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Municipalities Secession and uncertainty on public goods provision

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Abstract

This paper investigates the causes of municipalities secession in Brazil. We develop a model where the median voter decides on the creation of new municipalities observing the trade-off between loss of scale on public production and increase in federal transfers to his/her municipality. Voters acquire more information from the decision undertaken by neighbor's municipalities within the state. We test the adherence of our model using Brazilian data of municipalities creation occurred in the 90's. Our results show that, on average, for each 10 municipalities seceded within a State in the previous period between 6 and 10 new ones are created in the next period.

1   Introduction

The traditional literature on decentralization focus the analisys on the efficiency loss of the local provided goods on the part of public sector (Tiebout, 1956, Oates, 1972, Alesina and Spolaore ,1997, Bolton and Roland, 1997, Person and Tabellini, 2000, Brink, 2004 and Chiekbossian, 2008).[1] We document an additional characteristic into the decentralization topic, which is the role played by the intergovernmental grants as a device to improve effectiveness in the public good provision.

In particular, this paper attempts to establish the relation between neighbor's decision of breaking-up on own municipality's valuation, taking into consideration economic conditions that influence the median voter's decision regarding fiscal decentralization with homogeneous individuals. The benefits of decentralization come from the increase in the per-capita intergovernmental transfers after the division while the cost is the scale loss of the capital in the public goods provision. The final effect determines whether there is an efficiency gain or loss in the production function of the public good. Assuming that the median voter is not fully informed about the amount of resources received by the transfers, he/she uses the decision taken by his/her counterpart's neighbor municipalities to account for his/her voting.

Therefore, we concentrate in the existent trade-off between capital's endowment in a municipality and expected intergovernmental transfers to the municipalities in order to evaluate its impact on the public good production function. This way one can ignore the additional trade-off between the costs and the benefits of diverse community living in the same municipality.[2] The paper is divided as follows. Next section describes a theoretical motivation fo our analysis. Section 3 presents the empirical method and results. Section 4 concludes.

2   Theoretical Motivation

Since our model focuses on the effects of secessions on the provision of public good within the municipalities, we adopt an additive utility function on private and public goods. This allows us to focus on the median voter decision on public good consumption, ignoring the substitution effect between private and public good provision as well as the spillover and migration effects. We have for a municipality i,

$$U(v, Y) = p(v) + Y \tag{1}$$

where Y net income assumed equal to his private consumption; p is the individual consumption of the public good; v is his vote on the municipality break up (*yes* or *no*). Therefore, the median voter chooses $v* = yes$ if the expected provision of the public good in the seceded municipality is greater than otherwise. Consider the municipality's production function of the public good (g) is

$$g(v) = f(K(v), T(N(v))) \tag{2}$$

where K is the fixed capital endowment and encompasses physical and human capital of that municipality, T is the amount of intergovernmental transfer, which depends on N, the total population of the municipality. Observe that the public good is equally divided among the population ($p(v) = g(v)/N(v)$).

In addition, suppose the production function has increasing returns of scale on capital and transfers. However, according to the Complementary Law of 1989, the intergovernmental transfer's function ($T(N)$) presents a concave format, which implies a diminishing return on N in the production function.

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[1]Brueckner (2004), on the other hand, introduces the costs raised to attend heterogeneous electors, the capital allocation distortion. Gramlich and Rubinfeld (1982) finds evidence that individuals choose to live in communities with menu of public goods similar to their own preferred level.

[2]See Brueckner (2006), Blanchard and Shleifer (2001) and Bardhan and Mookherjee (2000) for different perspectives.

Assume that $g(K(v), N(v))$ is homogeneous of degree γ on K and N and that γ can be decomposed in two distinct effects, $\gamma = i + s$. We define i as an idiosyncratic municipality effect and s as a state effect. The break up pays off if $\gamma < 1$ or $s < 1 - i$.[3]

After the break up of the municipality, both the capital endowment and population in new municipalities are divided. The break up pays off if the production function has decreasing returns of scale. Our contribution here is to allow the median voter not to be fully informed about the value of γ. He can only observe his municipalitys idiosyncratic parameter, i, but not s. The uncertainty on s is related to the fact that he does not know the effect of intergovernmental transfer on the public good provision *per capita*. Despite that, the median voter knows whether the neighbor municipalities in his state have successfully seceded. Note that this information is valuable to him even when he does not have information about the idiosyncratic parameter of the other municipality, since he can compute the conditional distribution of s.

