)
Foreign share (t-1)	18.44***	19.12***	18.85***	19.41***
	(7.111)	(7.092)	(7.028)	(7.024)
Pupils' structure (t-1)	yes	yes	yes	yes
rho	-0.00600	-0.0356		
	(0.0496)	(0.0470)		
lambda			-0.0463	-0.0657
			(0.0558)	(0.0510)
No. of Obs.	445	445	445	445
R-squared	0.017	0.013	0.015	0.013

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Bavaria: Regression results using SDM-Model

VARIABLES	(5)	(6) Wx	(7)	(8) Wx
Share Apprentices (t-1)	-17.19	-10.96	-17.81	2.278
	(14.61)	(28.95)	(14.21)	(21.74)
Share Apprentices Big (t-1)	1.681**	1.274	1.702***	0.604
	(0.659)	(1.290)	(0.655)	(1.084)
Share Apprentices Small (t-1)	-0.330	-0.318	-0.361	-1.261
	(1.018)	(1.720)	(1.015)	(1.535)
Share Guest Students (t-1)	-0.845**	0.113	-0.788**	0.391
	(0.352)	(0.783)	(0.352)	(0.577)
Share Foreign Pupils (t-1)	-4.932***	-1.831	-4.816***	-0.354
	(0.820)	(1.159)	(0.809)	(1.289)
Log Disposable Income/Capita (t-1)	-0.0301	-1.291	-0.135	-0.913
	(0.662)	(1.086)	(0.672)	(0.980)
Log Public Debt/Capita (t-1)	-0.0333	-0.173	-0.0283	-0.0791
	(0.115)	(0.278)	(0.114)	(0.187)
Unemployment Rate (t-1)	-0.0261	0.0496	-0.0153	0.0240
	(0.0204)	(0.0385)	(0.0202)	(0.0298)
CSU Seats Share (t-1)	1.407**	3.502**	1.429**	2.307**
	(0.669)	(1.455)	(0.668)	(1.122)
Share elderly (t-1)	-6.948	5.241	-6.526	6.117
	(6.268)	(6.503)	(6.238)	(5.983)
Foreign share (t-1)	19.78***	11.22	18.90***	25.31**
	(7.359)	(17.02)	(7.333)	(12.31)
Pupils' structure (t-1)	yes	yes	yes	yes
rho	-0.0652		-0.0660	
	(0.0561)		(0.0503)	
No. of Obs.	445	445	445	445
R-squared	0.000	0.000	0.041	0.041

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1