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The Effect of Intergovernmental Aid on City Property Taxes: New Results for Minnesota

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THE EFFECT OF INTERGOVERNMENTAL AID ON CITY PROPERTY TAXES: NEW RESULTS FOR MINNESOTA

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ABSTRACT. An earlier study found that certain Minnesota state aid programs stimulated city property tax levies to a high degree. If this is accurate, it suggests potentially serious problems with state property tax relief efforts. This article re-examines this question and finds that most aid programs have little direct effect on property tax levies. However, certain aid formulas that reduce the effective price of property taxes do indirectly stimulate property taxes. Therefore, states need to be careful in designing aid programs intended to reduce property taxes.

INTRODUCTION

In presenting results on the different effects of Minnesota state aid programs, Bell and Bowman (1987) found that a state homeowner property tax credit had a stimulative effect on city property tax levies while state lump-sum aid to cities had a positive but insignificant effect on tax levies. They argued that this result was due in part to the substitution and income effects of the former program in contrast to the income effect of the latter. The irony of these findings is that both

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programs have property tax relief as their goal, but instead apparently stimulate higher property taxes. Bell and Bowman (1987: 293) wrote, "These findings are consistent with the notion that a bloating of the public sector results from divorcing the pain of taxation from the pleasure of spending."

Their findings are important for policy design. If policies designed to reduce local property taxes have the perverse effect of increasing them, then this suggests a serious need for reform. More generally, findings that aid programs have varying fiscal impacts may suggest ways that policymakers can fine-tune the grants-in-aid system to get the results they seek.

This paper re-examines Bell and Bowman's results for Minnesota and extends and corrects their work. Then a simultaneous equation model is presented to allow more detailed examination of city fiscal response to aid. This paper proceeds as follows: first the aid programs are described, followed by a literature review. Then the relevant variables are operationalized, the econometric issues are discussed and Bell and Bowman's model is re-estimated. Then a comprehensive model of city budgets is estimated, followed by a conclusion.

DESCRIPTION OF THE AID PROGRAMS

Several aid programs are examined here. Minnesota's local government aid program (LGA) is a form of lump-sum aid that attempts to substitute state resources for local property taxes, and to distribute funds to counter disparities in local tax effort and tax capacity (Bell, 1986). In fiscal year 1987, cities received $296 million from this program, about $69 per capita (Carlson, 1988). Until 1988, the homestead credit directly reduced homeowners' property tax bills by 54% up to a $700 maximum. The state reimbursed local taxing authorities for the tax relief. This aid is effectively a form of matching aid for the entire budget of local governments. The program cost the state $582 million in fiscal year 1987, or $137 per capita. Cities received $116 million of the total (Carlson, 1988; Minnesota Department of Revenue, 1987). In 1988 the Minnesota Legislature changed the homestead credit design, rolling the credit into the state property tax classification system. As a

result, the credit is now part of a more generous calculation of the taxable valuation of homes, and so no longer has the matching aid effect.

Minnesota's property tax refund, or "circuit breaker" program is paid to both homeowners and renters based on their household income and property tax paid. The program acts as a refund where the state sends the claimant a check for property taxes already paid. In fiscal year 1987 total payments were $156 million or $37 per capita (Minnesota Department of Revenue, 1987).

Minnesota state highway aid is distributed to municipalities based on population and need, as determined by the Minnesota Department of Transportation. Other state and local aid to cities fund police, fire, airports, community development, health, project grants, and aid to cities in taconite mining areas.

Federal aid is composed of many different aid programs. Two of the largest during this period for these cities are general revenue sharing (GRS) and community development block grants (CDBG). Other federal aid includes grants for sewage, airports, health and project grants.

LITERATURE REVIEW

Bell and Bowman (1987) examined the effect of aid on local property tax levies. They found that total federal aid was significant, ranging from .11 to .16 in three specifications. State LGA was positive but not significant and the homestead credit was significant, ranging from 1.14 to 1.33.

There are relatively few articles focusing on state intergovernmental aid other than Bell and Bowman's. Most examine the effect of aid on spending rather than taxes. Ladd and Yinger (1989) looked at the spending effect of total state aid on several U.S. cities and reported a significant .32 effect on current city spending. Simonsen (1994) found that a state aid variable consisting largely of highway aid had no effect on either capital or current spending for Oregon cities.

A few studies have looked at the effect of state aid on the revenue side. Stine (1994) found that increases in total state aid (mostly matching categorical aid) had no significant effect on either own-source revenues

or property taxes for Pennsylvania counties. However the aid response was asymmetric; aid increases had no effect but aid decreases were associated with an increase of .19 in local own-source revenue and .09 in property taxes. Examining a pooled data set of 39 U.S. cities over 17 years, Bartle (1995) found that state general purpose aid reduced city property taxes by .43 per dollar of aid and increased capital spending by .18. Categorical state aid caused a small (.07) increase in city non-property taxes and increased both current (.72) and capital (.12) spending for a total spending increase of .84.

With the exception of the Bell and Bowman article, the effect of aid on revenues ranged from .07 to -.43 and the effects of aid on spending ranged from zero to .84. The positive effect of aid on property taxes that Bell and Bowman found differs from most other findings. In particular, the coefficients for the homeowner credit are very high.

