The Incentive Effects of the Minnesota Fiscal Disparities Program on Tax Policy in Minnesota

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In this work, we provide a theoretical analysis and empirical evidence of the incentive effects of the tax base sharing program on property tax rates set by municipalities in the Twin Cities metropolitan area. We identify two incentive effects generated by this program: the equalization base effect and the revenue matching effect, and test their combined impact on local property tax rates. Our empirical analysis shows that cities and townships respond to the combined impact of these two effects by raising their property tax rates while counties and school districts do not.

INTRODUCTION

Intergovernmental equalization transfers are an important part of the fiscal decentralization system in many countries around the world. They are present both in federations and unitary states and affect regional as well as local governments. For example, such federations as Australia, Belgium, Canada, Germany, Russia, and Spain, and such unitary states as Japan, Scandinavian countries, and Ukraine extensively use equalization programs. Some supranational organizations like European Union also redistribute resources from its more economically prosperous to its less developed members. While the main purpose of such unconditional equalization grants is to make sure that all jurisdictions have comparable fiscal resources to provide a certain level of public services rather than altering their behavior, a number of researchers have been concerned with unintended incentives imbedded in such equalization programs that affect the recipient jurisdictions' tax policies. Another purpose that such transfers could serve is to achieve a Pareto efficient allocation in the presence of fiscally induced migration (Boadway & Flatters, 1982).

The most attention so far has been paid to the representative tax system-based equalization transfer program that redistributes resources among Canadian provinces. When studying this system, Courchene and Beavis (1973) conclude that there is plenty of room for the provinces to manipulate the system by adjusting their tax policies. Smart (1998) provides theoretical analysis showing that such a system may distort the equalized jurisdictions' tax policies by encouraging them to raise tax rates and follows up with empirical results showing that equalization grants in the Canadian equalization system cause recipient provinces to raise their tax rates and to magnify their increase in tax rates in response to tax competition (Smart 2007). Boadway and Hayashi (2001) demonstrate that in Canada when the average business tax rate goes up those provinces that receive equalization transfers are more likely to raise their business tax rates than those that do not, while Esteller and Sole Olle (2002) report a similar effect for Canadian personal tax rates. Snoddon (2003) shows that most recipient provinces that were excluded from the new

standard as a result of the 1982 equalization reform in Canada experienced growth in their own-source revenue. The latest development in the analysis of the effects of equalization grants in Canada on the recipient provinces' tax policy is provided by Ferede (2016) who demonstrates that equalization grants in Canada provide provincial governments an incentive to raise their business and personal income tax rates.

Also, Germany's equalization systems (both at provincial and local levels) as well as the one in Australian have been studied to identify their effects on the recipient jurisdictions' tax policies. Baretti, Huber and Lichtblau (2002) show that the German state's tax revenues are negatively affected by equalization transfers that are distributed among them based on the size of their tax revenues, concluding that this decrease in the tax revenues occurs due to a reduction in the tax enforcement activity by states caused by the incentives created by the equalization transfers. Dahlby and Warren (2003) investigate the effect of the Australian equalization system on their fiscal decisions and conclude that such effect is potentially significant for a number of taxes. Buettner (2006) reports that equalization grants induce higher business tax rates imposed by municipal governments in a German state.

In this work, we extend the scope of the previous research by studying the effects of equalization transfers distributed by the Fiscal Disparities program—the only major general purpose local property tax base sharing program in the US. The program has not received much attention from academics since it has been evaluated by Reschovsky (1980 and 1981) and Fox (1981) and represents an interesting case to study due to its unconventional structure and availability of a large dataset. Our main goal in this work is to analyze the program's mechanism, develop a theoretical model that allows us to come up with testable hypotheses, and provide empirical evidence of the incentive effects of equalization transfers distributed by the program on the recipient municipalities' tax policy using panel data from municipalities in the Twin Cities Metropolitan area over the period from 2000 to 2015. We focus on property tax rates as the per capita property tax base has been the major component of the equalization transfer allocation formula throughout the period under consideration. We use a theoretical framework—previously used by Wildasin (1989), Dahlby (2002), Buettner (2006), and Ferede (2016)—to show how the equalization base effect and the revenue matching effect of the program can influence the level of taxation imposed by a municipality if these effects reduce a municipality's perceived marginal cost of public funds.

