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Neighborhood Influence and Political Change: Evidence from US School Districts

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Non-Technical Summary

In striking contrast to the intense theoretical debate on policy innovation and policy experimentation in decentralized systems of government, an empirical literature on strategic interactions among local jurisdictions with regard to policy experiments is virtually non-existent. The purpose of this paper is to help to fill this gap and to shed light on policy innovation among jurisdictions in a federal system, with a focus on how jurisdictions influence each other in the discrete choice decision between competing political technologies.

The jurisdictions we are looking at are school districts in Michigan. The evidence on strategic policy interactions is based on the participation of school districts in the first two years of a public school choice program launched in Michigan in 1996. Under Michigan law, beginning with the 1996-97 school year, school districts were asked to determine whether they would admit non-resident students at local schools. Together with a school finance scheme paying school districts a fixed amount of state aid per student, the program did increase competition between school districts. Participation of school districts in the program can therefore be considered an important policy innovation in a decentralized public sector.

The key result of the paper is that school district policies towards open enrollment have been heavily affected by lagged decisions of neighboring districts. Across various specifications, a one percentage point increase in the share of previous-year adopters among neighbors is estimated to increase the current probability of adoption by about 0.2%. There is also evidence for asymmetric responses among districts, with non-adopters being 'pulled' to participation by previous-year adopters in their geographical environment. The results suggest that in the analysis of the diffusion of policy innovations among local jurisdictions it is crucial to take into account strategic interaction between the jurisdictions' governments. Furthermore, the paper supports the view that in federal systems the diffusion of new political technologies is stimulated by horizontal interactions between jurisdictions.

Neighborhood Influence and Political Change: Evidence from US School Districts

Johannes Rincke*

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Abstract

This paper investigates how local jurisdictions in a federal system influence each other in the adoption of policy innovations. We look at school districts in Michigan and their participation in a public school choice program launched in 1996. Districts' participation decisions are modelled as simultaneous discrete choice decisions using a spatial latent variable model. Strong effects are found saying that lagged adoptions of neighbors positively affect the current probability of participation. This finding is robust to various changes in specification. The results suggest that in federal systems the diffusion of policy innovations is stimulated by horizontal interactions between jurisdictions.

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1 Introduction

In the public economics literature, an ongoing discussion revolves around policy innovation and policy experimentation in decentralized systems of government. One of the key issues in the debate is how the incentives of local governments to experiment with new policies and the behavior of local governments in the diffusion of policy innovations are affected by interactions between jurisdictions. A sort of standard view is that local governments are constantly searching for better ways to solve problems of political governance. With several jurisdictions performing policy experiments, local governments can learn from each other.[1] Of course, it will often take some time until outcomes of policy experiments can be assessed. Nevertheless, even in situations where no information on outcomes is available, local governments can mutually observe each other's actions and learn from this observation by rational Bayesian inference on information conveyed in the behavior of others. Hence, borrowing an argument from the literature on behavioral convergence and social learning, one could also argue that policy experimentation is spurred by reputational concerns of local governments who benefit from following the role model of jurisdictions which have already adopted a new policy.[2] Strategic interaction between jurisdictions in policy experimenting and policy innovation may also take the form of yardstick competition. For correlated environments, Besley and Case (1995) have shown that voters can use comparative performance evaluation of representatives to alleviate political agency problems. Under certain conditions, yardstick competition will promote the diffusion of new political technologies. For instance, in many cases policy makers will prefer to run traditional policies because this requires lower effort. Yardstick competition can provide policy makers with incentives

[1] Kollman, Miller, and Page (2000) provide a computational model for the ability of federated systems to solve difficult problems. For a survey on 'laboratory federalism', see Oates (1999).

[2] See the surveys of Gale (1996) and, focussing on herd behavior at financial markets, Hirshleifer and Teoh (2003).

to implement superior but more demanding new policies.[3] Of course, less optimistic perspectives on policy innovation in decentralized systems of government have also received theoretical support. For instance, Rose-Ackerman (1980) shows that risk aversion can lead jurisdictions to abstain from policy experimentation. In a recent contribution, Strumpf (2002) elaborates on horizontal information externalities. Policy experiments provide useful information for all governments, and this creates an incentive for free-riding on other jurisdictions' experimentation efforts. However, in a related theoretical paper Kotsogiannis and Schwager (2004) show that, once career concerns of political actors are accounted for, the traditional view that decentralized systems of government offer favorable conditions for policy experimentation and policy innovation is again validated.

In striking contrast to the intense theoretical debate, an empirical literature on strategic interactions among local jurisdictions with regard to policy experiments and policy innovation is virtually non-existent. The purpose of this paper is to help to fill this gap and to shed light on policy innovation among jurisdictions in a federal system, with a focus on how jurisdictions influence each other in the discrete choice decision between competing political technologies. The jurisdictions we are looking at are school districts in Michigan. Note that members of school boards in Michigan school districts are determined by general elections, and that school boards have the ultimate responsibility for school district operations. Hence, school districts are independent local jurisdictions that seem to be well suited for an empirical analysis of policy innovation in a decentralized system of government.

In this paper, the evidence on strategic policy interactions is based on the participation of school districts in the first two years of a public school choice program launched in Michigan in 1996. Under Michigan law, beginning with the 1996-97 school year, school districts were asked to determine whether

[3] A formal model with yardstick competition between governments which have to choose between a traditional and a new policy is presented in Rincke (2005b).

they would admit non-resident students at local schools. Together with a school finance scheme paying school districts a fixed amount of state aid per student, the program did increase competition between school districts. Participation of school districts in the program can therefore be considered an important policy innovation in a decentralized public sector.

