Intergovernmental transfers and the political competition in Hungary

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Abstract

I test the effect of political competition on the allocation of intergovernmental transfers to Hungarian municipalities in the period between 1998-2006. The intergovernmental transfers were intended to finance schooling, care for elderly and administrative tasks in municipalities. Using pivotal probabilities at municipality level as proxies for political competition, I test the presence of politically motivated targeting in the amount of money allocated through this system. I find evidence of targeting swing municipalities in case of villages, which covers almost one third of the regional electorate. The magnitude is important too, the transfer difference between the politically most competitive and least competitive villages is equivalent to a transfer difference implied by 2.61-6.65 percentage points difference in the proportion of primary school pupils.

Keywords: grants, intergovernmental relations, political economy, Hungary
JEL: H72, H77, D78

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1. Introduction

In this study I analyse whether the allocation of intergovernmental transfers[1] was politically motivated in Hungary between 1999 and 2006. The transfers were determined by the yearly budget law, approved by the Hungarian Parliament. In principle objective factors should have played a role in the amount of intergovernmental transfers received by each municipality. However, according to the probabilistic voting model, municipalities where the political competition is intense should receive more support. The politicians try to win the electorate by allocating more money to crucial constituencies, where the outcome of the elections is ambiguous. Municipalities that tend to change political preferences often called swing municipalities.

So far in empirical studies the theoretical predictions were either confirmed or refused. In my analysis I use Hungarian municipality data to estimate effect of the political competition. To better identify the undergoing political dynamics I use pivotal probabilities to proxy for swing voters. Pivotal probability is the probability that a voter's vote would change the outcome of the election. In tighter elections this probability is supposed to be high, as it is more probable that only one vote decide the final outcome.

In my results, I found significant effects of political competition on the size of intergovernmental transfers, the sign of the coefficient is in line with the predictions of the probabilistic voting model. The sign is positive and the effects are large relative to other factors such as schooling. However, the effect is only significantly different from 0 in case of villages. In overall around 35% of the regional electorate is concerned by political targeting, Budapest is left out from the analysis due to data limitations.

2. Literature review

The theory of probabilistic voting model roots back to the 1980s'. First, Lindbeck and Weibull (1987) analysed the balanced-budget redistribution between voter groups as the result of a two-party competition. Their main conclusion, that swing voters get the most transfers, was extended to a general framework by Dixit and Londregan (1996) and by Dixit and Londregan

[1] In Hungarian the transfer items of our interest are called normative supports, but to avoid ambiguity I call it intergovernmental transfers. Throughout the study when intergovernmental transfers are mentioned, strictly speaking I mean these normative supports.

(1998).

Dixit and Londregan (1996) article analyses the competing theories of *swing voter theory* and *machine politics*. In the first theory the parties target hesitating voters to win elections. As politicians cannot perfectly target their supporting group, they provide general supports to constituencies. On the other hand, the machine politics' parties favour only their loyal supporters. The crucial assumption in the latter theory that parties can perfectly detect their supporters, thus they can favour them.

In a follow up model of swing voter theory, Dixit and Londregan (1998) analyse the trade-off between pork-barrel politics and ideological convictions. They set up a model where parties and voters do not only care about votes and consumption level, but they have preferences on income equality too. Their main conclusion is that parties try to appeal to swing voters, and they get their support by adopting pork-barrel projects. So the more voters in a group are inclined to vote for the rival party, the more transfers are promised for this group.

At the same many empirical studies were conducted to find out the effects of politics on inter-governmental transfers. The first was Wallis (1998) who was testing on New Deal spending data that allocating grants on social and other programs were politically motivated. He conclusion was ambigious: both economical and political reasons played a role in the spending decisions. Moreover, his empirical analyses had ambiguous results too, as his estimates were very sensitive to variable definitions, to scaling, moreover the identification strategy made it difficult to disentangle the political effects from econonomical effects.

One of the first study testing the probabilistic voting model was done by Case (2000). She investigated the distribution of block grants in the 1990s Albania. Besides using the closeness of the last election as proxy for election tightness, she used surveys with mayors and with social assistance administrators to measure the intensity of political competition. She found a positive relationship between the size of the grants and political leanings of the commune.

Johansson (2003) proceeded in this direction on Swedish municipality panel data. She used surveys as well to measure partisanship and the extent of possibility of changing the political alignment in each municipality. She found a positive relationship between the extent of *swingness* and the size of government grants allocated to the communes too. In Dahlberg and Johansson (2002), using the same identification strategy for political competition, analyses an ecological grant program introduced in Sweden, before the 1998 election. Their analyses confirm the same results, so the incumbent government used the grants to get support in swing municipalities. More recently Banful (2011) analysed the case of Ghana and found positive relationship between swing and politically motivated targeting of intergovernmental transfer.

All these studies found a positive relationship between swing municipalities and transfer size. However, in the case of the USA Larcinese et al. (2013) did not find significant relationship between the size of indifferent voters in a region and the transfers targeted to the area. The authors used exit polls conducted by different news organization to measure the partisanship of the regions. Their results are partly in contradiction with Levitt and James M. Snyder (1995) findings, who found that Democratic vote share was a good predictor of federal dollars directed to a district. Still, their main conclusion was that voter types are targeted and not districts. Meaning that swing voters could be still targeted, but politicians do not use district specific transfers to reach them, but more general means.

Strömberg (2004) and Strömberg (2008) did research on related topics. In Strömberg (2004) the author addressed a different question, he measured the effect of the voters' information access on federal spending distribution, but as a control he needed the tightness of the elections, or in other words whether districts were considered inclined to swing. He used the standard deviation of vote share from previous elections as a proxy for swing voters, and the effect was not signficant. Strömberg (2008), when assessing the campaign efforts of presidential candidates in the US, used the theoretical setting of a probabilistic voting model and surveys as well, to measure political leanings. He found a positive relationship between presidential candidates campaign visits and the tightness of political support.

As we can see political targeting is present in many countries, but the means are different. It mainly depends on how the politicians can reach the voters e.g. through general transfers or region specific grants etc. In all this cases, the institutional setting limited the possibility to measure partisanship, so the authors used surveys to get a better estimate of voters' partisanship. Or they simply used past election results to proxy the intensity of political competition in each municipality. However, my claim is that the Hungarian election system allows to better identify the party preferences, so we can get a better proxy for political preferences from the election data. Moreover by measuring the political competition by pivotal probabilities, a new proxy for political competition, I can verify if the political competition has an effect on the size of intergovernmental transfers.

3. The theoretical model

3.1. The probabilistic voting model

I use the Dixit and Londregan (1996) theoretical model, I present the Johansson (2003) version of the model. There are two competing parties, the left (L) and the right (R), both want to maximise their votes and they keep their election promises. To be credible the budget must be balanced, so the transfers between the municipalities net out.

The voters have an ideological preference, but the transfers they receive play an important role in their vote. The utility function that describes voter i's choice in municipality j, her preference of party L over party R, is the following

$$U(Y_j + T_j^R) - U(Y_j + T_j^L) > X_i$$

Where Y_j is the income, T_j^L is transfer promised by L in municipality j. X_i is the ideological preference of voter i. So in the utility function it is the parties' promised consumption level play a crucial role e.g. $C_j^R = Y_j + T_j^R$

Hence the voter share for party O in municipality j:

$$\sigma_j(U(Y_j + T_j^R) - U(Y_j + T_j^L))$$

Now, we can write the problem of the parties. The politicians have to decide how to choose election promises to maximise there overall vote share: M. For example the opposition party's problem is, where the expected number of voters ($\mathbb{E}(N_j)$) equals λ_j[1]:

$$\max_{T_1^R, T_2^R, \ldots, T_j^R} M^R = \sum_j \lambda_j \sigma_j (U(\underbrace{Y_j + T_j^R}_{C_j^R}) - U(\underbrace{Y_j + T_j^L}_{C_j^L}))$$

[1] In the original model instead of expectations the number of voters in each region is used. However, one can consider the case where the population size, so the number of voter who turn up, is a random variable following a Poisson-distribution. In that case its expected value is λ.

s.t.

$$\sum_j \lambda_j T_j^R = 0 \ \ (\mu)$$

FOC:

$$\sigma'_j(U(C_j^R) - U(C_j^L))U_c(C_j^R) - \mu = 0$$

The second order constraints are assumed to be fulfilled, so we have an unique symmetric Nash-equilibrium. By the implicit function theorem and knowing that we are in a symmetric Nast-equilibrium we can get at the cutpoints different testable implications. The most important one is that $\frac{dT_j}{d\sigma'_j(0)} > 0$ which implies that if the model is valid, we should find a positive correlation between transfers and the first derivative of the voter share function. Thus, *ceteris paribus* large transfers are expected in municipalities where the derivative is high.

Interpreting the derivative is not straightforward. In Dixit and Londregan (1996) σ_j is considered a cumulative distributive function, thus the first derivative is the probability density function. A high value of the derivative means that the density is high, however to measure the density is difficult. In empirical studies the closeness proxy is used instead. Researchers use the absolute difference between the two blocks to measure how high the density is. Using closeness implicitly assumes that the closer is the election, the higher is the value of the density function. This a strong limitation, but as it is hard to find a better measure it has been common to use the closeness proxy. One exception was Johansson (2003), where using the Swedish surveys she could calculate the density itself. In Sweden the political surveys are produced on a relatively low level of the administration, so it was possible to get the political preferences at constituency level and estimate constituency-specific cumulative distribution functions. And finally by using the vote share the author was able to get the densities at municipality level. Even though by doing so the theoretical model is directly estimated, having detailed surveys is crucial for this exercise. In my study I offer another measure, the pivotal probabilities calculated. These probabilities calculated based on the party share and on the number of people who went to vote. The closeness measure takes into account only the party shares, but not the number of people who voted, thus the pivotal probability is a refinement of the closeness proxy. Opposed to the closeness proxy, higher pivotal probability means higher competition.