As these two effects are closely correlated, in the empirical part of our work we estimate their combined impact on property tax rates imposed by municipalities in the Twin Cities metropolitan area. Our estimates suggest that a combined impact of both effects provide cities and townships with an incentive to raise their property tax rates.

Based on our empirical results, we conclude that if the tax base sharing program was abandoned or modified to eliminate the revenue matching effect to resemble the representative tax system-based equalization programs such as the ones used in Australia, Canada, and other countries, then local property tax rates imposed by local governments in the Twin Cities metropolitan area would be lower.

Description of the Program

The official statutory name of the program is the Charles R. Weaver Metropolitan Revenue Distribution Act, but it is mostly referred to as the Fiscal Disparities program. The program enacted in 1971 and began operation in 1974. The program affects all taxing jurisdictions (i.e., counties, cities, towns, school districts, and special taxing districts) located in the Twin Cities Metropolitan area with few exceptions. Initially, the objectives of the program included six components, three of which emphasized the goals of sharing, help, and establishing incentives for all parts of the area to work for the growth of the area as a whole, two others focused on a reduction of fiscal considerations on the location of businesses and protection of the environment, and one objective declared that resources should stay at the local level when redistributed. Currently, the two major goals of the program are stated as 1) promoting more orderly regional development, and 2) improving equity in the distribution of fiscal resources.

The program works as if 40 percent of all commercial-industrial property that developed in the jurisdiction since 1971 to the preceding year was removed from local taxing authority, accumulated in a pool, and then redistributed among jurisdictions. More specifically, every year for each municipality included in the program the auditor of each county in the area determines the difference in the net tax

capacity of commercial-industrial property subject to taxation in that municipality between the preceding year and the base year of 1971, $\Delta CINTC_{i,t} = CINTC_{i,t-1} - CINTC_{i,1973}$, where t indicates the year in which taxes from the tax base are payable, $CINTC_{i,t-1}$ and $CINTC_{i,1971}$ are the assessed value of industrial-commercial property that are subject to taxation in municipality i in year $t-1$ and in year 1971 respectively. Net tax capacity is taxable market value multiplied by the appropriate class rate specified in statute for the use classification of the property. For example, the commercial/industrial classification has a class rate of 1.5% for the first $150,000, and 2.00% over $150,000. There is a one year lag between the year when the tax base is assessed and the year when taxes from that base are payable. For the sake of consistency we are using the year when taxes are payable as a reference point for variables like tax bases, levies, and tax rates. No adjustments for inflation are made in these calculations. Forty percent of that change in the net tax capacity of commercial-industrial property constitutes the municipality's contribution to the areawide tax base or its contribution net tax capacity. This is what each municipality contributes to the areawide base in year t: $C_{i,t} = 0.4\Delta CINTC_{i,t}$. The sum of contributions by all municipalities determines areawide tax base, that is, the total size of the industrial and commercial tax base in the area that will be distributed among municipalities and be subject to taxation at the areawide tax rate t^* in year t: $C_t = \sum_{i=1}^{N} C_{i,t}$, where N is the number of municipalities included in the program.

On the distributional side of the program, there is a distribution index calculated for each municipality as $I_{i,t} = pop_{i,t-1} \frac{\overline{FC}_{i,t-1}}{\overline{FC}_{t-1}}$, where $pop_{i,t-1}$ and $FC_{i,t-1}$ are the municipality's population and fiscal capacity (per capita market value of real and personal property) in the preceding year, $t-1$, respectively, and $\overline{FC}_{t-1}$ is the average fiscal capacity across all municipalities in the area in the preceding year, $t-1$. The fiscal disparities contribution and distribution values and tax rates are based on the previous year for administrative reasons.