Assuming that s and i are independently standard uniform distributed, the probability that a municipality breaks up can be calculated, i.e., $Prob(p(yes) > p(no)|i) = 1 - i$.

Now assume that a neighbor municipality, say municipality n, within the same state has been seceded. The median voter in the municipality i knows that $\gamma_n = s + i_n < 1$.[4] The probability that the secession pays off can be conditioned on this information. However, the median voter on i does not have information on i_n, but he can calculate the conditional probability,[5]

$$Prob(p(yes) > p(no)|i, s < 1 - i_n) = (1 - i)(1 - i\ln(1 - i)) \tag{3}$$

The information that a neighbor municipality has successfully seceded helps the median voter in the locality i to choose $v = yes$, estimated in the next section,[6]

$$Prob(s < 1 - i|i, s < 1 - i_n) > Prob(s < 1 - i|i) \tag{4}$$
$$\texttt{or } i\ln(1 - i) < 0 \rightarrow i > 0$$

3 Empirical Discussion

The 1988 Constitution establishes one of the most important institutional mark for the creation of new municipalities in Brazil (article 18, paragraph 4). The creation of a new municipality depends on a State legislation where the majority of municipalities sets a minimum of population living in the new-to-be municipality and one plebiscite to be approved in which all population involved (old and new municipality) must participate. In 1996, given the large number of municipalities created, one Constitutional Emend (number 15) adds a new requirement for the creation of municipalities: new municipalities should present evidences for mainly economic viability. There has been a large number of municipalities created on our sample period (1991 through 2000). IN 1991 there were 4491 municipalities in Brazil and moved to $4,974$ in 1993, $5,498$ in 1997 and finally to 5363 nowadays. We consider two methods to test our model's prediction, i.e., whether, the median voter of municipality under the analysis uses the information of his/her neighbors in order to vote for or against emancipation. First, we use

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[3]We assume that after the division the new municipalities maintains the original idiosyncratic effect i, but no further division is allowed to the new municipalities. The Brazilian 1996 "Emend Constitution" allows the division of municipalities under some specific rules. For instance, these municipalities willing to break up have to prove economic viability after the secession and they have to obtain the approval of the actual population. These can be seen as obstacles to divide. As in our sample we do not have enough time span to observe a municipality seceded twice, this fact is as an assumption in our theoretical model.

[4]Assuming that the median voter observes that the break up increased the public good consumption in municipality n.

[5]If $i \leq i_n$ which implies $\gamma < \gamma_n < 1$, one has $Prob(s < 1 - i|i, i_n, s < 1 - i_n) = 1$. On the other hand, for values where $i_n > i$, the break up pays off only if s is low enough, i.e., $Prob(s < 1 - i|i, s < 1 - i_n) = (1 - i)/(1 - i_n)$. See the Appendix for calculations.

[6]Observe that the inequality holds for any $i \in (0, 1]$. In the case that $i = 0$, it is straightforward to show that the municipalities' break up pays off regardless of s.

the fact that emancipated municipalities within the state affects the probability (probit) of a secession in the municipality i,