Districts' participation decisions are modelled as simultaneous discrete choice decisions using spatial latent variable models. The key result of the paper is that in their predisposition to participate in inter-district open enrollment the school districts have been heavily affected by lagged decisions of neighboring districts. This finding is robust to various changes in specification. The neighborhood influence on districts' adoption decisions is also present if we control for vertical interactions in the federal system. More precisely, we account for the influence of Intermediate School Districts as regional service agencies on district policies. This is important because in a federal system spatial correlation in local policy innovations could be driven by the impact higher-level authorities have on local jurisdictions.

From a methodological point of view, this paper relates to the growing body of literature on strategic policy interaction. However, this literature has to date almost exclusively focused on fiscal variables like tax rates, expenditures and local public goods provision.[4] A study more closely related to local policy innovations is Brueckner (1998), dealing with the adoption of growth control policies in California cities. Fredriksson and Millimet (2002) examine environmental policymaking and find that US states are influenced by their neighbors when adopting more or less stringent regulations. In contrast to this paper, where the discrete choice between competing policies is modelled, both studies examine the stringency of regulations as continuous dependent variables. It should also be noted that the literature in political science has amassed descriptive material on the diffusion of policy innova-

[4]A literature survey is given by Brueckner (2003).

tions in federal systems, in particular among the American states.[5] However, analytical approaches focusing on the identification of strategic interaction among local governments are largely missing in that literature.

The paper proceeds as follows. In the next section, the Michigan open enrollment program and potential factors affecting policy preferences of districts are described. Section 3 deals with the estimation approach. In section 4, estimation results are presented and discussed, and section 5 concludes.

2 Inter-district open enrollment as a local policy innovation in Michigan

As mentioned above, the policy innovation under investigation in this paper is inter-district public school choice, sometimes also called inter-district open enrollment. Basically, it allows students to attend a public school in a school district other than the district of residence. In the U.S., school choice policies have been a much discussed topic of educational reform in recent years. The significance of the inter-district version of school choice comes from the fact that it will tend to increase competition for students between districts.[6] Michigan's inter-district public school choice program has been launched in 1996 by a state law saying that each school district shall determine whether or not it will accept applications for enrollment by nonresident students for the next school year.[7] Under the new law, districts were free to enroll any applicant in the district's schools provided that the student's home district belongs to the same Intermediate School District.[8] School choice in

[5]For an early analysis on the diffusion of policy innovations in the US see Walker (1969). A survey on related literature in political science is given by Berry and Berry (1999).

[6]See Hoxby (2000) and Hoxby (2003) for a discussion on the effects of competition among public schools on school productivity.

[7]For details see Michigan Compiled Laws, Section 388.1705 (Act 300, 1996).

[8]ISDs are regional educational service agencies comprising several local school districts. ISDs originally were created to provide school districts with services and programs too expensive or too extensive to be offered by districts individually. In 1997, Michigan had 554

Michigan gained much of its significance as a policy innovation by the fact that districts were not given the power to prevent resident students to enroll elsewhere. At the same time, competition for students was fuelled by the fact that in its school finance scheme Michigan had shifted from local property taxes to a per-student state guarantee in 1994. The minimum per-student state aid was $ 4,200 for the school year 1994-95 and had increased to $ 4,816 for the school year 1996-97.[9] Districts loosing students under the school choice regime would thus immediately suffer a significant decrease in revenues. At the same time, the school choice program offered districts the chance to attract students from elsewhere and thereby to raise their revenues.

Of course, school boards as local authorities in individual districts are rather interested in the impact of school choice on the conditions at local schools than in potential overall effects of increased competition on school productivity. In the following, we will briefly discuss the factors which might have affected the districts' willingness to participate in inter-district open enrollment.

First of all, as enrollment of non-resident students will increase revenues, districts have a fiscal incentive to admit non-resident students at local schools. Of course, this incentive should be stronger for districts experiencing fiscal stress than for districts with abundant revenues. A reason for hesitation in switching to a policy of open enrollment may be limited capacity in local schools. In general, districts with crowded schools will be less willing to allow for the enrollment of transfer students. Furthermore, crowded schools are perceived as less attractive by potential transfer students and, from an ex-ante perspective, decrease the probability that the district will be successful in attracting non-resident students.

Furthermore, the racial composition of school districts as well as the in-

school districts and 57 ISDs.

[9]For details on the school finance reform in Michigan, see Michigan Department of Treasury (2002).

come of an average resident household may have an influence on preferences towards open enrollment. Another factor influencing participation of districts in public school choice may be the districts' location relative to large central cities. Traditionally, suburban school districts have been opposing the idea of inter-district open enrollment (Ryan and Heise 2002). Given their social and economic characteristics, suburban schools are, on average, better than urban schools, and residents in suburban districts tend to perceive inter-district transfers as a threat to the superior quality of local public schools. More generally, the predisposition towards open enrollment may depend on the district's position with regard to some characteristic relative to its geographical neighbors. The point is that, due to transportation to more distant schools being either unavailable or prohibitively costly, school districts will be able to attract students only from nearby districts. The relative attractiveness of each district for non-resident students and the characteristics of transfer students whose application for enrollment in local schools is anticipated will therefore depend on the district's characteristics relative to its neighbors. To capture this, we construct an additional control variable, describing the districts' relative position with respect to the share of minority students. This variable is conveniently defined as the difference between the district's own share of minority students and the mean of this share for all contiguous districts, weighted by district population. Finally, we will also account for the possibility that smaller districts are in general more flexible than larger districts in the adoption of policy innovations.

Based on the preceding discussion, we include as control variables in our empirical specification two dummy variables, one for districts in large or mid-size central cities ($CITY$) and one for suburban school districts (SUB); enrollment (ENR) as a measure for the districts' size; the student-teacher ratio (STR), measuring the capacity for enrollment of transfer students; the share of minority students in local public schools (MST)[10]; the district's rev-

[10] MST is defined as one minus the share of white non-Hispanic students.

enue per student (REV) as a measure for fiscal stress; the median household income (MHI); and the relative position in the share of minority students (R_{MST}).