Each municipality's share in the areawide base determined in the current year, t, is calculated as the ratio of its distribution index value, $I_{i,t}$, and the sum of all index numbers for municipalities in the metro area:

$$S_{i,t} = \frac{I_{i,t}}{\sum_{i=1}^{N} I_{i,t}} \tag{1}$$

Accordingly, the dollar value of the share in the areawide tax base distributed to jurisdiction i in the current year is $D_{i,t} = s_{i,t}C_t$. Distribution net tax capacity, $D_{i,t}$, is taxed at the municipality's local property tax rate in the preceding year, $t_{i,t-1}$. The size of the areawide portion of the municipality's levy also called the municipality's distribution levy that determines the amount of revenue generated by the municipality's share in the areawide base C_t in year t is calculated as:

$$L_{i,t} = t_{i,t-1}D_{i,t} \tag{2}$$

This levy constitutes the equalization grant received by each municipality according to the program. The sum of those revenues, or levies, imposed on the areawide base by each municipality, $L_t = \sum_{i}^{n} L_{i,t}$, is used to calculate the areawide tax rate, $t_t^* = \frac{L_t}{C_t}$.

Each municipality's contribution, $C_{i,t}$, to the areawide base, C_t, is then effectively taxed at this areawide tax rate. This is achieved by separating each parcel of commercial-industrial property in two parts and taxing their assessed values at two different tax rates: the proportion of each parcel's assessed value that matches the proportion of the municipality's contribution to the areawide base in its commercial-industrial net tax capacity is taxed at the areawide tax rate, t_t^*, while the remaining part of the assessed value is taxed at the local tax rate, $t_{i,t}$.

By substituting (1) in (2), rearranging terms, and dividing (2) by the municipality' population we can express the size of the per capita equalization grant received by the municipality more explicitly:

$$g_{i,t} = \frac{\tau_{i,t-1}C_t}{FC_{i,t-1}\sum_{j=1}^{N-1}\frac{pop_{j,t-1}}{FC_{j,t-1}}+pop_{i,t-1}}$$
(3)

where all parameters in (3) are defined above.

Theoretical Model

Our theoretical model relies on the concept of the marginal cost of raising public funds employed previously by Wildasin (1989), Buettner (2006), Dahlby (2008), and Ferede (2016). Consider the tax policy of the local government of municipality i that is facing the following budget constraint in per-capita terms:

$$z_i = \tau_i B_i + g_i$$
(4)

where z_i is public spending, τ_i is the local tax on tax base B_i, and g_i is inter-governmental revenue. The tax base is mobile and is decreasing in the size of the tax rate. Private consumption, c_i, is positively related to the size of the tax base and, therefore, is decreasing in the amount of public services provided.

The government is assumed to maximize the utility of a representative household by figuring out which combination of public and private consumption to choose, and, therefore, at what level to set the tax rate. Following Buettner (2006) we assume a quasi-linear utility function maximized by the government,

$$u_i = c_i + \alpha_i \upsilon(z_i) \text{ , where } \upsilon' > 0, \upsilon'' < 0.$$
(5)

First, consider a case where there are no equalization transfers, that is, when g_i is zero and, therefore, $\frac{\partial g_i}{\partial \tau_i} = 0$ as well.

The following first order condition determines the optimal choice of the tax rate,

$$\alpha_i \upsilon'(z_i) = \frac{B_i}{B_i + \tau_i \frac{\partial B_i}{\partial \tau_i}}$$
(6)

that means that the marginal rate of substitution between public and private consumption equals the marginal rate of transformation or, in other words, that the marginal benefit from the public service equals the marginal cost of raising public funds.

Second, suppose that the jurisdiction receives per capita fiscal equalization transfer according to the distribution component of the equalization program defined according to (5) above but expressed in a more compact form:

$$g_i = \frac{\tau_i C}{a_i B_i + b_i}$$
(7)

where $a_i = \sum_{j=1}^{N-1} \frac{pop_j}{B_j}$, $b_i = pop_i$, and all other parameters are defined above.

Given this equalization grant, the first order condition for optimal tax policy above takes the following form:

$$\alpha_i \upsilon'(z_i) = \cfrac{1}{1 + \cfrac{\tau_i}{B_i}\cfrac{\partial B_i}{\partial \tau_i} - \cfrac{\tau_i}{B_i}\cfrac{\partial B_i}{\partial \tau_i}\cfrac{a_i C}{(a_i B_i + b_i)^2} + \cfrac{1}{B_i}\cfrac{C}{a_i B_i + b_i}} \tag{8}$$

This model indicates that the equalization transfers will affect local property tax rates: the higher the size of the redistributed property tax base pool, C, the higher will be local tax rates set by the recipient jurisdictions. To see this, we need to note that as long as, long as elasticity of the tax base with respect to the tax rate, $\frac{\tau_i}{B_i}\frac{\partial B_i}{\partial \tau_i}$, is negative, RHS of (8) is decreasing in C. Thus, as C is going up, the marginal cost of raising public funds is going down, dropping below the marginal benefit of public spending. According to the second-order condition, optimality can only be restored if the tax rate goes up.