$$P(B_t^{is}) = \beta B_{t-1}^s + \gamma X + \epsilon_t \tag{5}$$

where B_t^{is} is a binary variable indicating if the municipality i in the state s broke up in the period t. B_{t-1}^s is the number of municipalities within the state s that seceded in the period $t - 1$. X is a vector of control variables and ϵ_t is the error term. Table 1 is divided in two panels. Panel A brings these results, shown in two different samples. First, all the 5363 Brazilian municipalities observed in our dataset in 2004 are included. The municipalities seceding in the $1993 - 1996$ period are set $B_t^{is} = 1$ (columns 1 and 3) and 0 otherwise. Second, in order to narrow the comparison to similar municipalities, only those municipalities created after 1993 are considered. In that case, the ones seceding in the $1997 - 2000$ are our control group, i.e., they are denoted as $B_t^{is} = 0$ and the treated group are the the same ones, i.e., those divided in $1993 - 1996$ (columns 2 and 4). Second, we estimate aggregated decision within States, i.e, we estimate whether the number of secessions occurred in a state during the $1993 - 1996$ term can be explained by the number of secessions occurred within that state in the $1989 - 1992$ for the very same two samples. In this case we consider OLS estimation.
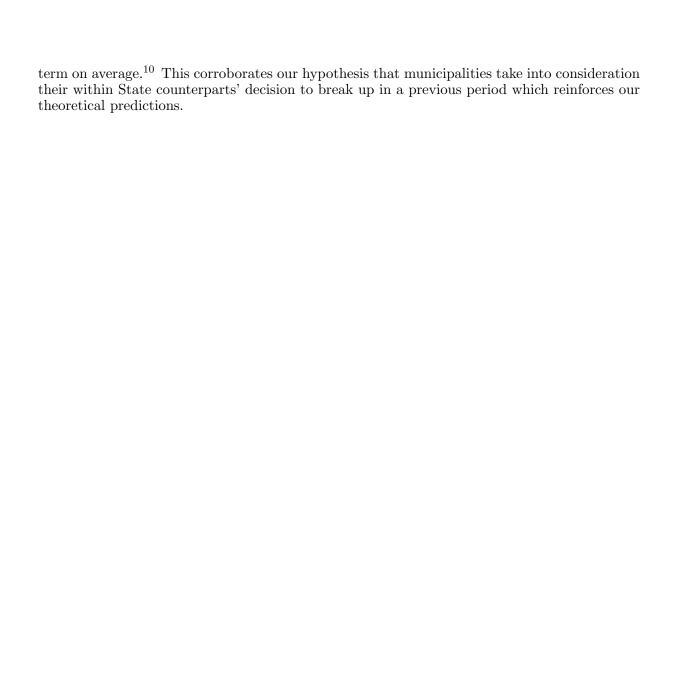
4   Results

Panel A presents marginal effects results for our probit estimation. The results are sensitive to the inclusion of the State controls when we consider full sample. The effect of the number of previous seceding municipalities within State implies a significant increase in the probability of division in the actual municipality of 0.0006 for the full sample.[7] The increase in the secession's probability in the model can be calculated as $\ln(1/(1 - i))$. Therefore, the average value of i in our sample is approximately 0.006. This means that seceding municipalities within a state in the previous term influences the probability of creation of a new municipality in the next term and we estimate that for 10 municipalities created in the state, another one secedes in the next term on average.[8] For the finer sample the marginal effect on the probability goes to 0.0065, statistically significant no matter whether controls are used. This result suggests that for each municipality seceded in the previous term another will be created in the next term on average.[9]

Panel B brings information on whether the number of seceded municipalities in a previous term within a State can help to explain the observed seceding municipalities in the current term using OLS equation. Again, two samples are provided and the results are robust to any controls. For the full sample (columns 1 and 3), one obtains, approximately, that for each two additional municipality seceding within the State s in the previous period, another one secedes in the next term on average. That estimation goes to 1.5 if one considers the restricted sample(columns 2 and 4). Although qualitatively similar, our probit model suggests a neighbor's effect more sensitive than OLS counterpart. This could be explained by different functional forms, nevertheless, considering only significant robust estimates, our empirical model suggests that after between 1 to 1.5 secession within state, a new municipality is created in the next

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[7] That coefficient is estimated 0.0008 but not statistically significant when State controls are incorporated.

[8] We obtain this result by dividing the number of municipalities $(4,500)$ per state (26 excluding the federal district in Brazil) and then multiplying by 0.0006.

[9] A possible shortcoming is that these local municipalities observe the State fixed effect, not through their counterparts previous decisions to secede. In this case, a shock in that fixed effect would lead to a secession spur in those municipalities within that State. However, we test that alternative explanation by running the same regressions but replacing the number of secession in the previous period by the the ones in the current period. No effects are found. This refuses the idea that observable contemporaneous state shocks are the cause of our results.

term on average.[10] This corroborates our hypothesis that municipalities take into consideration their within State counterparts' decision to break up in a previous period which reinforces our theoretical predictions.