3 Modelling policy innovation among school districts

As mentioned above, the Michigan open enrollment law requires each school district in each year to announce whether in the following school year it will admit non-resident students at local schools. This is a discrete choice decision problem which is captured in an econometric model using a simple latent variable framework. Suppose that the observable policy decision y_{it} is related to the latent predisposition towards the adoption of open enrollment, y_{it}^*, according to

$$y_{it} = 1[y_{it}^* > 0], \qquad i = 1, \ldots, N \tag{1}$$

where $1[\cdot]$ is the indicator function. Suppose furthermore that i's predisposition towards the adoption of open enrollment in period t is a function of lagged adoption decisions of other districts $\{y_{j,t-1}\}_{j\neq i}^N$, i's lagged own decision $y_{i,t-1}$ and a vector of exogenous characteristics x_{it} where the first element is unity. A linear specification for the latent variable would then be

$$y_{it}^* = \phi \sum_{j\neq i}^{N} \omega_{ij}\, y_{j,t-1} + \lambda\, y_{i,t-1} + x_{it}\beta + u_{it}, \tag{2}$$

where ω_{ij} is the weight assigned to district j by district i, ϕ, λ and β represent coefficients and u_{it} is a well-behaved idiosyncratic error distributed symmetrically about zero. The conditional probability that i adopts open enrollment policies is

$$\Pr\left(y_{it} = 1 \,|\, \{y_{j,t-1}\}_{j=1}^N, x_{it}\right) = \Pr\left(y_{it}^* > 0 \,|\, \{y_{j,t-1}\}_{j=1}^N, x_{it}\right). \tag{3}$$

With an appropriate assumption on the distribution of u, the parameters ϕ, λ and β are identified and average partial effects can be estimated using standard maximum likelihood techniques. Of course, the parameter of primary interest in this specification is ϕ. A non-zero value of ϕ would imply that the attitude towards the adoption of open enrollment as a policy innovation in any given district depends on lagged adoption decisions in other districts.

With respect to the latent variable model displayed in eq. (2), a number of issues must be addressed. First of all, the question arises why strategic interaction among districts should take the specific form assumed here. For instance, in related empirical work drawing on Case (1992), spatial interactions between jurisdictions in the adoption of policy innovations have been verified using an alternative model with y^*_{it} depending on the contemporaneous predisposition towards adoption in other districts (Rincke 2005a). The main argument in favor of the specification in eq. (2) is that, as we will see, adoption decisions are strongly serially correlated and, therefore, the lagged policy of any given district is a good predictor for current policies. Hence, if the true model is one in which districts choose their policies simultaneously and where each district's choice is a function of expected policies elsewhere, our specification will nevertheless capture quite accurately how districts interact with each other. Another attractive feature of the model is that using lagged adoption decisions as independent variables in eq. (2) rules out problems of reverse causation that might be present in other models. Since current own policies cannot affect past policies in other districts, the direction of influence among districts, should any such influence be present, is unambiguous.

A second issue is the choice of the weights ω_{ij}. In general, it is difficult to define appropriate weights since no general criterion for discriminating between competing definitions is available. In our case, however, things should be less complicated than in many other applications. First of all, given the mere number of more than 550 school districts in Michigan, it seems reasonable to assume that decision makers at the district level are able to track conditions for policymaking and actual decisions only in a tiny fraction of all districts. Focusing attention on similarly situated districts will, for most districts, not suffice in order to define a sufficiently small set of reference districts suitable for a close tracking of policies in 'neighboring' districts. Thus, the estimation approach of Hautsch and Klotz (2003), where neighbors are defined in an abstract social space, does not seem to be appropriate for the analysis of policies in a large sample of local jurisdictions.[11] Given these arguments, it seems reasonable to define the weights in eq. (2) according to some measure of geographical proximity. A straightforward way to do this is to define the group of neighbors for each district as the set of contiguous districts. With this definition, the average district has 5.4 neighbors. An alternative is to define groups of neighbors according to the affiliation of districts to Intermediate School Districts (ISDs). As regional educational service agencies, ISDs have substantial influence on local policies, and school district officials can be expected to be much more familiar with general conditions as well as specific policies in school districts belonging to the same ISD. Furthermore, the Michigan open enrollment law in its original formulation allowed transfers of students only within the same ISD. Hence, with respect to open enrollment policies, the ISD level was of particular importance for decision makers in local school districts. Relying on affiliation to ISDs gives 12.0 neighbors for the average district.

Section 4 presents results which have been derived using different weighting schemes. Formally, in each scheme the impact of lagged policy decisions of neighbors in eq. (2) takes the general form

$$\phi \left(\sum_{j \neq i}^{N} d_{ij}\, w_j \right)^{-1} \sum_{j \neq i}^{N} d_{ij}\, w_j\, y_{j,t-1}\,, \tag{4}$$

where d_{ij} is an indicator taking value 1 if j belongs to the set of neighbors of i and zero otherwise, and w_j is a weight for district j among all potential

[11] Using spatial weights defined according to Hautsch and Klotz (2003), no evidence on interaction among districts has been found.

neighbors of i. To construct different weighting schemes, the indicators d_{ij} are either defined to select contiguous districts or districts in the same ISD, whereas w_j is either set to unity, assigning to all neighbors of i the same potential impact on i's decision, or w_j is given by j's population such that larger neighbors have stronger influence than smaller neighbors. Combining both definitions for the indicators d_{ij} with both definitions for w_j gives four different weighting schemes. Note that in all schemes the overall potential influence of neighbors on any given district is normalized.