Empirical Specification

The right side of (8) represents marginal cost of public funds, MCF. Thus, the perceived MCF is equal to the following:

$$MCF_i = \cfrac{1}{1 + \cfrac{\tau_i}{B_i}\cfrac{\partial B_i}{\partial \tau_i} - \cfrac{\tau_i}{B_i}\cfrac{\partial B_i}{\partial \tau_i}\cfrac{a_i C}{(a_i B_i + b_i)^2} + \cfrac{1}{B_i}\cfrac{C}{a_i B_i + b_i}} \tag{9}$$

The first two sets of terms in the denominator of (9) show how a tax rate change affects the municipality's own source revenues, the third set of terms shows how it affects its equalization transfer by inducing changes in the size of its tax base, and the fourth set of terms shows how a tax rate change affects the municipality's revenues generated by its distribution tax base.

By keeping in mind that the municipalities' fiscal capacity is equivalent to their per capita property tax base, we can come up with the following way to express marginal cost of public funds that each municipality is dealing with:

$$MCF_i = \cfrac{1}{1 + \cfrac{\tau_i}{FC_i}\cfrac{\partial FC_i}{\partial \tau_i} - \cfrac{\tau_i}{FC_i}\cfrac{\partial FC_i}{\partial \tau_i}\cfrac{a_i C}{(a_i FC_i + b_i)^2} + \cfrac{1}{FC_i}\cfrac{C}{a_i FC_i + b_i}} \tag{10}$$

In this form, each term in the denominator is easy to interpret: the second one is elasticity of the tax base with respect to the tax rate, the third one is the product of elasticity of fiscal capacity with respect to the property tax rate and the absolute value of the responsiveness of the per capita distribution commercial-industrial tax base, y, to changes in the municipality's fiscal capacity, FC:

$$\frac{dy_{i,t}}{dFC_{i,t-1}} = -\cfrac{C_t}{\left(FC_{i,t-1}\sum_{j=1}^{N-1}\frac{pop_{j,t-1}}{FC_{j,t-1}} + pop_{i,t-1}\right)^2}\sum_{j=1}^{N-1}\frac{pop_{j,t-1}}{FC_{j,t-1}} \tag{11}$$

and the fourth term is the ratio of per capita distribution commercial-industrial net tax capacity to the municipality's fiscal capacity.

In our empirical analysis, we assume that elasticity of the fiscal capacity with respect to the property tax rate in the area is constant and focus on the responsiveness of the distribution commercial-industrial tax base to changes in the municipality's fiscal capacity (the equalization base effect), (11), and the ratio of the municipality's per capita distribution net tax capacity to its fiscal capacity (the revenue matching effect). Assuming that elasticity of fiscal capacity with respect to the property tax rate is negative, the larger each of these two parameters are, the smaller the municipality's MCF is, and, thus, the larger is the property tax rate that it is going to impose on its net tax capacity. Thus, we expect to find a positive

relationship between the municipalities' property tax rates and both the equalization base and the revenue matching effects.

The logic behind the way that these two effects work is quite intuitive. The larger the equalization base effect that a municipality is dealing with is, the higher is the value of the per capita distribution tax base that it gets for every dollar in its fiscal capacity lost. Thus, the larger the equalization base effect is, the larger is the cushioning effect that compensates the municipality for the loss in its tax base that shrinks in response to higher local property taxes, and, therefore the more likely it is for a municipality to raise its tax rate. Also, the larger the ratio of the per capita distribution tax base to the municipality's fiscal capacity is, the higher is the proportion of resources that the municipality receives in the form of transfers without imposing any tax burden on local property tax bases at any given local property tax rate. Effectively, this mechanism works as a tax revenue matching grant that matches every dollar collected from the local tax property base with a certain amount in transfers.