3.2. The pivotal probabilities

In previous studies the competition was either measured by the closeness between dominant political parties or by a survey based measure of political swing. In this study I use pivotal probabilities to proxy political swing. The pivotal probability is a proxy for political competition and it does not originate from an other optimisation problem than the probabilistic voting model. It follows the line of the closeness proxy as it offers a possibility to measure the political competition even when survey data is not available. Changing political alignment is related to fact if there are many swing voters or just the competition is fierce among dominant political powers. In a competitive environment every vote is more crucial, as it can turn out to be pivotal. Using Myerson (2000) calculations, so assuming a Poisson distribution of participation and two parties of competing, we can derive the following pivotal probability.

$$P = \frac{e^{n(2\sqrt{\sigma_L \sigma_R} - \sigma_L - \sigma_R)}}{4\sqrt{\pi n (\sigma_L \sigma_R)^{1/2}}} \frac{\sqrt{\sigma_L} + \sqrt{\sigma_R}}{\sqrt{\sigma_L}}$$

Where σ_L is party L's probability of winning in the constituency, and σ_R is the probability of party R's win, n is the number of voters who eventually turn up at the election. The best method to calculate these probabilities would be using *predicted winning probabilities* and *predicted number of voters*. So in that case we would use *ex ante* pivotal probabilities which is more in line with the probabilistic voting model's assumption. However, I calculate the *ex post* pivotal probabilities from election data. Estimating the *ex ante* pivotal probabilities would be a further extension of empirical exercise.

4. Background information on the Hungarian institutional setting

For testing the probabilistic voting model we need a system where transfers are comparable, where we have 2 dominant parties and where the votes reflect political preferences, there is no strategic voting. In case of Hungary all these three criteria were meet in the period between 1990 and 2010. First, I describe the Hungarian election system and what kind of votes I use in the empirical exercise. After I describe the Hungarian municipality financing system.

4.1. The Hungarian election system

In Hungary[1], between 1990 and 2010 was a multi-party system with coalition governments. The government had three different levels: the central level, the counties and the county level towns[2] and finally the municipality level. The last level was responsible for schooling, health and social services, guaranteeing drinking water, street lighting and local roads. At county level we could find the duties overtaken from the local level. In the following I describe the Hungarian election system's most important rules and what kind of votes I will use in the empirical exercise later.

The election system was more or less the same between 1990-2010, there were only important changes in 1994. Even though the political landscape changed several times, from 1998 till 2010 the two dominant parties did not change: on the right Fidesz[3] and on the left the MSZP[4] had the major support. The parliamentary elections were held mainly in April or in May, in general two rounds took place and the voters had two votes. One vote could be cast to a district candidate, and the other one on a county level party list. In the mandate allocating system the compensating mechanism was strong, so even if the votes were cast for a loosing candidate, they were taken into account in the mandate allocation. This strong compensating mechanism allows us to ignore the possibility on insincere voting strategies and to use the parliamentary election votes as a revelation of political preferences of the electorate.

In the parliamentary elections 386 mandates were distributed[5]. A parliamentary mandate could be won either in election district or through the party lists. The party list system functioned in a complicated way. 176 mandates were allocated in 176 election districts. Maximum 152 mandates were given through county and capital level party lists. Through the country level - or compensation - party list maximum 58 more mandates were allocated. The exact way and number of distributed mandates depended on the votes, so the composition of mandates distributed through the county and the coun-

[1]This part is mainly based on Körösényi et al. (2003) and on Berta (2006)

[2]Budapest and its districts have a special status.

[3]Alliance of Young Democrats

[4]Hungarian Socialist Party

[5]This part is based on The Act XXXIV. on the election of the members of Parliament, 1989 and on the Act's interpretation in Berta (2006)

try level list was only known *ex post* the elections. However, the maximum amount of mandates given through party lists were 176. To set up a county or a country level list was restrictive[1].

The parliamentary elections had two rounds. In the first round if more than 50 % of the electorate participated, the round was considered valid. If one of the candidates had the absolute majority, so more than 50 % of the votes, then the round was conclusive and the candidate got the mandate. In lack of absolute majority all the candidates who received at least 15 % of the votes qualified for the second round, but at least 3 candidates. In the second round, the validity constraint was lower, only a 25 % participation rate. There is no constraint for conclusive result, the candidate who got the most votes, received the mandate. A very important feature of the system that first rounds' votes of the loosing candidates were reused in another part of the election system. This votes were called *fragmentary votes* and they belonged to the party that nominated the candidate. They were only calculated in the first round.

After casting the vote on a candidate, the voters had to cast to their vote on party from the county list. On the county list the parties got the mandates in proportion of their votes[2], at county level. Votes that did not result in a mandate on the county level list were classified to be fragmentary votes too[3].

The fragmentary votes were coming from two sources. On one hand, all

[1]County level lists could only be made by parties, and in each county in minimum 25 % of districts the party should have had a candidate or at least in 2 districts. To be allowed to have a country level list, the party should have had at least 7 county lists. A candidate could run for a seat at one district, at one county list and at one country level list. If the candidate had won a mandate in a district, she would have been taken off the county level list. If she had won a mandate in a county level list, she would have been taken off the country level list.

[2]Here the Hagenbach-Bischoff formula was used (pp 244 Körösényi et al. (2003)). According to this the total number of votes should have been divided by the available mandates at the county plus one, this gave the number of necessary votes to win a mandate. If there were remaining mandates after this allocation, the next highest number of votes could result in a mandate (minimum 2/3 of the necessary votes). If there were still remaining mandates, then those were allocated in the country level list. In that case the fragmentary votes should have been subtracted from the votes on the county level list

[3]There was a participation constraint too. Each party should have received at least 5% of the votes cast on the county level lists and of the country level aggregated votes.

votes cast for the losing district candidates and on the other hand all the votes that not resulted in a mandate on the county list. All these votes were aggregated on the country level list. It is important to emphasize that in case of step back, the votes remained at the party list. Moreover, fragmentary votes were considered to be the vote of the party. It did not matter that they were coming from the loosing district candidate or from the county level list. All the fragmentary votes were used on the country level list to allocate the remaining mandates.[1]

As we can see the system was complicated[2], the flowchart of the election system demonstrates the mandate allocation process (Figure 1). The most important aspect: fragmentary votes the compensation mechanism was very strong in every election. The district candidates could attire many votes because of their idiosyncratic characteristics. So even though their fragmentary votes were their parties' votes, those are not considered purely as preference for certain party. However, the county level votes either resulted in a mandate for the preferred party at the county or at the country level list. Thus, a strong incentive was present to vote sincerely. The fact that votes cast to loosing candidates does not mean that the vote is not taken into account, allows us to better identify the electorate's preferences. In my empirical analysis I use this county list votes (the grey boxes at Figure 1) to calculate pivotal probabilities, because of the strong compensation mechanism allows me to identify political preferences.

4.2. The financial resources of the Hungarian municipalities

After the democratic transformation of Hungary in 1990, the role of municipalities and their financing changed too. Though municipalities became

[1]The d'Hondt method was used to allocate the mandates (pp 256 Körösényi et al. (2003)). This meant that a matrix was calculated, in each column we found the votes of each country level parties. The first row includes all the fragmentary votes, the second row the half of the fragmentary votes, the third row the third of the votes and so on. Once the matrix is prepared this way, then the highest number should have been found, and the party with those vote received a mandate. Then the second highest number in the matrix should have been found, and then that party received a mandate. The procedure was done till all the mandates were allocated - always the highest number of votes resulted in a mandate.

[2]The system was designed at the end of Communist dictatorship. So many political aspects were taken into account at the same time, that is why the system became complicated.

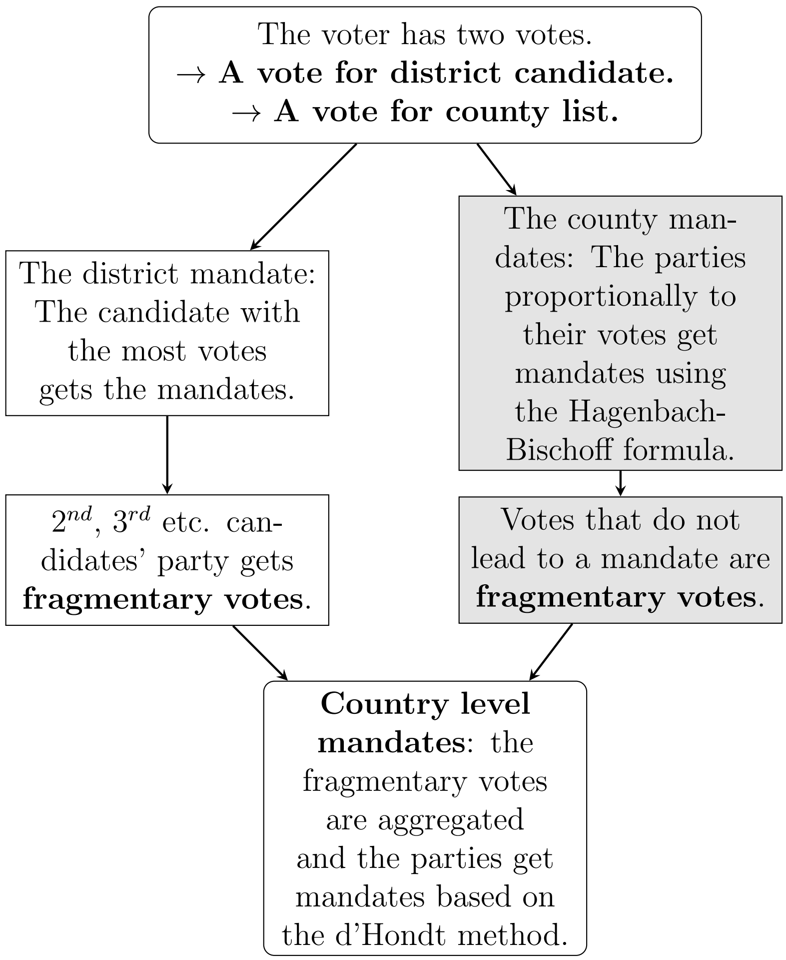


Figure 1: Flowchart of the Hungarian parliamentary election system

responsible for 3700 activities Darázs (2008), the most important responsibilities were schooling, health and social services, and guaranteeing drinking water, street lighting, local roads. Moreover some duties were overtaken from the local level to the county level.