A potential problem in the identification of horizontal strategic interaction among school districts that we have to address is the impact Intermediate School Districts have on local school district policies. ISDs are higher level authorities in the federal educational system of Michigan, and the vertical impact of ISD policies on local school districts may well lead to spatial correlation in the school districts' behavior towards open enrollment. Suppose, for instance, that ISDs engage in policy coordination among affiliated districts,[12] or that ISD officials have certain preferences towards inter-district school choice and try to affect policies at the local level accordingly. Not accounting for the effect of ISD policies on adoption decisions of local school districts could then lead to false conclusions with respect to horizontal interaction among districts. In section 4 results for estimations are reported where the effect the affiliation to ISDs may have on district policies is controlled by dummy variables for ISDs. Of course, it is not possible to identify any neighborhood influence in these regressions with neighbors being defined according to affiliation to ISDs.

A final point in the discussion of the estimation approach relates to the possibility that the districts' response to lagged decisions of neighbors systematically differs between adopters and non-adopters. More specifically, we

[12]Note that under Michigan law ISDs could run their own ISD-wide school choice programs. Local school districts in these ISDs would then be exempt from the provisions of the statewide program. See Michigan Compiled Laws, Section 388.1705b (effective since June 1997).

will also estimate a model with the latent variable equation being

$$y_{it}^{*} = \phi_1 \sum_{j \neq i}^{N} \omega_{ij}\, y_{i,t-1}\, y_{j,t-1} + \phi_2 \sum_{j \neq i}^{N} \omega_{ij}\, (1 - y_{i,t-1})\, y_{j,t-1} + \lambda\, y_{i,t-1} + x_{it}\beta + u_{it}. \quad (5)$$

For districts which have adopted open enrollment in $t-1$ the second term on the right hand side of eq. (5) equals zero. Hence, ϕ_1 measures the extent to which neighbors' lagged decisions affect current policies. If open enrollment has not been adopted in $t-1$, the first term equals zero, and ϕ_2 measures the neighborhood influence on current policies. A difference between ϕ_1 and ϕ_2 would indicate that it depends on lagged own decisions how districts are affected by policies in neighboring districts.

4 Estimation and results

The empirical analysis is based on data on 522 Unified School Districts in Michigan, but most estimations reported in this section utilize the information from only 504 districts.[13] The analysis focuses on the behavior of school districts in the first two years of the Michigan open enrollment program. Since lagged policies are included in all specifications, the spatial interaction among districts is identified using the cross-section of districts from the second year of the program, 1997.

In the first year, 185 out of 504 districts in the sample allowed for enrollment of non-resident students. In 1997, 59 districts joined and 14 districts left the program. With 230 open enrollment districts, the participation rate in 1997 was 45.6%.

[13]A minority of 30 Michigan school districts runs only elementary schools and is excluded from the sample. Furthermore, inter-district school choice cannot be considered a relevant policy in two Unified School Districts which are islands. To identify influential observations, a linear probability model was estimated using the remaining 522 observations. Based on the approach proposed by Krasker, Kuh, and Welsch (1983), 18 observations were removed. This left 504 districts for the analysis.

Table 1: School choice in Michigan 1997, descriptive statistics

		Participation in 1997	
District characteristics	All districts	Yes	No
Share of participating districts in own ISD, previous year	.370 (.342)	.568 (.329)	.204 (.252)
Own decision in previous year	.367 (.482)	.743 (.438)	.051 (.221)
Central city, *CITY*	.077 (.267)	.083 (.276)	.073 (.261)
Suburb, *SUB*	.327 (.470)	.248 (.433)	.394 (.490)
Enrollment, *ENR*	2.76 (3.28)	2.33 (2.77)	3.12 (3.63)
Student-teacher ratio, *STR*	14.9 (1.85)	14.7 (1.94)	15.2 (1.75)
Share of minority students, *MST*	.088 (.125)	.091 (.128)	.085 (.123)
Revenues per student[a], *REV*	7.11 (1.09)	7.01 (.998)	7.20 (1.16)
Median household income[a], *MHI*	42.5 (11.1)	40.0 (9.63)	44.6 (11.8)
Relative position in share of minority students, R_{MST}	-.039 (.159)	-.019 (.129)	-.056 (.180)
Nob	504	230	274

Sources: Information on participation of districts is from Arsen, Plank, and Sykes (1999); Information used to construct the dummies *CITY* and *SUB* is from the Local Education Agency (School District) and School Universe Survey Longitudinal Data Files of the National Center for Education Statistics (NCES), Common Core of Data (CCD) at http://nces.ed.gov/ccd/ccddata.asp; Data on enrollment, minority students, staff and revenues is from the K-12 database of the Michigan Department of Education, Center for Educational Performance and Information (CEPI) at www.michigan.gov/cepi. Data on median household income is from the School District Demographic System of the National Center for Education Statistics (NCES) at http://www.nces.ed.gov/surveys/sdds/.
[a] In thousands of dollars; Standard deviations in parentheses.

Table 1 provides some descriptive statistics on the explanatory variables, allowing for a first inspection of differences between participating and non-participating districts. First of all, on average participating districts are located in environments where participation is the rule rather than the exception, whereas for districts opting out it is the other way round: adopters are located in ISDs where 57% of all other districts accept transfer students.

For non-participating districts, this share is only 20%. The own lagged decision seems to have a strong influence on current decisions. 74% of participating districts have adopted open enrollment already in 1996, while only 5% of the districts without open enrollment did participate in the previous year. Among participating districts, the share of suburban school districts is significantly lower than among districts which do not accept non-resident students. Participating districts are also smaller and have a lower student-teacher ratio than non-adopters. Furthermore, adopters have lower revenues and a lower median household income. Interestingly, adopters and non-adopters also differ in their relative position with respect to the share of minority students, with the difference showing the expected sign. Non-participating districts on average have a share of minority students which is 6 percentage points below that of their immediate neighbors. This difference is significantly lower (in absolute value) for districts accepting transfer students.