A closer look at the equalization tax base effect and matching effect reveals that these two effects are closely correlated, and, therefore, separating an impact of each effect on tax property tax rates empirically is not feasible. Instead, we focus on identifying the joint impact of these two effects by leaving only one effect, that is, the revenue matching effect, in our model. Accordingly, our empirical analysis of the effects of equalization grants on property tax rates can be specified as:

$$\tau_{i,t} = (ME_{i,t}; FC_{i,t}, POP_{i,t}, \psi_i, \phi_t) \tag{12}$$

where $ME_{i,t}$ is the revenue matching effect, $FC_{i,t}$ is fiscal capacity, $POP_{i,t}$ is population of municipality, while ψ_i captures a location-specific effect and ϕ_t capture a time specific effect.

Another way to express the empirical specification is:

$$\tau_{i,t} = \alpha + \beta_1 ME_{i,t} + \beta_2 FC_{i,t} + \beta_3 POP_{i,t} + \varepsilon_{i,t} \tag{13}$$

In this work, the source of empirical variation in fiscal incentives across municipalities and time occurs due to the variations in those factors that determine the incentives as one can see in (11): fiscal capacity, population, and the amount of the commercial-industrial property values that gets distributed among municipalities. While pursuing this approach, as indicated by Buettner (2006), one has to deal with a major challenge of separating the incentive effects generated by the fiscal equalization system from other characteristics that affect local tax policy while remaining unobserved. The problem is that variations in incentives are affected by variations in fiscal capacity that in its turn is influenced by variations in those unobserved variables that affect tax policy. To put it differently, by choosing higher tax rates municipalities tend to suppress their tax bases which in its turn results in higher incentive effects generated by the equalization program. Thus, under the circumstances it is not that only the incentives effects influence local tax rates, but local tax rates affect tax bases, and, as a result, the incentives as well. As we cannot possibly control for all determinants of local tax policies, it is necessary to come up with a technique that allows to prevent an overestimation of the causal effect of the incentives on local tax rates.

Keeping these concerns in mind, Buettner (2006) uses two alternative approaches: first, exploiting the fact that the incentives vary discontinuously with the underlying fiscal conditions and, second, relying on the variation of incentives due to changes in policy. Ferede (2016) relies on a discontinuity in the grant allocation at the cutoff point where the per capita fiscal capacity of a province is equal to the standard provinces' average fiscal capacity as a province is entitled to receive equalization grants only if its per capita fiscal capacity is below that number.

Due to the way that the Fiscal Disparities program is designed, neither of these approaches are available. In particular, all municipalities receive certain amount of the equalization grant, no matter how high their fiscal capacity is, and, therefore, there is no clear cutoff that would allow to take advantage of discontinuity. Instead, similar to Bania and Gray (2007), Green, Malpezzi and Mayo (2005), and

Spilimbergo (2009), we are relying on replacing a suspected simultaneously-determined explanatory variable with its lagged value.

DATA AND EMPIRICAL RESULTS

In our empirical analysis, we use a dataset obtained from Minnesota Department of Revenue. All variables are reported in their relation to cities and townships of the Twin Cities metropolitan area of Minnesota, US. The dataset includes observations for years 2000-2015. Table 1 provides some descriptive statistics.

TABLE 1
DESCRIPTIVE STATISTICS, 2000-2015

Variables	Mean	Standard deviation	Minimum	Maximum
Average effective local property tax rate, counties (in %)	38.0	8.81	23.0	65.2
Average effective local property tax rate, cities and townships (in %)	31.9	17.33	.5	125.2
Average effective local property tax rate, school districts (in %)	29.6	12.15	8.3	81.5
Average effective local property tax rate, special taxing districts (in %)	5.9	2.48	2.1	14.6
Equalization base effect	0.124	3.14	0	0.671
Revenue matching effect	0.121	0.126	0	0.635
Fiscal capacity (in $)	118,302	71,108	17,529	590,758
Population	15,580	38,429	97	400,938

In Table 1, property tax rates and other variables for all types of municipalities are reported for 178 cities and townships for years 2000-2015. There is a slight variation in this number as some cities and townships were merging and separating from each other over the time period.