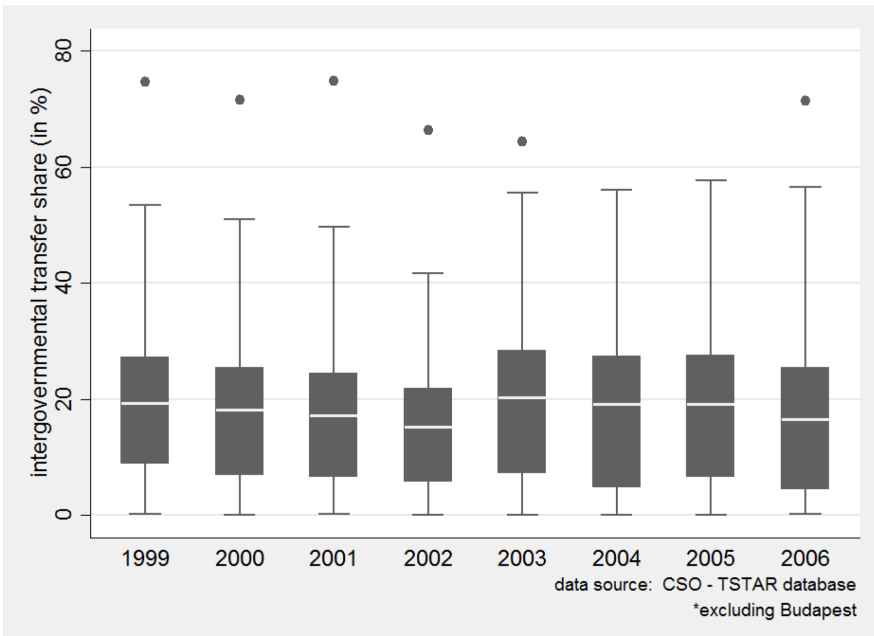
A part from the responsibilities a diverse municipality financing system was set up. The most important items of their revenues are their own current income, then the ceded revenue and the intergovernmental transfers. In this study I analyse the development of a specific intergovernmental transfer[1] whose level is determined based on a different indices. The legal framework of determining this item's level was set in the Act LXV. on local municipalities in 1990. The general regulation stated that the allocation rule must be based on the municipalities' size, the number of inhabitants, the share of different age groups in the total population and finally the number of transfer recipients. The detailed regulation and allocation mechanism was defined in Hungary's budget law. One chapter was dedicated to municipality financing in the yearly budget, specifying how much money was allocated to different goals. In general, the budget was approved by the Parliament in November-December. The municipality financing constituted an important share of the Hungarian economy, municipalities total revenues add up 8.2-9.1% of the GDP between 2003 and 2010. Though the municipalities have other important revenues, the size of the intergovernmental transfers is important as it took 1.5-2% of the GDP during the same period(see Figure A.4 in Appendix A). As we can see the amount on money transferred though the intergovernmental transfers system is important. However, to understand the importance of intergovernmental transfers we should see its relative size compared to total revenues. In Figure 2 we can see the proportion of intergovernmental transfers relative to municipalities' total revenue[2]. The median share was between 15.23% and 20.3%, thus generally in municipalities financing it plays an important role, but most of their revenue comes

[1]In Hungarian the transfer items are called normative supports, but I call it intergovernmental transfers. In this study intergovernmental transfers only cover normative supports.

[2]I use the Government Finance Statistics (GFS) definition by the IMF: the transfers from the national budget, the transfers from outside the national budget and the previously allocated loans payback, temporarily taken liquid assets. Aggregating all these we get the GFS structured income. Corrected by the loans, bonds, government bond incomes, we can derive the total income of the municipality.

from other sources[1]

To sum up, the size of the intergovernmental transfers is important, but still it is not the predominant factor of municipalities revenues. However, this is the only item that shows up in each municipalities balanced sheet and whose size is determined solely by the Parliament.



Explanation of the graph's lines from the bottom to the top and of the signs: lower adjacent value, 25^{th} percentile, median, 75^{th} percentile, upper adjacent value, the dark part interquartile range and the dots are outliers.

Figure 2: Boxplots of the intergovernmental transfers share in municipalities' total revenues, 1999-2006

[1]The municipalities total current revenues consist of their own current revenue, which includes the VAT income, different fees and local taxes (including business tax), then the ceded revenue, which contains a part of the personal income tax, the tax on cars, the third is the accumulation and capital revenues. The forth resource, which is in the interest of this study, is the state contribution and supports which contains the normative supports and other targeted supports. In this study I call these normative supports as intergovernmental transfers.

5. The data

5.1. The municipalities

Budapest is not included in the dataset, but because of it is special legal status the capital should have been analysed differently. By leaving out Budapest and some other municipalities I still have a large dataset, my results are mainly valid in case of villages. So it concerns more than one third of the Hungarian population. The vote share of villages is line with their population share (see Table 1).

Table 1: Demographics of municipalities

	villages	cities
1998 election		
population share (in %)	38.1	61.9
vote share (in %)	35.9	64.1
number of obs.	2825	305
2002 election		
population share (in %)	38.4	61.6
vote share (in %)	36.2	63.8
number of obs.	2825	305

Excluding Budapest.

5.2. The descriptive statistics of intergovernmental transfers and control variables

The CSO-TSTAR dataset contains the municipalities balance sheet items from 2002 till 2011, and many characteristics from 1990 till 2011. No data is available on Budapest and on intergovernmental transfers before 2002. However, I use for the period between 1998-2002 the PIT, the intergovernmental transfers and GFS structured revenues from the TEIR dataset. But after the 2002 I use the CSO-TSTAR. Some control variables were missing for year 2000, in those cases I plugged in the 1999 values. The Hungarian budget laws enlisted every item that provided claims for the intergovernmental transfers, so for choosing the control variables I used the text of the law as benchmark. As I do not have exactly the same items in my dataset I tried to find variables that approximate the listed items.I started my analysis with the variables that are explicitly mentioned in budget laws and I added some other control variables too for the period of 1999-2006. I use the tax base per capita, the population share of different age cohorts, the are of the municipalities, the population density. However, in the econometric analyses not all of them are significant. Therefore, the most relevant variables and their descriptive statistics could be found in Table A.8. Even though there is variation in the sample, it is mostly between municipalities and not in time. The box plots in Appendix A Figure A.5 shows that the distribution of each variable does not change much from one year to the next. However, this is understandable as most of these variables are related to demographics. An important aspect that the control variables' variation in time is lower than the intergovernmental transfers' variation.

5.3. The election dynamics

I use the election data from the National Election Office, but because of data limitations only the 1994, 1998 and the 2002 election results are included in this analysis. The probabilistic voting model assumes two blocks and for calculating the pivotal probabilities we need two blocks too. In Hungary, even though there were many parties, we can identify two blocks. A leftist and a rightist block, to determine the member parties of each block I used coalitions formed in government. There were parties who changed their political orientation or allies. But no party formed government with different allies in the government. In Table 2 we can see that creating the block this way most votes cast in the election are covered. The same phenomenon is shown at municipality level on Figure 3a and Figure 3b. In most municipalities the electorate voted for parties that made it to the parliament.

Table 2: Creating left and right blocks

election year	Left		Right		Total vote share
	parties	average vote share	parties	average vote share	
1994*	MSZP, SZDSZ ASZ	48.13	Fidesz, FKGP MDF, KDNP	42.00	89.55
1998	MSZP, SZDSZ	35.31	Fidesz, FKGP MDF	50.05	85.79
2002	MSZP, SZDSZ	40.57	Fidesz	49.56	89.53

*The 1994 elections are only used in the robustness check.