The first step in the analysis is to run two baseline regressions where we completely ignore the potential impact of lagged own decisions and lagged policies of neighbors. The baseline regressions are meant as a first, albeit crude test whether the approach of estimating a discrete choice model for the adoption of open enrollment policies with the given set of control variables is meaningful at all. Table 2 reports the results of a simple probit and a probit with dummy variables for ISDs as additional regressors. In the simple probit model, four out of the eight explanatory variables show coefficients significant at least at the 10% level. The model correctly predicts more than 62% of all decisions. The coefficients of the student-teacher ratio and the revenue variable show the expected sign. Furthermore, the results suggest that districts with lower median household income and with a higher share of minority students relative to their immediate neighbors participate with a higher probability. The estimation with ISD dummies has only 339 observations. The reason is that in 22 out of 57 ISDs all affiliated local school districts either adopt open enrollment, or they all opt out of the program.

Table 2: Adoption of school choice - baseline regressions

Explanatory variables	Simple probit Coeff.	Simple probit Slope[b]	Probit with ISD dummies[a] Coeff.	Probit with ISD dummies[a] Slope[b]
Suburb, *SUB*	.328	.122	.120	.033
	(.270)		(.374)	
Central city, *CITY*	.024	.009	.146	.041
	(.163)		(.257)	
Enrollment, *ENR*	-.029	-.011	-.012	-.003
	(.024)		(.030)	
Student-teacher ratio, *STR*	-.112 **	-.042	-.157 **	-.044
	(.042)		(.058)	
Share of minority students, *MST*	-.350	-.130	-.781	-.217
	(.645)		(.763)	
Revenues per student, *REV*	-.165 **	-.061	-.287 **	-.080
	(.072)		(.098)	
Median household income, *MHI*	-.012 *	-.004	-.013	-.004
	(.007)		(.011)	
Relative position in share of minority students, R_{MST}	.954 **	.356	1.45 **	.405
	(.475)		(.569)	
Nob	504		339	
Log-likelihood	-328.36		-167.41	
Percent correctly predicted	62.3		78.5	
	Actual adoptions			
	Yes	No	Yes	No
Predicted adoptions: Yes	127	87	133	39
Predicted adoptions: No	103	187	34	133

Standard errors in parentheses; [a] Additional regressors: dummy variables for Intermediate School Districts; [b] Average of estimated individual changes in probabilities; ** Significant at the 5% level; * Significant at the 10% level.

With dummy variables for ISDs, these observations have to be removed from the sample in order to avoid the problem of complete separation. The results for the probit with ISD dummies are similar to those of the simple probit, even though the coefficient for the median household income is insignificant and the average partial effects of the student-teacher ratio, revenues and the relative position in the share of minority students are now somewhat higher in absolute value. Furthermore, the model correctly predicts almost 78% of all decisions. Taken together, the results of the baseline regressions suggest that a number of important school district characteristics affecting the adoption of open enrollment as a policy innovation have been identified.

We now turn to estimations of the model with dynamic spatial effects, i.e. with lagged adoption decisions of neighbors as additional explanatory variables. Table 3 displays four sets of results, corresponding to the different weighting schemes discussed in the previous section. The results for all estimations suggest that there is positive neighborhood influence in the adoption of open enrollment policies, and that the impact of lagged adoption decisions of neighbors on current policies is substantial. A one percentage point increase in the share of neighbors participating in the first year of the school choice program increases the current probability of adoption by 0.18% to 0.22%. This implies that a district with a share of innovating neighbors one standard deviation above that of an otherwise identical reference district is between 6.6% and 7.4% more likely to participate. As we expected from the inspection of the descriptive statistics, the own lagged decision is a strong predictor for current participation decisions. Districts which already adopted open enrollment in 1996 are between 40.5% and 41.8% more likely to allow for the transfer of non-residents in 1997 than districts which did not participate in the previous year. In addition, the student-teacher ratio and the revenues per student affect district policies. An additional student per teacher decreases the probability of adoption by 4.0%, while $ 1,000 of additional revenues per student decrease the participation probability by 3.5% to 4.1%. The appropriateness of the model with dynamic spatial effects to explain the districts decisions whether to adopt open enrollment policies is underscored by the fact that about 85% of all decisions are correctly predicted. Furthermore, the choice of the weighting scheme seems to have little impact on the results. This makes us confident that the ad-hoc definition of spatial weights is not a serious problem for the empirical analysis of horizontal interactions among districts as long as the weights select a small number of neighbors based on some measure of geographical proximity.

As the next step in the analysis, a series of smaller models is estimated: a

Table 3: Adoption of school choice - probit estimates with dynamic spatial effects