The data are used to compute the average effective property tax rates for each type of municipality as the ratio of the municipality's levy to its total taxable net tax capacity. To interpret the magnitude of the tax rates properly, one should keep in mind that net tax capacity is calculated by multiplying taxable market value by the appropriate class rate determined according to classification of the property. As most class rates vary around 1.00%, to get an idea what the magnitude of these tax rates is in relation to taxable market value, they should be divided approximately by 100.

Fiscal capacity of a municipality is calculated as its real and personal taxable market value divided by its population. The areawide base for each year is calculated as the sum of fiscal disparities distribution net tax capacity for all municipalities in the area. The tax revenue matching effect is calculated as a share of the distribution net tax capacity to the total taxable net tax capacity and the base effect is calculated as (11). A closer look at these two variables show that there are two obvious outliers: over the 16 years of observations the Fort Snelling's base effect and revenue matching effect averages are 8.212 and 1.385, and Hilltop City's base effect and revenue matching effect averages are 27.9 and 1.221, while the third largest averages for the base effect and the revenue matching effect are only 0.416 and 0.421 respectively.

In fact, observing a base effect value that exceeds unity can be considered as an equalization anomaly because when the absolute value of (11) exceeds 1, a one dollar increase in the municipality's fiscal capacity results in a more than one dollar decrease in the distribution tax base that it receives according to

the program. In particular, in case of Fort Snelling, whose base effect average for the observed time period of 16 years is 8.212, a one dollar drop in its fiscal capacity is supposed to produce an eight dollar increase in the distribution tax base, and, vice versa, a one dollar increase in its fiscal capacity is supposed to result in an eight dollar decrease in the distribution tax base. Thus, we can conclude that for municipalities with very low fiscal capacity the program creates anomalously strong incentives to raise their tax rates and suppress their own fiscal capacity to gain more transfers in revenue when taxing the distribution tax base.

   Tables 2 and 3 show the regression results for property tax rates for three types of local governments: cities and townships, counties, and school districts. Our main focus as in Buettner (2006) is on cities and townships. The basic estimation follows (13) and we use a fixed effects approach to control for municipality and time effects while focusing on the variation of incentives within groups of observations. We also use year dummy variables, but do not include them in the table for the sake of briefness.

TABLE 2
PROPERTY TAX RATE REGRESSIONS, 2000-15:
NO LAG IN REVENUE MATCHING EFFECT

Variable/Dependent Variable	City/ Township rates	County rates	School district rates
Revenue matching effect (no lag)	29.1*	0.04	4.18
	(5.09)	(2.03)	(4.22)
Fiscal capacity ($1000)	-0.027*	-0.0002	-0.005
	(0.006)	(0.0024)	(0.005)
Distribution NTC per capita, $	0.026*	0.026*	0.01
	(0.157)	(0.006)	(0.013)
Share of Contribution NTC in Total NTC	50.6*	13.3*	-2.7
	(7.9)	(3.16)	(6.58)
Population (1000 people)	-0.02	-0.001	0.155*
	(0.06)	(0.024)	(0.05)
Sample size	2,838	2,839	2,839
R^2	0.4905	0.1964	0.4819

   *Significance at 5% level is marked with an asterisk

TABLE 3
PROPERTY TAX RATE REGRESSIONS, 2000-15:
ONE YEAR LAGGED REVENUE MATCHING EFFECT

Variable/Dependent Variable	City/ Township rates	County rates	School district rates
Revenue matching effect	31.7*	2.41	4.9
(one year lag)	(3.43)	(1.37)	(4.22)
Fiscal capacity	-0.011*	-0.0003	0.004
($1000)	(0.006)	(0.0022)	(0.004)
Distribution NTC per	0.047*	0.022*	0.023*
capita, $	(0.011)	(0.0043)	(0.008)
Share of Contribution	66.1*	12.2*	-6.1
NTC in Total NTC	(8.14)	(3.26)	(6.4)
Population (1000 people)	-0.02	-0.01	0.13*
	(0.07)	(0.027)	(0.05)
Sample size	2,658	2,659	2,659
R^2	0.4968	0.1898	0.3429