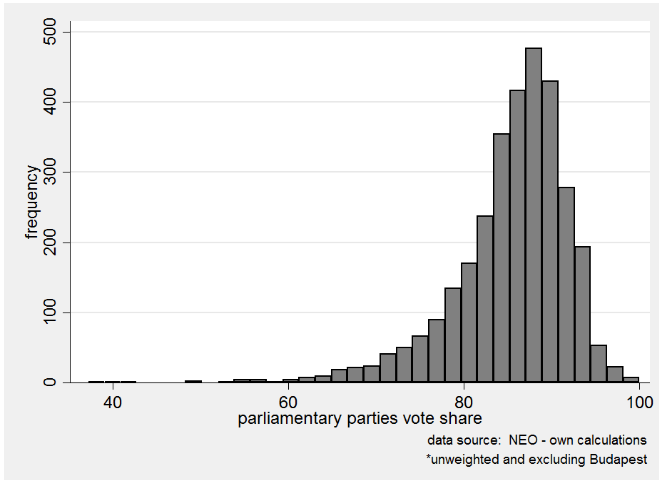
The 1998 and 2002 elections were different. We can see that the turnout, increased from 1998 to 2002. In Appendix A , in Table A.9 we can observe that the turnout rate on average was 67.66%, more than 10 percentage point higher compared to 1998. Moreover the average closeness between the opposition and the government parties was high, almost 20 percentage points. The standard deviation is high too. Intuitively I consider these as the signs of polarization of the political scene in Hungary. The descriptive statistics of original closeness between the left and the right does not change much by using the closeness based only on parliamentary votes. I calculated closeness between blocks as if the votes cast on non-parliamentary parties did not exist.

To measure the political competition I calculate pivotal probabilities for each municipality using the left and right blocks. The pivotal probability shows the probability of being pivotal between the two major parties at the election. The size of the pivotal probability depends on the number of voters and on the relative vote share of the two blocks. Even though the parliamentary parties were covering a large share of the total votes, not all of them. However, taking into account only the parliamentary parties vote share does not distort the election results from the original results. By looking at the correlation table of the political variables in Table 3 and in Table 4 we can observe that the correlation between the original closeness and the newly calculated closeness is almost 1 in both elections.

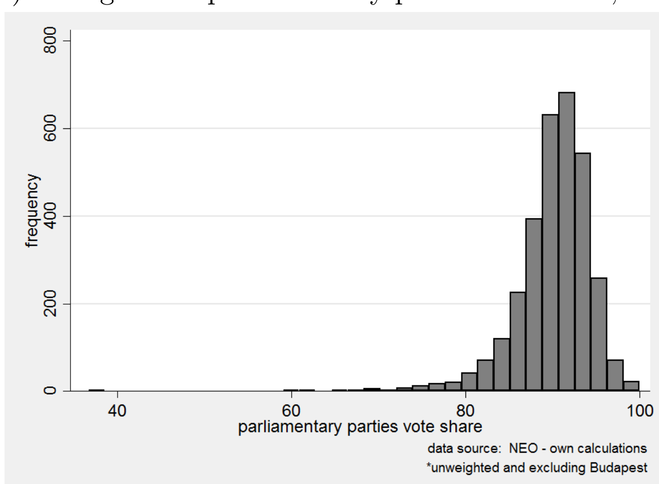
Table 3: Correlation table of political variables, 1998

	Turnout	Close.	Number of voters	Left's share	Pivotal pr.	Close. (pr)
Turnout	1.000					
Close.	0.227	1.000				
Number of voters	-0.006	-0.130	1.000			
Left's share	-0.173	-0.676	0.098	1.000		
Pivotal pr.	0.099	-0.443	-0.093	0.277	1.000	
Close.(pr)	0.234	0.990	-0.133	-0.705	-0.447	1.000

By further analysing the correlation tables, we can observe that the larger the closeness between the parties, the higher is the turnout rate in the election. While between the left's share and the turnout rate the correlation



(a) Histogram of parliamentary parties voteshare, 1998



(b) Histogram of parliamentary parties voteshare, 2002

Figure 3: Histograms of parliamentary parties voteshare, 1998 and 2002

is negative. This could be explained by anecdotal evidence, the left had always struggled to mobilize her supporters. The pivotal probabilities are negatively correlated with closeness and with number of people *turning up at the election*. This is related to the way how I construct the pivotal probabilities. Fierce competition means that the closeness between the two blocks are close, so the probability of being pivotal is higher. However, the if in the constituency is highly populated, the probability of being pivotal is lower.

Table 4: Correlation table of political variables, 2002

	Turnout	Close.	Number of voters	Left's share	Pivotal pr.	Close. (pr)
Turnout	1.000					
Close.	0.260	1.000				
Number of voters	0.037	-0.093	1.000			
Left's share	-0.172	-0.493	0.129	1.000		
Pivotal pr.	0.044	-0.414	-0.095	0.135	1.000	
Close.(pr)	0.258	0.997	-0.091	-0.499	-0.418	1.000

The low correlation between pivotal probabilities and the number of people who showed up at the election shows that not the turnout determines mainly the pivotal probability, but the closeness[1].

All these statistics are descriptive, in the following we try to disentangle the different effects and find out whether there is a systematic political influence in determining the formula of normative supports.

6. Econometric results

6.1. The estimation strategy

The key prediction of the theoretical model is that municipalities with intense political competition tend to receive more intergovernmental transfers. To measure degree of competition, I use pivotal probabilities calculated from the election data *ex post*. In case of this proxy: the larger the probability, the more competitive is the municipality. The smaller the probability is, the less intense the political competition is. According to the theoretical prediction the coefficient of this variable should be positive, as high pivotal probability means that the probability of being pivotal at the election is high. The probability is high if in the municipality the competition is intensive, in other words it is politically divided.

[1]In case of villages the correlation between pivotal probability and the number of people voting is much stronger, but not that strong that we could claim that the turnout determines the magnitude of the pivotal probability.

Due to data limitations, I analyse only the period between 1998 and 2006. I incorporate the 1998 and 2002 election results, but for the robustness analysis I use the 1994 election results too. The data structure allows to control for time and county fixed effects. However, I do not control for municipality level fixed effects, keeping the variation inside counties as it is measured. Moreover, I have only two elections and limited variation of pivotal probabilities in time. Therefore, I cannot profit from the panel structure.

6.2. The estimation

To test the predictions of the probabilistic voting model's predictions I assume the following population model[1]:

$$\begin{aligned}\text{intergovernmental transfer}_{jt} = \quad & \beta_0 + \beta_{\text{pivotal probability}}\text{pivotal probability}_{j\bar{t}} \\ & \beta_{inter}\text{time dummies}_t * \text{pivotal probability}_{j\bar{t}} \\ & +\beta_{controls}\text{controls}_{jt-1} \\ & +\beta_{time\_dummies}\text{time dummies}_t \\ & +\beta_{county}\text{county dummies} + u_{jt}\end{aligned}$$

where

$$\begin{aligned} t &= 1999, ..., 2006 \\ \bar{t} &= 1998, 2002 \\ j &= 1, ..., 3130 \end{aligned}$$

The pivotal probability takes into account the political competition and the turnout in each municipality. Left and right are defined on the basis of coalitions formed in government - in case of the opposition this means the period when they were in power. Closeness between blocks could be used directly as a measure for competition, but it is a crude proxy for measuring the extent to which a municipality is ready to change the political preferences.

My dependent variable is the intergovernmental transfer, which is measured in per capita terms and in Hungarian forints of the year 2002. The

[1]The members of parliament decided about the formula in period t, and the transfer was sent in period t+1, but the for the calculations the administration used t-1 values of the items. In my empirical analysis I do not do so, as I would lose the 1999 data in that case.

tax base is measured in an identical way. With respect to the other control variables. I include population density, the surface of the municipality and the population itself. An important part of the control variables cover the population share of different age cohorts of children enrolled in crèche, in day nursery, in primary school and in secondary school. These are the enrolled 0-3, enrolled 4-6, enrolled 7-14 and enrolled 14-18 variables. Moreover the population share of elderly people who are older than 60 years is included. For controlling time and county fixed effects, time dummies and county dummies are included in the estimations. The detailed description is in Table 5.

6.3. The estimated results

The most relevant results can be found in model (5) in Table 6 and in Table 7, and in Appendix B different robustness checks can be found. A regression for the whole period is run (Table B.10). The key conclusion: all the control variables are significant and in the case of villages we can find significant positive effect of the pivotal probability. Thus, the share of old people and the share of pupils in the population explain an important part of the variation of the intergovernmental transfers per capita.

With respect to the pivotal probability the results are robust to different samples. However I prefer to analyse separately the results for villages. In both periods, and in any model specification the pivotal probability is significant at worst case at 10 % level. However, the most relevant specification is when we introduce interaction terms between years and the pivotal probability. According to the F-test, these variables significant together[1]. Though the pivotal probabilities are significant their coefficients magnitudes vary in periods. In the first period the political competition tends to have a lower effect on the size of the intergovernmental transfers than in the second period between (see Table 6 and Table 7). Running the regressions on the whole period I find similar conclusions, in this specification the pivotal probabilities effect is smaller in the second period than in the first one. However, this is a misleading as we can see that even though the signs are the same in the two periods, the magnitude of the coefficients is different in case of the controls too. For example the $\hat{\beta}_{\text{enrolled 7-14}}$ in case of villages is 3.497 in the

[1] One exception is the period 2003-2006, and the whole sample specification. In that case the p=value is 7 %.

Table 5: The variables used in the econometric analyses, all the monetary variables are corrected for inflation, all of them measured in HUF of 2002

Variable	**Description**	**Unit of measure**
intergovernmental transfer	Intergovernmental transfer in per capita terms and in HUF of 2002	Per capita 1000 HUF (in value of 2002)
pivotal probability	Probability of being pivotal at the election. The measure is based on the closeness between the two major parties and the turnout of voters.	Percentage point
taxbase per capita	Tax base in per capita terms and in HUF of 2002	Per capita 1000 HUF (in value of 2002)
enrolled 0-3	Population share of children enrolled in in creche	Percentage point
enrolled 4-6	Population share of children enrolled in in day nursery	Percentage point
enrolled 7-14	Population share of children enrolled in in primary school	Percentage point
enrolled 14-18	Population share of children enrolled in in secondary school	Percentage point
old 60 share	Population share of adults older than 60 years	Percentage point
area sqmeter	Area in square meter meter	m^2
pop density	Population density	People per m^2
population	Population	Number of people
time dummies	7 dummies which cover the 8 years	Categorical
county dummies	18 dummies which cover the 19 counties	Categorical

second period (see Table 7), but in the first period it is 2.062 (see Table 6). Thus, the effect of political competition is significant and positive in both periods, but its magnitude differs. Moreover, the effects of control variables differ in too in both periods. This is not surprising as the majority of parliament and government were different in these periods. The governments put different weight on giving transfers for primary schooling or for kinder garden education, based on their political preferences. Still, irrespective of political orientation, the parliament allocated more money to places where the political competition was fierce.