Definition of neighbors:		Contiguous districts				Districts in same ISD		
		unweighted		weighted by pop.		unweighted		weighted by pop.	
Explanatory variables		Coeff.	Slope[a]	Coeff.	Slope[a]	Coeff.	Slope[a]	Coeff.	Slope[a]
Neighbors' impact, ϕ		1.02 **	.204	.935 **	.188	1.09 **	.217	.917 **	.184
		(.267)		(.247)		(.258)		(.235)	
Own decision in previous year, λ		2.08 **	.418	2.08 **	.418	2.03 **	.405	2.05 **	.413
		(.180)		(.180)		(.182)		(.182)	
Central city, *CITY*		.287	.058	.239	.048	.217	.043	.198	.040
		(.374)		(.377)		(.364)		(.369)	
Suburb, *SUB*		.225	.045	.201	.040	.241	.048	.230	.046
		(.203)		(.203)		(.206)		(.205)	
Enrollment, *ENR*		-.011	-.002	-.012	-.002	-.012	-.002	-.011	-.002
		(.031)		(.031)		(.031)		(.031)	
Student-teacher ratio, *STR*		-.197**	-.040	-.197**	-.040	-.200**	-.040	-.197**	-.040
		(.053)		(.053)		(.054)		(.054)	
Share of minority students, *MST*		-.627	-.126	-.601	-.121	-.481	-.096	-.449	-.090
		(.886)		(.891)		(.872)		(.875)	
Revenues per student, *REV*		-.175*	-.035	-.176*	-.035	-.206**	-.041	-.195**	-.039
		(.091)		(.091)		(.091)		(.091)	
Median household income, *MHI*		-.005	-.001	-.004	-.001	-.003	-.001	-.003	-.001
		(.009)		(.009)		(.009)		(.009)	
Relative position in share of minority students, R_{MST}		.907	.183	.940	.189	.931	.186	.943	.189
		(.638)		(.646)		(.630)		(.633)	
Log-likelihood		-183.67		-183.80		-182.02		-183.40	
Percent correctly predicted		85.5		85.1		85.1		84.7	
		Actual adoptions							
		Yes	No	Yes	No	Yes	No	Yes	No
Predicted adoptions	Yes	175	18	173	18	175	20	174	21
	No	55	256	57	256	55	254	56	253

Nob=504; Standard errors in parentheses; [a] Sample average of estimated individual changes in probabilities; ** Significant at the 5% level; * Significant at the 10% level.

Table 4: Adoption of school choice - probit estimates of smaller models

Explanatory variables	Coeff.	Slope[a]	Coeff.	Slope[a]	Coeff.	Slope[a]
Neighbors' impact [b], ϕ	-	-	.944** (.259)	.202	-	-
Own decision in previous year, λ	2.35** (.166)	.493	2.04** (.176)	.438	2.33** (.159)	.516
Central city, *CITY*	.175 (.356)	.037				
Suburb, *SUB*	.161 (.202)	.034				
Enrollment, *ENR*	-.014 (.031)	-.003				
Student-teacher ratio, *STR*	-.182** (.053)	-.038				
Share of minority students, *MST*	-.469 (.848)	-.098				
Revenues per student, *REV*	-.165* (.090)	-.035				
Median household income, *MHI*	-.006 (.009)	-.001				
Rel. pos. in share of min. stud., R_{MST}	.830 (.614)	.174				
Log-likelihood	-191.02		-195.62		-202.34	
Percent correctly pred.	85.9		85.5		85.5	
	Actual adoptions					
	Yes	No	Yes	No	Yes	No
Predicted adoptions Yes	173	14	171	14	171	14
Predicted adoptions No	57	260	59	260	59	260

Nob=504; Standard errors in parentheses; [a] Sample average of estimated individual changes in probabilities; [b] Definition of neighbors: contiguous districts, unweighted; ** Significant at the 5% level; * Significant at the 10% level.

model without the dynamic spatial effect, a model without explanatory variables other than lagged decisions, and a model predicting current adoption decisions only from lagged own policies. The purpose of estimating these models is to provide additional evidence on the significance of the neighborhood influence on actual policies and the overall fit of the model. The results are displayed in Table 4. The first set of results is for the model with all control variables present but without the dynamic spatial effect. It provides us with the interesting insight that not accounting for the impact of lagged decisions of neighbors on current adoption decisions results in the effects of horizontal interaction among districts being attributed to the district's *own* lagged decision. While the average partial effects for the student-teacher ratio and revenues per student are virtually unchanged, the effect of participation in the previous year on the probability of current participation is now estimated to be about 8% higher than in the full model. In addition, likelihood ratio tests reveal that the increase in the log-likelihood from -191.0 to the levels achieved with the full model (-183.8 to -182.0) is highly significant. Thus, including the neighborhood influence improves the overall fit of the model while removing a strong upward bias from the estimate of the partial effect of lagged own decisions.

The second set of results from Table 4 can be used for a test whether the control variables used in the simple baseline probit estimation do have any effect on the overall fit of the model once the impact of lagged policies is taken into account. Again, a likelihood ratio test reveals that the difference in the log-likelihood compared to the full model is highly significant. Hence, even though the model without explanatory variables other than lagged policy decisions has the same power in predicting actual policies and the partial effects for the lagged policy variables are of similar size as in the full model, not accounting for the effects of the additional control variables removes a significant amount of information from the system. Finally, dropping the spatial effect from the model and predicting current decisions only from lagged own policies again involves a strong upward bias in the partial effect of the lagged own policy. Furthermore, the log-likelihood is again significantly lowered. As a last observation from Table 4, note that the merit of the full model of being able to correctly predict about 85% of all adoption decisions is due to the lagged own decision as the single most powerful predictor of actual adoption decisions.

As mentioned in section 3, a potential problem in the identification of horizontal strategic interaction among school districts is that policies of local school districts are affected by Intermediate School District authorities. To