*Significance at 5% level is marked with an asterisk

Table 2 presents the results received when using the same year revenue matching effect, and Table 3 presents the results when using the one year lagged revenue matching effect. In either case the sign of the coefficient that measures an impact of the revenue matching effect on cities and townships' property tax rates is in accordance with the theoretical expectations as the revenue matching effect is associated with a higher property tax rate as predicted by our theoretical model. According to the adjusted R^2, both specifications show very similar fit, while the magnitude of both coefficients showing the impact of the revenue matching effect faced by cities and townships in the area are very similar as well: 29.1 when using the same year revenue matching effect, and 31.7 when using the revenue matching effect that is lagged by one year. These results indicate a substantial effect of fiscal equalization provided by the program when it comes to local property taxes imposed by cities and townships, suggesting that for this type of municipalities an increase in the revenue matching effect by 1 percentage point is associated with an increase in the local property tax rates by approximately 0.3 percentage points.

For the county and school district property tax rates the coefficients measuring an impact of the revenue matching effect are not significantly different from zero in either specification. That suggests that counties and schools districts do not respond to the incentives generated by the program that are supposed to affect municipalities' tax policies like cities and townships. Why it is the case is an interesting question and we leave it for further research.

Aside from the revenue matching effect, which is the key variable of interest in our analysis, we control for a number of other relevant variables: fiscal capacity, per capita distribution net tax capacity, share of contribution net tax capacity in total net tax capacity, and population. Coefficients for all these variables in our model are significantly different from zero. The coefficient for fiscal capacity is negative which is consistent with an expectation that municipalities with larger own tax base can afford to keep their tax rates relatively low while maintaining their public services at a reasonable level. Per capita distribution net tax capacity produces a positive, even if a small effect, on local property taxes imposed by cities and townships as well as on those imposed by counties, but its effect is insignificant for school district property tax rates. The share of contribution net tax capacity in total net tax capacity positively affects city and township property tax rates and to a smaller extent county property tax rates. It probably indicates that municipalities to a certain extend are making up for the lost tax base by raising their

property tax rates. The population size does not seem to have any effect on the city and township property tax rates but does affect school district rates in a positive way.

CONCLUSION

As a general design of the Fiscal Disparities tax base sharing program implemented in the Twin cities metropolitan area of Minnesota is similar to a number of other general equalization programs around the world, it is a subject to similar concerns that have been expressed about such programs, in particular their tendency to influence the recipient jurisdictions' taxing policies resulting in higher tax rates. While applying the concept of the marginal cost of raising public funds in our theoretical model, we identify two effects produced by the model that are likely to create incentives for the recipient municipalities to raise their property tax rates: the equalization base effect and the revenue matching effect. The former has been identified in other equalization programs, such as the representative tax system-based equalization transfer programs implemented in Australia and Canada, while the latter is a unique feature of the Fiscal Disparities program. As these two effects are very closely correlated, we set our empirical goal to estimate their joint effect.

In our empirical analysis, we use data over the period from year 2000 to 2015 to investigate a combined impact of these two effects on property tax rates set by three types of local governments: cities and townships, counties, and school districts. The empirical results that we receive for city and township property tax rates are in agreement with theoretical predictions as we find the impact of the revenue matching effect to be both statistically and economically significant: according to our estimates, an increase in the revenue matching ratio by 1 percentage point is associated with an increase in the city and township property tax rates by approximately 0.3 percentage points. Meanwhile, county and school district property tax rates do not seem to respond to the incentives created by the program: our empirical results show that the coefficients that measure the impact of the revenue matching effect on property tax rates imposed by these two types of municipalities are not significantly different from zero. Why it could be the case is an interesting question and we leave it for further research.

Based on these findings, as in case of some other equalization programs discussed in the literature, one might argue that if the Fiscal Disparities program was eliminated, the local property tax rates in the Twin cities metropolitan area would be lower. However, whether such a reduction in local property tax rates is desirable or not depends on one's view on the efficiency of the system of local taxation. If local property tax rates are believed to be too low to begin with (for example, as a result of the competitive pressures on local governments to lower tax rates to attract mobile tax bases) then the program should be left intact and probably some additional measures to encourage an increase in local tax rates could be considered. On the contrary, if local property tax rates are believed to be efficient in the absence of the tax base sharing program, then its impact on local property tax rates reduces efficiency, and in such a case eliminating the program would have a positive effect on efficiency.