The size of the estimated effects are large. In the period between 1999-2002, the difference between the most and the least competitive village is 5392-13719 HUF per capita (depending on the year). In relative terms the magnitude is even larger, to have such an increase in the intergovernmental transfers based on the control variables the percentage of primary school pupils has to increase by 2.61-6.65 percentage points. In the period between 2003-2006 the effects are still important, then the difference is 14440-22000 HUF, and the percentage of primary school pupils has to increase by 4-6.3 percentage points[1].

6.4. Robustness

To analyse the robustness of the results I test other specifications too. First, I analyse how sensitive the results are for changing the way I calculate pivotal probabilities, so taking into account only villages where the parliamentary vote shares cover different thresholds. Then instead of pivotal probabilities I try specifications where I use political alignment, the closeness between the two blocks and finally I use lagged pivotal probabilities to see how these modifications change the conclusion.

6.4.1. Parliamentary vote share

Restricting my village sample to municipalities where the parliamentary parties votes share covered more than 75 %, 80 %, 85 % or 90 % does not change the results (see Table B.11 - Table B.14). The sign and more or less the magnitude of the coefficients remain the same, as in the original sample. Their significance and their p-value changes, but in general at 10% all the coefficients are significantly different from 0. There is one exception, in case of the period 2003 and 2006 the political variables are slightly not significant at the 10 % level fro the samples 75% and 80 % (see Column (5) in Table

[1]The calculations based on $\hat{\beta}_{\text{enrolled 7-14}}$ and on the pivotal probabilities coefficients. Monetary items are measured in 2002 HUF.

Table 6: The main regression results from for the whole sample and for villages, 1999-2002
dependent variable: intergovernmental transfer per capita

sample	whole sample			village		
period	1999-2002			1999-2002		
	(1)	(2)	(3)	(4)	(5)	(6)
Pivotal	0.929***	0.567*	0.991***	0.923***	0.634**	0.973***
	(0.280)	(0.303)	(0.286)	(0.276)	(0.304)	(0.283)
Pivotal*2000		1.106***			0.979***	
		(0.230)			(0.233)	
Pivotal*2001		0.165			0.036	
		(0.156)			(0.154)	
Pivotal*2002		0.178	-0.246**		0.139	-0.200*
		(0.155)	(0.115)		(0.153)	(0.117)
Controls						
Taxbase	-0.005	-0.005	-0.005	-0.007*	-0.007*	-0.007*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Enrolled4-6	2.017***	2.018***	2.018***	2.000***	2.000***	2.000***
	(0.395)	(0.395)	(0.395)	(0.398)	(0.398)	(0.398)
Enrolled7-14	2.052***	2.051***	2.051***	2.062***	2.062***	2.062***
	(0.218)	(0.218)	(0.218)	(0.221)	(0.221)	(0.221)
Enrolled14-18	1.472***	1.472***	1.472***	0.684*	0.685*	0.685*
	(0.257)	(0.257)	(0.257)	(0.369)	(0.369)	(0.369)
Old60	0.348***	0.348***	0.348***	0.348***	0.347***	0.347***
	(0.102)	(0.102)	(0.102)	(0.104)	(0.104)	(0.104)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
P-value[1]		0.000	0.001		0.000	0.003
Observations	12516	12516	12516	11296	11296	11296
R^2	0.756	0.757	0.756	0.764	0.765	0.764

P-value[1] - p-value of the F-test for the joint significance of the political variables.
Robust standard errors in parentheses, clustered by NUTS4 regions.
*** p<0.01, ** p<0.05, * p<0.1

B.11 and in Table B.12). In larger samples the variables are significant at 10 % level. Thus, using the parliamentary vote share aggregation robust to

Table 7: The main regression results from for the whole sample and for villages, 2003-2006
dependent variable: intergovernmental transfer per capita

sample	whole sample			village		
period	2003-2006			2003-2006		
	(1)	(2)	(3)	(4)	(5)	(6)
Pivotal	1.624*	1.792**	1.712**	1.604*	1.808**	1.701**
	(0.866)	(0.855)	(0.862)	(0.859)	(0.847)	(0.854)
Pivotal*2004		-0.473***			-0.509***	
		(0.174)			(0.173)	
Pivotal*2005		0.234			0.190	
		(0.266)			(0.274)	
Pivotal*2006		-0.435*	-0.355		-0.497*	-0.391*
		(0.261)	(0.225)		(0.261)	(0.226)
Controls						
Taxbase	-0.008**	-0.008**	-0.008**	-0.008**	-0.008**	-0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Enrolled4-6	2.704***	2.703***	2.703***	2.662***	2.662***	2.661***
	(0.391)	(0.391)	(0.391)	(0.389)	(0.389)	(0.389)
Enrolled7-14	3.461***	3.461***	3.461***	3.497***	3.497***	3.497***
	(0.355)	(0.355)	(0.355)	(0.361)	(0.361)	(0.361)
Enrolled14-18	1.636***	1.637***	1.637***	0.379	0.379	0.380
	(0.315)	(0.315)	(0.315)	(0.267)	(0.267)	(0.267)
Old60	0.425***	0.425***	0.425***	0.430***	0.430***	0.429***
	(0.113)	(0.113)	(0.113)	(0.115)	(0.115)	(0.115)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
P-value[1]		0.070	0.036		0.048	0.028
Observations	12512	12512	12512	11292	11292	11292
R^2	0.761	0.761	0.761	0.767	0.767	0.767

P-value[1] - p-value of the F-test for the joint significance of the political variables.
Robust standard errors in parentheses, clustered by NUTS4 regions.
*** p<0.01, ** p<0.05, * p<0.1

other kind of thresholds too.

6.4.2. Party alignment

Machine politics could be a competing theory to probabilistic voting model. In that case intergovernmental transfers would targeted to municipalities where the majority voted for the governing party. To test this hypothesis I run model specifications with the left block's vote share (see Table B.15) and with left majority dummy (see Table B.16). Results are contradictory, during the period of 1999-2002 the coefficients are supposed to be negative as the government was from the right, and during the 2003-2006 period the coefficients are supposed to be positive as the government was from the left. However, estimated coefficient signs are just the opposite than the expected. Moreover the results are only significant for the period 2003-2006. If we look the 2 periods together and the dummy variable specification we can see, that the political variables p-value is 50.2 %.

For the period 2003-2006 the left majority and the left share coefficients are significant, but their signs are in the opposite direction as expected. So we cannot confirm the machine politics theory based on these estimations.

6.4.3. Closeness as explanatory variable

Another common measure of political competition is the closeness between dominant blocks. I run models where instead of pivotal probabilities I use the absolute value of closeness in percentages points to explain the size of intergovernmental transfers per capita. In this setting the expected sign of the coefficient is negative, as higher closeness means that the blocks further away from each other, so the competition supposed to be less intense between them. In most models the coefficients are significant, but their sign is positive. Only in the specification for the period 1999-2006 when I can find coefficients that confirm this theory, in Column (8) Table B.17, the coefficients $\hat{\beta}_{\text{Closeness 2003}}$, $\hat{\beta}_{\text{Closeness 2004}}$, $\hat{\beta}_{\text{Closeness 2005}}$ and $\hat{\beta}_{\text{Closeness 2006}}$. However, this is not consistent with the estimation for the 2003-2006 period. There the effects are positive again.

The results are even more contradictory if we create dummies to measure the political competition. I created a dummy variable which took the value 1 when the closeness between the blocs was less than 5 % (see Table B.18), and another dummy when the closeness was less than 3 % (see Table B.19). Here again, only in the specification for the period 1999-2006, in Column (8) Table B.18, I find coefficients with the expected signs. But here again these results are not consistent with the estimation for the 2003-2006 period, in case of neither dummy specifications.

To sum up, based on closeness proxy for competition I find contradictory results. The coefficients' sign depend on the sample selection and on the model specification. In most cases the signs are opposite to the expected signs.

6.4.4. Previous election pivotal probabilities

The last robustness analysis is to use the previous elections pivotal probabilities. So for the 1999-2002 period I used the election results from 1994, and for the 2003-2006 period the 1998 election results were used. The results are consistent with the original findings. The coefficients signs and magnitudes are similar to the original specifications (Table B.20). So this further strengthens our results. Places where the political competition is intensive, the intergovernmental transfers tend to be higher.

7. Conclusion

In this study a new variable was proposed to measure the political competition and its effect on intergovernmental transfers. According to the probabilistic voting model, politicians target swing voters with transfers to win the elections. So far many empirical studies were in favour of the predictions of the model, however, in most case the authors either used surveys or direct measures to infer the political preferences of the electorate.

Using Myerson (2000) pivotal probabilities is a new measure for political competition. Pivotal probabilities proxy political swing as changing political alignment is related to fact if there are many swing voters or just the competition is fierce among dominant political powers. In an intense competition every vote is crucial, as it can turn out to be pivotal to the final success. In the Hungarian case the election results are good for identifying political preferences, as the voting system gives incentives for sincere voting and revealing party preferences. The results are not distorted by candidates individual bias. Using election results *ex post* to proxy the political competition helps us to identify significant political bias. The magnitude of the bias is important too.