Table 5: Adoption of school choice - probit estimates with ISD dummies

Definition of neighbors:	Contiguous distr., unweighted		Contiguous distr., weighted by pop.	
Explanatory variables	Coeff.	Slope[a]	Coeff.	Slope[a]
Neighbors' impact, ϕ	1.21**	.202	.955*	.160
	(.579)		(.509)	
Own decision in previous year, λ	2.57**	.429	2.55**	.427
	(.279)		(.276)	
Suburb, SUB	-.038	-.006	-.060	-.010
	(.487)		(.483)	
Central city, $CITY$	.199	.033	.164	.028
	(.317)		(.318)	
Enrollment, ENR	.024	.004	.023	.004
	(.042)		(.041)	
Student-teacher ratio, STR	-.254**	-.042	-.246**	-.041
	(.075)		(.074)	
Share of minority students, MST	-1.28	-.213	-1.32	-.221
	(.970)		(.971)	
Revenues per student, REV	-.281**	-.047	-.273**	-.046
	(.120)		(.120)	
Median household income, MHI	-.006	-.001	-.007	-.001
	(.015)		(.015)	
Relative position in share of minority students, R_{MST}	1.20	.200	1.17	.196
	(.769)		(.780)	
Log-likelihood	-101.99		-102.49	
Percent correctly pred.	87.3		87.6	
	Actual adoptions			
	Yes	No	Yes	No
Predicted adoptions Yes	148	24	148	23
Predicted adoptions No	19	148	19	149

Nob=339; Standard errors in parentheses. Additional regressors: dummy variables for Intermediate School Districts; [a] Sample average of estimated individual changes in probabilities; ** Significant at the 5% level; * Significant at the 10% level.

put it shortly, it could be that the estimated positive coefficient of lagged policies of neighbors is not due to horizontal interaction among local school districts but due to the impact of ISDs on affiliated districts. Table 5 reports results of estimations where the effect of vertical interactions in the educational system on district policies is controlled by dummy variables for ISDs. The first set of results reports parameter estimates and partial effects with neighbors' lagged policies being defined as the unweighted share of adopters among contiguous districts. All partial effects are of similar size as in the model without ISD dummies, although the negative effect of revenues per student is now somewhat more pronounced. Most importantly, the impact of lagged adoption decisions of neighbors is highly significant, with a one percentage point increase in the share of participating neighbors increasing the current probability of adoption by 0.20%. An increase in the share of innovating neighbors by one standard deviation makes current adoption of open enrollment 6% more likely. If neighbors' lagged policies enter the model as the share of adopters among contiguous districts weighted by population, the partial effect is somewhat reduced and the coefficient is significant only at the 10% level. Note, however, that to estimate the model with ISD dummies the sample has to be reduced by 165 observations in order to avoid complete separation, and that 34 dummy variables are included in the model as additional regressors. Taken together, the results from Table 5 confirm the key insights derived so far. Most importantly, the positive partial effect of lagged policies of neighbors on the participation probability of school districts does not seem to be driven by Intermediate School Districts policies towards affiliated districts.

We now turn to asymmetric responses. Table 6 reports results for the model with the districts' predisposition towards adoption of open enrollment given by eq. (5). In the interest of brevity, results for only two weighting schemes are displayed. With neighbors defined as contiguous districts, the hypothesis that previous-year adopters' choice of current policies is not affected by lagged decisions of neighbors cannot be rejected at the 10% significance level. At the same time, the coefficient ϕ_2 is highly significant. The partial effect indicates that previous-year non-adopters are 0.23% more likely to participate in open enrollment if the share of previous-year adopters among neighbors is increased by one percentage point. With neighbors defined as districts in the same ISD (weighted by population), the impact of lagged policies of neighbors on previous-year adopters is weakly significant. The results

Table 6: Adoption of school choice - probit estimates with asymmetric responses

Definition of neighbors:	Contiguous distr., unweighted		Districts in same ISD, weighted by pop.	
Explanatory variables	Coeff.	Slope[a]	Coeff.	Slope[a]
Neighbors' impact on previous-year adopters, ϕ_1	.705 (.466)	.141	.763* (.408)	.153
Neighbors' impact on previous-year non-adopters, ϕ_2	1.17** (.327)	.234	.992** (.286)	.199
Own decision in previous year, λ	2.27** (.308)	.456	2.15** (.278)	.431
Suburb, *SUB*	.304 (.373)	.061	.205 (.367)	.041
Central city, *CITY*	.228 (.204)	.046	.228 (.205)	.046
Enrollment, *ENR*	-.011 (.031)	-.002	-.011 (.031)	-.002
Student-teacher ratio, *STR*	-.201** (.054)	-.040	-.198** (.054)	-.040
Share of minority students, *MST*	-.609 (.883)	-.122	-.419 (.876)	-.084
Revenues per student, *REV*	-.184** (.092)	-.037	-.199** (.092)	-.040
Median household income, *MHI*	-.006 (.009)	-.001	-.003 (.009)	-.001
Relative position in share of minority students, R_{MST}	.893 (.641)	.179	.931 (.634)	.187
Log-likelihood	-183.35		-183.30	
Percent correctly pred.	85.7		84.9	
	Actual adoptions			
	Yes	No	Yes	No
Predicted adoptions Yes	176	18	175	21
Predicted adoptions No	54	256	55	253

Nob=504; Standard errors in parentheses; [a] Sample average of estimated individual changes in probabilities; ** Significant at the 5% level; * Significant at the 10% level.

suggest that a one percentage point increase in the share of innovating neighbors increases the probability of participation among previous-year adopters by 0.15%, while raising the participation probability among previous-year non-adopters by 0.20%. Note, however, that the difference in the estimates for ϕ_1 and ϕ_2 is not significant at conventional levels. Thus, while the neighborhood influence on previous-year non-adopters is highly significant across all weighting schemes[14], the evidence on previous-year adopters being affected by lagged policies of neighbors is mixed.

Taken together, these results suggest that school districts which did not participate in the first year of Michigan's inter-district school choice program were 'pulled' to participation in the second year by previous-year adopters in their geographical environment. First-year adopters seem to have been confirmed in their choice by participation of neighbors, but this effect is not robust across the various specifications for spatial weights.

5 Conclusion

This paper sheds light on the participation of school districts in the early phase of Michigan's public school choice program launched in 1996. Together with a school finance scheme paying school districts a fixed amount of state aid per student, the program did increase competition between school districts. Participation of school districts in the program can therefore be considered an important policy innovation in a decentralized public sector.