In the latter case, a less drastic alternative to a complete elimination of the program is an elimination of the revenue matching effect, which can be achieved by replacing municipalities' own property tax rates as a parameter that determines the size of their equalization transfers when those tax rates are applied to their distribution net tax capacity, with some sort of a standard tax rate that is determined exogenously and cannot be affected by the municipalities. Such a modification would take away from the municipalities an opportunity to tax the base outside of their jurisdictions, thus, exporting their tax burden bringing the Fiscal Disparities program closer to other equalization programs like the ones used in Australia, Canada, and Germany.

REFERENCES

Bania, N., Gray, J. A., & Stone, J.A. (2007). Growth, Taxes, and Government Expenditures: Growth Hills for U.S. States. *National Tax Journal*, LX, 193-204.

Baretti, C., Huber B., & Lichtblau, K. (2002). A Tax on Tax Revenue: The Incentive Effects of Equalizing Transfers: Evidence from Germany. *International Tax and Public Finance*, 9, 631-649.

Boadway, R., & Flatters, F. (1982). Efficiency and Equalization Payments in a Federal System of Government: A Synthesis and Extension of Recent Results. *Canadian Journal of Economics*, 15, 613-633.

Boadway, R., & Hayashi, M. (2001). An Empirical Analysis of Intergovernmental Tax Interaction: The Case of Business Income Taxes in Canada. *Canadian Journal of Economics*, 34, 481-503.

Buettner, T. (2006). The Incentive Effect of Fiscal Equalization Transfers on Tax Policy. *Journal of Public Economics*, 90, 477-97.

Card, D., & Payne, A. (2002). School Finance Reform, the Distribution of School Spending, and the Distribution of Student Test Scores." *Journal of Public Economics*, 83, 49-82.

Courchene, T., & Beavis, D. (1973). Federal-provincial Tax Equalization: An Evaluation. *Canadian Journal of Economics*, 6, 483-502.

Dahlby, B. (2002). The Incentive Effects of Fiscal Equalization Grants. In Boothe P. (Ed.) *Equalization: Welfare Trap or Helping Hand?* Halifax Nova Scotia: Atlantic Institute for Market Studies.

Dahlby, B. & Warren N. (2003). The Fiscal Incentive Effects of the Australian Equalization System. *Economic Record*, 79, 434-45.

Dahlby, B. (2008). *The Marginal Cost of Public Funds: Theory and Applications*, Cambridge, MA: MIT Press.

Ferede, E. (2016). The Incentive Effects of Equalization Grants on Tax Policy: Evidence from Canadian Provinces. *Public Finance Review*, 45,(6), 723-747.

Fox, W. (1981). An Evaluation of Metropolitan Area Tax Base Sharing: A Comment. *National Tax Journal*, 24, 275-9.

Green, R.K., Malpezzi, S. & Mayo, S.K. (2005). Metropolitan-Specific Estimates of the Price Elasticity of Supply of Housing, and Their Sources. *American Economic Review*, 95, 334-339.

Reschovsky, A. (1980). An Evaluation of Metropolitan Area Tax Base Sharing. *National Tax Journal*, 23, 55-66.

Reschovsky, A. (1981). An Evaluation of Metropolitan Area Tax Base Sharing: Reply. *National Tax Journal*, 26, 58-62.

Smart, M. (1998). Taxation and Deadweight Loss in a System of Intergovernmental Transfers. *Canadian Journal of Economics*, 31, 189-206.

Snoddon, T. (2003). On Equalization and Incentives: An Empirical Assessment. Discussion Paper, Wilfrid Laurier University, Waterloo, Canada.

Smart, M. (2007). Raising Taxes through Equalization. *Canadian Journal of Economics*, 40, 1188-212.

Spilimbergo, A. (2009). Democracy and Foreign Education. *American Economic Review*, 99, 528-543.

Wildasin, D. (1989). Interjurisdictional Capital Mobility: Fiscal Externality and a Corrective Subsidy. *Journal of Urban Economics*, 25, 193-212.