In the period between 1999-2002, the difference between the most and the least competitive villages is equal to 2.61-6.65 percentage points increase percentage of primary school pupils. In the period between 2003-2006, the percentage of primary school pupils has to increase by 4-6.3 percentage points to compensate the difference between the most and the least competitive villages.

In the robustness check instead of pivotal probabilities I tried specifications where I used political alignment, the closeness between the two blocks and lagged pivotal probabilities. All of this specifications provided ambiguous results, so pivotal probabilities seem to be the most robust measure of political competition that determines the amount of intergovernmental transfers in case of villages.

The results are still limited as I could only study the period between 1999 and 2006. Because of the limited time span I cannot apply panel estimation techniques as my variables vary little in time. So one of the extension would be to incorporate the period between 2007 and 2010, when the intergovernmental transfers scheme became more formalised. Another extension would be to use *ex ante* pivotal probabilities by estimating the parties vote share and the participation rate. Then calculating the pivotal probabilities.

Appendix A. Descriptive statistics

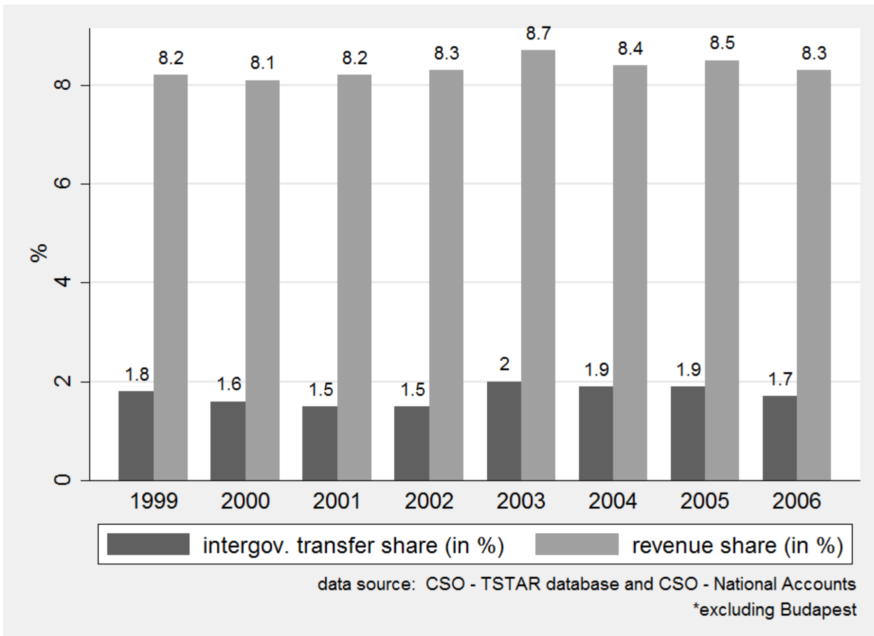


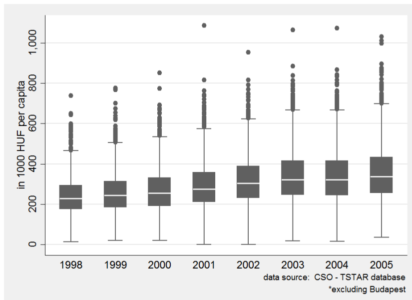
Figure A.4: Total intergovernmental transfers and all municipalities' total revenues relative to GDP, 1999-2006

Table A.8: The descriptive statistics of the variables used in the calculation of the inter-governmental transfers, 1999-2006

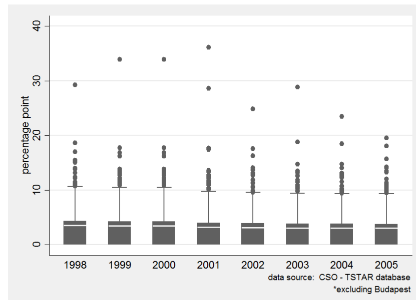
	villages		cities		whole sample	
	mean	std	mean	std	mean	std
1999-2002						
Int.gov. transfer	19.26	17.94	30.87	12.35	20.39	17.81
Taxbase	251.82	93.78	350.47	111.01	261.43	99.97
Enrolled 4-6	2.92	2.33	3.75	0.55	3.00	2.23
Enrolled 7-14	6.54	6.59	10.58	1.76	6.94	6.39
Enrolled 14-18	0.05	0.82	3.63	3.56	0.40	1.72
Old 60	22.74	6.63	18.63	2.65	22.34	6.47
Observations	11300		1220		12520	
2003-2006						
Int.gov. transfer	26.26	28.32	43.20	18.07	27.91	27.95
Taxbase	321.17	116.87	442.06	127.92	332.95	123.32
Enrolled 4-6	2.62	2.13	3.42	0.53	2.70	2.05
Enrolled 7-14	6.15	6.40	10.15	1.92	6.54	6.23
Enrolled 14-18	0.06	0.88	4.17	4.08	0.46	1.95
Old 60	22.53	6.48	19.54	2.64	22.24	6.28
Observations	11300		1220		12520	
1999-2006						
Int.gov. transfer	22.76	23.96	37.04	16.66	24.15	23.73
Taxbase	286.49	111.49	396.27	128.20	297.19	117.81
Enrolled 4-6	2.77	2.24	3.59	0.56	2.85	2.15
Enrolled 7-14	6.35	6.50	10.37	1.85	6.74	6.31
Enrolled 14-18	0.05	0.85	3.90	3.84	0.43	1.84
Old 60	22.64	6.56	19.09	2.68	22.29	6.38
Observations	22600		2440		25040	

Table A.9: The descriptive statistics of political variables, 1998

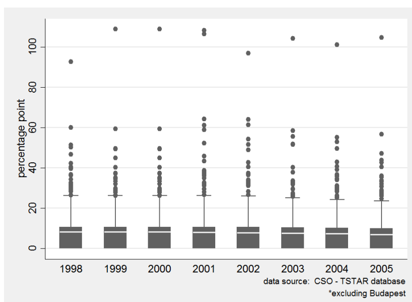
	villages		cities		whole sample	
	mean	std	mean	std	mean	std
1998						
Turnout	55.45	10.62	52.93	7.53	55.20	10.38
Closeness	20.47	15.06	12.39	9.25	19.68	14.79
Left_share	34.90	10.25	39.16	6.83	35.31	10.05
Pivotal	0.51	1.04	0.05	0.17	0.47	1.00
Pivotal_dist	23.95	17.35	14.36	10.55	23.01	17.04
Observations	2825		305		3130	
	villages		cities		whole sample	
2002						
Turnout	67.68	8.25	67.48	6.45	67.66	8.09
Closeness	20.47	15.74	13.21	9.70	19.76	15.41
Left_share	39.95	11.77	46.35	7.96	40.57	11.61
Pivotal	0.49	1.01	0.05	0.16	0.44	0.97
Pivotal_dist	22.60	17.18	14.74	10.72	21.83	16.82
Observations	2825		305		3130	



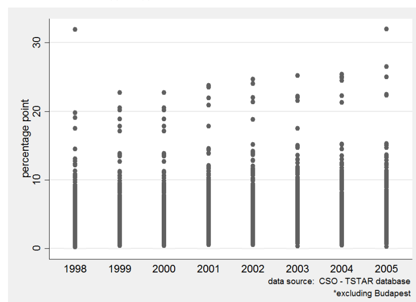
(a) Tax base in 1000 HUF per capita



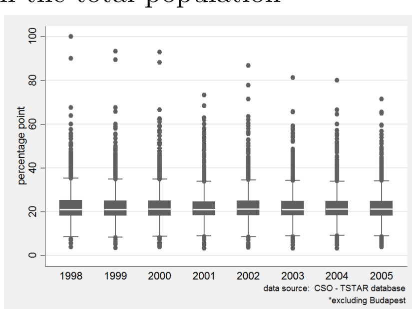
(b) The share of enrolled pupils of age 4-6 in the total population



(c) The share of enrolled pupils of age 7-14 in the total population



(d) The share of enrolled pupils of age 14-18 in the total population



(e) The share of people older than 60 in the total population

Figure A.5: Boxplots of the control variables

Appendix B. Robustness analysis

Table B.10: The main regression results from for the whole sample and for villages 1999-2006 **dependent variable: intergovernmental transfer per capita**

sample	whole sample			village		
period	1999-2006			1999-2006		
	(1)	(2)	(3)	(4)	(5)	(6)
Pivotal	1.284**	1.423***	1.348**	1.266**	1.400***	1.329**
	(0.595)	(0.394)	(0.591)	(0.592)	(0.396)	(0.588)
Pivotal*2000		1.103***			0.974***	
		(0.230)			(0.233)	
Pivotal*2001		0.162			0.032	
		(0.157)			(0.155)	
Pivotal*2002		0.198	0.274		0.159	0.231
		(0.164)	(0.258)		(0.163)	(0.265)
Pivotal*2003		-0.517			-0.389	
		(0.578)			(0.574)	
Pivotal*2004		-1.001*			-0.909*	
		(0.524)			(0.521)	
Pivotal*2005		-0.306			-0.225	
		(0.690)			(0.689)	
Pivotal*2006		-0.897	-0.819**		-0.837	-0.763**
		(0.630)	(0.367)		(0.627)	(0.368)
Controls						
Taxbase	-0.006**	-0.006**	-0.006**	-0.007**	-0.007**	-0.007**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Enrolled4-6	2.280***	2.280***	2.279***	2.247***	2.247***	2.246***
	(0.356)	(0.357)	(0.356)	(0.355)	(0.356)	(0.355)
Enrolled7-14	2.748***	2.749***	2.748***	2.770***	2.771***	2.770***
	(0.289)	(0.289)	(0.289)	(0.293)	(0.293)	(0.293)
Enrolled14-18	1.576***	1.578***	1.577***	0.526*	0.534*	0.529*
	(0.282)	(0.282)	(0.282)	(0.270)	(0.271)	(0.270)
Old60	0.393***	0.393***	0.393***	0.391***	0.391***	0.391***
	(0.103)	(0.103)	(0.103)	(0.104)	(0.105)	(0.104)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
P-value[1]		0.000	0.000		0.000	0.000
Observations	25028	25028	25028	22588	22588	22588
R^2	0.725	0.726	0.725	0.729	0.729	0.729