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[10]In other words, for each 10 municipalities seceded within a State in the previous period betweem 6 and 10 new ones are created in the next period.

Table 1: Empirical Results

Panel A - Probit Estimation	**D**ependent Variable: Seceding Municipality (Yes=1,No=0)			
Independent variable	**F**ull Sample	**A**fter 1993	**F**ull Sample	**A**fter 1993
Number of Seceding Municipalities in State (First Term after the Constitution) 1988-1992	0.0006***	0.0047**	0.00008	0.0065***
	(0.0001)	(0.0006)	(0.0001)	(0.001)
Municipalities Controls	*YES*	*YES*	*YES*	*YES*
States Controls	*NO*	*NO*	*YES*	*YES*
Observations	5.363	972	5.363	972
Adjusted R2	0.11	0.1	0.15	0.14

Panel B - OLS Estimation	**D**ependent Variable: Number of New Municipalities within State			
Independent variable	**F**ull Sample	**A**fter 1993	**F**ull Sample	**A**fter 1993
Number of Seceding Municipalities in State (First Term after the Constitution) 1988-1992	0.503***	0.739**	0.427***	0.876***
	(0.010)	(0.017)	(0.009)	(0.025)
Municipalities Controls	*YES*	*YES*	*YES*	*YES*
States Controls	*NO*	*NO*	*YES*	*YES*
Observations	5.363	972	5.363	972
Adjusted R2	0.49	0.76	0.73	0.8

Note: * means significant at the 10% level, ** at the 5% level and *** at the 1% level. In parentheses we report the standard errors. The Municipality controls are The Average Tax Revenue (1997-2000 - the first term after the end of incentives to breaking up municipalities), The Average Grants from States Government (1997-2000), The Average Grants from Federal Government (1997-2000), The Average Education and Culture Expenditure (1997-2000), The Average Health and Sewer Expenditure (1997-2000), The Average Legislative Expenditure(1997-2000), The Average Investment (1997-2000), The Municipality Population (2000), The Percentage of houses with power energy and TV (2000). The States controls are The Average Transportation Expenditure per capita (1989-1992), The Housing Expenditure per capita (1989-1992), The Average Health and Sewer Expenditure per capita (1989-2002), The Average Education and Culture Expenditure per capita (1989-2002), the Average Salary Expenditure per capita (1989-20002). Source of data: The Regional Electoral Courts (TREs) and IPEADATA (IBGE, The National Treasury).

5   Conclusion

This paper investigates the causes of municipalities secession in Brazil. The theoretical model proposes that the median voter is not fully informed about trade-off between the loss of scale in public production and increase in federal transfers received to his/her municipality and uses the break up decision undertaken by neighbor's municipalities within the state to account for his voting. We use Brazilian municipalities' creation occurred in the 90's where the inclusion of intergovernmental transfers as a benefit component after decentralization might seem to be a particular characteristic. After the implementation of 1989 Complementary Law, many municipalities requested their emancipation and the ones that succeeded observed a higher amount of intergovernmental transfers (see Bremakaer, 2001)).

Our results indicate that the break up decision undertaken by neighbor's municipalities within the state has a positive impact on the median voter's decision of the municipality analyzed. In particular we estimate that after ten secessions within state in the previous period one observes, in average, from 6 to 10 new municipalities within that State. This reinforces our theoretical predictions where local municipalities might not be fully informed on the State component of the local production function of the public good and seem to use the information on the neighbors municipalities to capture the State effect.

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Appendix

After observing i and knowing the distribution of i_n, define $Prob(s < 1 - i | i, i_n < 1 - s) = \Phi(i, i_n)$. Therefore, the probability of breaking up is:

$$Prob(p(yes) > p(no) | i, i_n < 1 - s) = \int_0^1 \Phi(i, i_n) di_n$$

As discussed in footnote 5:

$$\int_0^1 \Phi(i, i_n) di_n = (Prob(i_n \leq i)) \int_0^i \frac{1 - i}{1 - i_n} di_n + (Prob(i_n > i)) \int_i^1 1 di_n = -1(1-i)\ln(1-i_n)|_0^i + 1 - i$$

$$Prob(p(yes) > p(no) | i, s < 1 - i_n) = (1-i)(1 - i\ln(1-i))$$