The empirical results presented in this paper show that in their attitude towards the adoption of school choice, the Michigan school districts have been heavily affected by lagged adoption decisions of neighboring districts. Across various specifications, a one percentage point increase in the share of previous-year adopters among neighbors is estimated to increase the current probability of adoption by about 0.2%. There is also evidence for asymmetric responses among districts, with non-adopters being 'pulled' to participation by previous-year adopters in their geographical environment. Furthermore, the paper accounts for the impact of Intermediate School Districts as higher level authorities in the educational system on school district policies. This is important, since not accounting for this impact could lead to false conclusions

[14]Results for the other weighting schemes closely resemble those displayed as the second specification in Table 6.

on the existence of neighborhood influence among districts. Taken together, the evidence provided in this paper suggests that in the analysis of the diffusion of policy innovations among local jurisdictions it is crucial to take into account strategic interaction between the jurisdictions' governments.

Evidence on neighborhood influence among local jurisdictions clearly supports the view that in a decentralized public sector jurisdictions interact with each other in the choice of policy instruments. Moreover, with respect to the adoption of policy innovations, evidence on positive neighborhood influence suggests that in federal systems the diffusion of new political technologies is stimulated by horizontal interactions between jurisdictions, whereas the hypothesis that local policy innovation is hampered by an incentive for decision makers to free-ride on experimentation activities in other jurisdictions is clearly rejected. The analysis provided in this paper thus extends and substantiates the results derived in Rincke (2005a).

Still, there are many open questions with respect to decentralized decision making and policy experimenting. For instance, this paper focuses on the early phase of experimentation with a new policy among local jurisdictions. In future empirical work, it will certainly be worthwhile to investigate the diffusion of policy innovations in panels of local jurisdictions with stronger emphasis on long-run effects of horizontal interactions.

References

Arsen, D., D. Plank, and G. Sykes (1999): *School Choice Policies in Michigan: The Rules Matter.* Michigan State University, East Lansing.

Berry, F. S., and W. D. Berry (1999): "Innovation and Diffusion Models in Policy Research," in *Theories of the Policy Process*, ed. by P. A. Sabatier, pp. 169–200. Westview Press, Boulder, Colorado.

Besley, T., and A. Case (1995): "Incumbent Behavior: Vote-Seeking, Tax-Setting, and Yardstick Competition," *The Amercian Economic Review*, 85(1), 25–45.

Brueckner, J. K. (1998): "Testing for Strategic Interaction Among Local Governments: The Case of Growth Controls," *Journal of Urban Economics*, 44(3), 438–467.

——— (2003): "Strategic Interaction Among Governments: An Overview of Empirical Studies," *International Regional Science Review*, 26, 175–188.

Case, A. (1992): "Neighborhood Influence and Technological Change," *Regional Science and Urban Economics*, 22, 491–508.

Fredriksson, P. G., and D. L. Millimet (2002): "Strategic Interaction and the Determination of Environmental Policy Across U.S. States," *Journal of Urban Economics*, 51(1), 101–122.

Gale, D. (1996): "What Have We Learned from Social Learning?," *European Economic Review*, 40, 617–628.

Hautsch, N., and S. Klotz (2003): "Estimating the Neighborhood Influence on Decision Makers: Theory and an Application on the Analysis of Innovation Decisions," *Journal of Economic Behavior and Organization*, 52, 97–113.

Hirshleifer, D., and S. H. Teoh (2003): "Herd Behavior and Cascading in Capital Markets: A Review and Synthesis," *European Financial Management*, 9(1), 25–66.

Hoxby, C. M. (2000): "Does Competition Among Public Schools Benefit Students and Taxpayers?," *The American Economic Review*, 90, 1209–1238.

——— (2003): "School Choice and School Productivity (Or, Could School

Choice Be a Rising Tide That Lifts All Boats?)," in *The Economics of School Choice*, ed. by C. M. Hoxby. Chicago: University of Chicago Press.

Kollman, K., J. H. Miller, and S. E. Page (2000): "Decentralization and the Search for Policy Solutions," *The Journal of Law, Economics, and Organization*, 16, 102–128.

Kotsogiannis, C., and R. Schwager (2004): "Policy Innovation in Federal Systems," Mimeo, University of Exeter.

Krasker, W. S., E. Kuh, and R. E. Welsch (1983): "Estimation for Dirty Data and Flawed Models," in *Handbook of Econometrics, Volume I*, ed. by Z. Griliches, and M. D. Intriligator, pp. 651–698. North-Holland Publishing Company, New York.

Michigan Department of Treasury (2002): *School Finance Reform in Michigan. Proposal A: Retrospective.* Office of Revenue and Tax Analysis.

Oates, W. E. (1999): "An Essay on Fiscal Federalism," *Journal of Economic Literature*, 37, 1120–1149.

Rincke, J. (2005a): "Policy Innovation in Local Jurisdictions: Testing the Neighborhood Influence Against the Free-Riding Hypothesis," ZEW Discussion Paper 05-08.

——— (2005b): "Yardstick Competition and Policy Innovation," ZEW Discussion Paper 05-11.

Rose-Ackerman, S. (1980): "Risk Taking and Reelection: Does Federalism Promote Innovation?," *Journal of Legal Studies*, 9, 953–612.

Ryan, J. E., and M. Heise (2002): "The Political Economy of School Choice," *The Yale Law Journal*, 111, 2043–2136.

Strumpf, K. S. (2002): "Does Government Decentralization Increase Policy Innovation?," *Journal of Public Economic Theory*, 4(2), 207–241.

WALKER, J. L. (1969): "The Diffusion of Innovations Among the American States," *The American Political Science Review*, 63(3), 880–899.