P-value[1] - p-value of the F-test for the joint significance of the political variables.
Robust standard errors in parentheses, clustered by NUTS4 regions.
*** p<0.01, ** p<0.05, * p<0.1

Table B.11: Robustness analysis for a sample where the parliamentary vote share is larger than 75%
dependent variable: intergovernmental transfer per capita

sample		village			village			village	
period		1999-2002			2003-2006			1999-2006	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Pivotal	0.727***	0.351	0.746***	1.609*	1.802**	1.672*	1.155*	1.097***	1.186*
	(0.260)	(0.276)	(0.262)	(0.901)	(0.900)	(0.897)	(0.627)	(0.371)	(0.623)
Pivotal*2000		0.974***						0.967***	
		(0.255)						(0.256)	
Pivotal*2001		0.211						0.205	
		(0.131)						(0.132)	
Pivotal*2002		0.320**	-0.075					0.338**	0.249
		(0.139)	(0.107)					(0.151)	(0.316)
Pivotal*2003								-0.069	
								(0.624)	
Pivotal*2004					-0.455**			-0.533	
					(0.182)			(0.544)	
Pivotal*2005					0.064			-0.004	
					(0.204)			(0.710)	
Pivotal*2006					-0.381	-0.251		-0.400	-0.488
					(0.269)	(0.203)		(0.654)	(0.364)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
P-value[1]		0.000	0.018		0.117	0.074		0.000	0.000
Observations	10388	10388	10388	11172	11172	11172	21560	21560	21560
R^2	0.771	0.771	0.771	0.772	0.772	0.772	0.734	0.734	0.734

P-value[1] - p-value of the F-test for the joint significance of the political variables.
Robust standard errors in parentheses, clustered by NUTS4 regions.
*** p<0.01, ** p<0.05, * p<0.1

Table B.12: Robustness analysis for a sample where the parliamentary vote share is larger than 80%
dependent variable: intergovernmental transfer per capita

sample		village			village			village	
period		1999-2002			2003-2006			1999-2006	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Pivotal	0.788***	0.399	0.821***	1.659*	1.860**	1.728*	1.225*	1.143***	1.272*
	(0.287)	(0.304)	(0.290)	(0.916)	(0.912)	(0.910)	(0.655)	(0.404)	(0.650)
Pivotal*2000		1.004***						0.993***	
		(0.288)						(0.288)	
Pivotal*2001		0.260**						0.250*	
		(0.125)						(0.126)	
Pivotal*2002		0.292**	-0.130					0.275*	0.146
		(0.143)	(0.104)					(0.153)	(0.328)
Pivotal*2003								0.011	
								(0.634)	
Pivotal*2004					-0.467**			-0.462	
					(0.186)			(0.552)	
Pivotal*2005					0.071			0.082	
					(0.211)			(0.726)	
Pivotal*2006					-0.406	-0.274		-0.356	-0.484
					(0.273)	(0.205)		(0.660)	(0.354)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
P-value[1]		0.002	0.015		0.106	0.056		0.000	0.000
Observations	9288	9288	9288	10964	10964	10964	20252	20252	20252
R^2	0.794	0.794	0.794	0.771	0.771	0.771	0.745	0.745	0.745

P-value[1] - p-value of the F-test for the joint significance of the political variables.
Robust standard errors in parentheses, clustered by NUTS4 regions.
*** p<0.01, ** p<0.05, * p<0.1

Table B.13: Robustness analysis for a sample where the parliamentary vote share is larger than 85%
dependent variable: intergovernmental transfer per capita

sample		village			village			village	
period		1999-2002			2003-2006			1999-2006	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Pivotal	0.889**	0.465	0.912**	1.848*	2.089**	1.916**	1.461*	1.357***	1.505**
	(0.392)	(0.405)	(0.396)	(0.964)	(0.957)	(0.957)	(0.754)	(0.483)	(0.748)
Pivotal*2000		0.988***						0.981***	
		(0.321)						(0.320)	
Pivotal*2001		0.353**						0.347**	
		(0.136)						(0.139)	
Pivotal*2002		0.358**	-0.089					0.347**	0.198
		(0.141)	(0.139)					(0.155)	(0.354)
Pivotal*2003								0.095	
								(0.611)	
Pivotal*2004					-0.553***			-0.446	
					(0.160)			(0.529)	
Pivotal*2005					0.035			0.149	
					(0.191)			(0.718)	
Pivotal*2006					-0.447*	-0.274		-0.302	-0.448
					(0.259)	(0.211)		(0.643)	(0.330)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
P-value[1]		0.003	0.071		0.017	0.045		0.000	0.000
Observations	6912	6912	6912	10204	10204	10204	17116	17116	17116
R^2	0.788	0.788	0.788	0.783	0.783	0.783	0.756	0.756	0.756

P-value[1] - p-value of the F-test for the joint significance of the political variables.
Robust standard errors in parentheses, clustered by NUTS4 regions.
*** p<0.01, ** p<0.05, * p<0.1

Table B.14: Robustness analysis for a sample where the parliamentary vote share is larger than 90%
dependent variable: intergovernmental transfer per capita

sample		village			village			village	
period		1999-2002			2003-2006			1999-2006	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Pivotal	1.170**	0.376	1.217***	2.005*	2.174*	2.054*	1.692*	1.052*	1.734*
	(0.453)	(0.475)	(0.449)	(1.166)	(1.148)	(1.157)	(0.937)	(0.589)	(0.929)
Pivotal*2000		1.791***						1.794***	
		(0.407)						(0.405)	
Pivotal*2001		0.735***						0.731***	
		(0.201)						(0.198)	
Pivotal*2002		0.655***	-0.187					0.646***	-0.037
		(0.184)	(0.168)					(0.188)	(0.580)
Pivotal*2003								0.712	
								(0.886)	
Pivotal*2004					-0.523***			0.201	
					(0.188)			(0.799)	
Pivotal*2005					0.164			0.895	
					(0.262)			(1.045)	
Pivotal*2006					-0.314	-0.195		0.449	-0.232
					(0.312)	(0.251)		(0.965)	(0.411)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
P-value[1]		0.000	0.013		0.098	0.127		0.000	0.013
Observations	2744	2744	2744	6800	6800	6800	9544	9544	9544
R^2	0.805	0.806	0.805	0.775	0.775	0.775	0.767	0.767	0.767

P-value[1] - p-value of the F-test for the joint significance of the political variables.
Robust standard errors in parentheses, clustered by NUTS4 regions.
*** p<0.01, ** p<0.05, * p<0.1

Table B.15: Robustness analysis for left's vote share

dependent variable: intergovernmental transfer per capita

sample		village			village			village	
period		1999-2002			2003-2006			1999-2006	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leftshare	0.015	-0.001	0.007	-0.070***	-0.088***	-0.079***	-0.021	-0.073***	-0.029*
	(0.022)	(0.018)	(0.021)	(0.020)	(0.024)	(0.021)	(0.016)	(0.018)	(0.017)
Leftshare*2000		-0.005						-0.007	
		(0.017)						(0.017)	
Leftshare*2001		0.029*						0.027*	
		(0.015)						(0.015)	
Leftshare*2002		0.040	0.032					0.043	-0.001
		(0.024)	(0.020)					(0.030)	(0.029)
Leftshare*2003								0.064**	
								(0.025)	
Leftshare*2004					0.022**			0.086***	
					(0.010)			(0.025)	
Leftshare*2005					0.005			0.069**	
					(0.013)			(0.027)	
Leftshare*2006					0.043***	0.034***		0.105***	0.060***
					(0.015)	(0.011)		(0.026)	(0.015)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
P-value[1]		0.014	0.299		0.004	0.001		0.000	0.001
Observations	11300	11300	11300	11300	11300	11300	22600	22600	22600
R^2	0.762	0.762	0.762	0.764	0.764	0.764	0.725	0.725	0.725

P-value[1] - p-value of the F-test for the joint significance of the political variables.
Robust standard errors in parentheses, clustered by NUTS4 regions.
*** p<0.01, ** p<0.05, * p<0.1

Table B.16: Robustness analysis for left's majority

dependent variable: intergovernmental transfer per capita

sample		village			village			village	
period		1999-2002			2003-2006			1999-2006	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leftmaj	0.686	0.474	0.607	-1.130**	-1.431***	-1.314***	-0.135	-0.282	-0.271
	(0.618)	(0.543)	(0.606)	(0.447)	(0.508)	(0.456)	(0.323)	(0.490)	(0.329)
Leftmaj*2000		0.062						0.016	
		(0.287)						(0.286)	
Leftmaj*2001		0.335						0.286	
		(0.316)						(0.308)	
Leftmaj*2002		0.450	0.318					0.429	0.417
		(0.365)	(0.239)					(0.407)	(0.502)
Leftmaj*2003								-0.161	
								(0.707)	
Leftmaj*2004					0.332*			0.166	
					(0.183)			(0.685)	
Leftmaj*2005					0.018			-0.174	
					(0.381)			(0.799)	
Leftmaj*2006					0.851**	0.735**		0.650	0.640
					(0.421)	(0.336)		(0.795)	(0.472)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
P-value[1]		0.534	0.304		0.007	0.005		0.502	0.059
Observations	11220	11220	11220	11244	11244	11244	22464	22464	22464
R^2	0.761	0.761	0.761	0.765	0.765	0.765	0.726	0.726	0.726

P-value[1] - p-value of the F-test for the joint significance of the political variables.
Robust standard errors in parentheses, clustered by NUTS4 regions.
*** p<0.01, ** p<0.05, * p<0.1

Table B.17: Robustness analysis for closeness

dependent variable: intergovernmental transfer per capita

sample period		village 1999-2002			village 2003-2006			village 1999-2006	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Closeness	0.015	0.010	0.019*	0.036***	0.045***	0.038***	0.021**	0.067***	0.023***
	(0.011)	(0.011)	(0.011)	(0.013)	(0.015)	(0.014)	(0.009)	(0.013)	(0.009)
Closeness*2000		0.027*						0.027*	
		(0.015)						(0.015)	
Closeness*2001		-0.001						-0.000	
		(0.010)						(0.010)	
Closeness*2002		-0.006	-0.015					-0.009	0.034*
		(0.015)	(0.013)					(0.019)	(0.020)
Closeness*2003								-0.084***	
								(0.019)	
Closeness*2004					-0.010			-0.093***	
					(0.007)			(0.019)	
Closeness*2005					-0.012			-0.093***	
					(0.010)			(0.022)	
Closeness*2006					-0.014	-0.006		-0.096***	-0.053***
					(0.010)	(0.008)		(0.019)	(0.011)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
P-value[1]		0.024	0.084		0.039	0.028		0.000	0.000
Observations	11300	11300	11300	11300	11300	11300	22600	22600	22600
R^2	0.762	0.762	0.762	0.763	0.763	0.763	0.725	0.726	0.725

P-value[1] - p-value of the F-test for the joint significance of the political variables.
Robust standard errors in parentheses, clustered by NUTS4 regions.
*** p<0.01, ** p<0.05, * p<0.1

Table B.18: Robustness analysis for closeness dummy (takes the value 1, if closeness< 5%)
dependent variable: intergovernmental transfer per capita

sample period	village 1999-2002			village 2003-2006			village 1999-2006		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Closenessdum	-0.180	-0.426	-0.245	-0.575	-0.595	-0.488	-0.420	-1.292***	-0.416
	(0.310)	(0.324)	(0.321)	(0.575)	(0.781)	(0.587)	(0.391)	(0.413)	(0.390)
Closenessdum*2000		0.296						0.283	
		(0.284)						(0.291)	
Closenessdum*2001		0.249						0.234	
		(0.263)						(0.269)	
Closenessdum*2002		0.440	0.258					0.475	-0.396
		(0.331)	(0.269)					(0.397)	(0.423)
Closenessdum*2003								1.545*	
								(0.785)	
Closenessdum*2004					0.012			1.483**	
					(0.440)			(0.624)	
Closenessdum*2005					0.311			1.697**	
					(0.599)			(0.682)	
Closenessdum*2006					-0.241	-0.349		1.240*	0.360
					(0.623)	(0.433)		(0.678)	(0.442)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
P-value[1]		0.627	0.549		0.679	0.436		0.036	0.324
Observations	11300	11300	11300	11300	11300	11300	22600	22600	22600
R^2	0.762	0.762	0.762	0.763	0.763	0.763	0.725	0.725	0.725

P-value[1] - p-value of the F-test for the joint significance of the political variables.
Robust standard errors in parentheses, clustered by NUTS4 regions.
*** p<0.01, ** p<0.05, * p<0.1

Table B.19: Robustness analysis for closeness dummy (take the value 1, if closeness< 3%)
dependent variable: intergovernmental transfer per capita

sample period	village 1999-2002			village 2003-2006			village 1999-2006		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Closenessdum3	-0.629*	-0.954**	-0.731**	-0.585	-0.339	-0.458	-0.545	-0.623	-0.521
	(0.354)	(0.437)	(0.360)	(0.703)	(0.824)	(0.727)	(0.436)	(0.493)	(0.427)
Closenessdum3*2000		0.441						-0.630	
		(0.428)						(0.448)	
Closenessdum3*2001		0.394						-0.679	
		(0.440)						(0.426)	
Closenessdum3*2002		0.585	0.446					-0.438	-0.497
		(0.422)	(0.323)					(0.490)	(0.414)
Closenessdum3*2003								0.641	
								(0.789)	
Closenessdum3*2004					-0.370			0.578	
					(0.609)			(0.615)	
Closenessdum3*2005					-0.071			0.792	
					(0.556)			(0.673)	
Closenessdum3*2006					-0.624	-0.548		0.336	0.268
					(0.753)	(0.601)		(0.736)	(0.571)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
P-value[1]		0.231	0.079		0.630	0.441		0.096	0.337
Observations	11300	11300	11300	11300	11300	11300	22600	22600	22600
R^2	0.762	0.762	0.762	0.763	0.763	0.763	0.725	0.725	0.725

P-value[1] - p-value of the F-test for the joint significance of the political variables.
Robust standard errors in parentheses, clustered by NUTS4 regions.
*** p<0.01, ** p<0.05, * p<0.1

Table B.20: Robustness analysis for lagged pivotal probabilities
dependent variable: intergovernmental transfer per capita

sample	village			village			village		
period	1999-2002			2003-2006			1999-2006		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LagPivotal	1.009***	0.656**	1.108***	1.065**	1.228**	1.079**	1.090***	1.631***	1.134***
	(0.251)	(0.261)	(0.265)	(0.436)	(0.484)	(0.452)	(0.318)	(0.323)	(0.326)
LagPivotal*2000		1.335***						1.347***	
		(0.471)						(0.468)	
LagPivotal*2001		0.023						0.036	
		(0.268)						(0.265)	
LagPivotal*2002		0.058	-0.395**					0.106	0.589***
		(0.265)	(0.164)					(0.277)	(0.191)
LagPivotal*2003								-1.206***	
								(0.306)	
LagPivotal*2004					-0.408**			-1.606***	
					(0.176)			(0.273)	
LagPivotal*2005					-0.039			-1.216***	
					(0.160)			(0.313)	
LagPivotal*2006					-0.206	-0.057		-1.353***	-0.847***
					(0.268)	(0.187)		(0.294)	(0.223)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
P-value[1]		0.000	0.000		0.002	0.049		0.000	0.000
Observations	11232	11232	11232	11296	11296	11296	22528	22528	22528
R^2	0.766	0.767	0.766	0.764	0.764	0.764	0.728	0.729	0.728

P-value[1] - p-value of the F-test for the joint significance of the political variables.
Robust standard errors in parentheses, clustered by NUTS4 regions.
*** p<0.01, ** p<0.05, * p<0.1

Appendix C. The legal framework

A helyi önkormányzatokról szóló 1990. évi LXV. törvény - The Act LXV. on local municipalities, 1990

A helyi önkormányzatokról címzett és céltámogatási rendszeréről szóló 1992. évi LXXXIX. törvény - The Act LXXXIX. on local municipalities's targeted allocation and grant system, 1992

1998. évi XC. törvény a Magyar Köztársaság 1999. évi költségvetéséről - The Act XC. on the 1999 Budget of the Republic of Hungary, 1998

1999. évi CXXV. törvény a Magyar Köztársaság 2000. évi költségvetéséről - The Act CXXV. on the 2000 Budget of the Republic of Hungary, 1999

2000. évi CXXXIII. törvény a Magyar Köztársaság 2001. és 2002. évi költségvetéséről - The Act CXXXIII. on the 2001 and 2002 Budget of the Republic of Hungary, 2000

2002. évi LXII. törvény a Magyar Köztársaság 2003. évi költségvetéséről - The Act LXII. on the 2003 Budget of the Republic of Hungary, 2002

2003. évi CXVI. törvény a Magyar Köztársaság 2004. évi költségvetéséről és az államháztartás hároméves kereteiről - The Act CXVI. on the 2004 Budget of the Republic of Hungary and on the 3 year framework of public finances, 2003

2004. évi CXXXV. törvény a Magyar Köztársaság 2005. évi költségvetéséről - The Act CXXXV. on the 2005 Budget of the Republic of Hungary, 2004

2005. évi CLIII. törvény a Magyar Köztársaság 2006. évi költségvetéséről - The Act CLIII. on the 2006 Budget of the Republic of Hungary, 2005

Appendix D. The data sources

- Hungarian Central Statistical Office - T-Star, The data was processed by The Databank Research Centre for Economic and Regional Studies, Hungarian Academy of Sciences.

  The dataset contains 3 164 settlements, which existed for at least one day since 1st January 1990. The period covered: 1990-2012, annually. The survey is analysing the endowments of Hungarys settlements, local development and measuring spatial inequalities.

  A T-star adatbázis a KSH tulajdonát képezi. A használt adatokat az MTA KRTK Adatbankja dolgozta fel.

- National Election Office, The Parliamentary Elections dataset for the period 1990-2010

- Hungarian Central Statistical Office, Data on GDP and on CPI, 1990-2010

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