OPERATIONALIZING THE MODEL

Following Bell and Bowman, the dependent variable for the first two models is city net property tax levy per capita (NPTLPC), which is the city tax levy net of the homestead credit amount received by the city. The third model is a simultaneous equation model with five different dependent variables.

Drawing from Inman (1979), a median voter model is derived demonstrating the effect of each of these aid programs on both the full fiscal income and the tax price of the median voter.[1] These two variables in turn affect the demand for public goods and hence the tax levy. Other variables influencing city tax levy are: the preferences of the median voter, before-tax income, and resident share of the property tax base.

Aid Variables

In this model, aid programs affect net city levy either through the tax price of the median voter or her full fiscal income. The matching or refund percentages of the homestead credit, circuit breaker and other matching aid affect tax price, while the dollar amount of these and other aid programs affect full fiscal income.

Lump sum aid affects only the income of the median voter. It is represented here by two programs, the per capita amount received from Minnesota's LGA program (LGAPC) and the per capita amount of state highway aid received (HYRPC). The state highway aid formula is based on demographic and other variables and so is essentially a type of lump sum aid. The predicted effect of lump sum aid on both public and private goods is positive. Public goods can be increased by increasing city spending while an increase in spending on private goods requires a tax reduction. Where net property tax levy is the dependent variable, the expected coefficients for lump sum aid programs is negative. It is possible that they might be zero, which implies that all of the aid funds the other portions of the budget: spending and non-property tax relief. It is not expected that the coefficients would be positive. This would imply that the full amount of the aid plus the added amount indicated by the positive coefficient is funding spending and non-property tax relief.

The effect of the homestead credit on the median voter's income is captured by the variable CREDPC, per capita homestead credit payments to the city. Like lump sum aid, it is expected to have a negative effect on the net city tax levy because city taxes must be reduced for this aid to fund private spending. The effect of the credit on tax price is discussed below. Circuit breaker payments net out the homestead credit received by homeowners. The variable CBNETPC is the per capita amount of these payments to city residents. The anticipated effect of the circuit breaker is different from that of other aid programs. Since this refund is paid directly to individuals rather than to the city, it should have a positive effect on taxes of between zero and one and a similar impact on spending.

Per capita amounts of other aid programs are represented by two variables: federal aid (FAIDPC) and other state and local aid (OTHRPC), each representing several aid programs which are both matching and non-matching in nature. While the matching aid programs affect tax price, data on the collective effect of their matching rates are not available and so are not included in the tax price variable. Instead these variables represent both the income and price effect of the aid. Thus, their effect on city tax levies should be higher than that of lump sum aid. Where the matching aid rates are high, these coefficients may be zero or positive.

Tax price is affected by the homestead credit percentage and the circuit breaker refund percentage. The tax price variable is constructed as follows:

$$PRICE = 1 - [(.54 * PHBMC) + (CBNET/CBQTAX)]$$

where 0.54 is the portion of the property tax bill paid by the state (up to the maximum),
PHBMC is the percentage of homes below the maximum credit,
CBNET is the net amount of circuit breaker payment to city residents and CBQTAX is total qualifying property tax payments (including rent).[2]

PRICE measures the combined effective subsidy rate for both aid programs, inclusive of both renters and homeowners. It uses the citywide average tax price as the price facing the median voter, although any particular person in the city may face a different tax price. It is hypothesized that PRICE will have a negative influence on net property tax levies.[3]

Other Variables

Following Bell and Bowman (1987), and Bradbury, Ladd, Perrault, Reschovsky and Yinger (1984), the preferences of the median voter are operationalized using several variables to represent the demand or preferences of the median voter. POLD is the percentage of the city population over 65 years of age and PYOUNG is the percentage under 18. PPOOR is the percentage under the poverty level and POWNOC is the percentage of occupied housing units that are owner occupied.[4] It is expected that cities with high proportions of population groups benefiting disproportionately from municipal services, such as children, may have greater demands on local spending and taxes, while cities with populations benefiting less, such as the elderly, would demand lower taxes and services. Thus PYOUNG should have a positive effect on spending and taxes while POLD should be negative. Homeowners feel the property tax more directly than do renters, so POWNOC should have a negative influence on property taxes. The influence of the poor on city taxes and spending is unclear due to two conflicting considerations. On the one hand they probably need a higher level of services, but on the

other they may be less able to pay for these services. Thus the sign for this variable is ambiguous.

Before-tax income is represented by per capita income (PCINC), which should have a positive effect on the tax levy. The influence of the resident's share of the property tax base is captured in the variable OMEQPC. This variable measures the per capita amount of property taxes that would be raised by one mill, and is expected to have a positive coefficient. No variable is included for the cost of local public goods here; it is assumed to be constant across these cities during this time period.

The effect of tax exporting is included here, following Bell and Bowman. They hypothesized that cities with higher percentages of taxable property value in commercial and industrial property would be able to "export" part of the property taxes on this property, thus creating a positive influence on city property taxes. The same question is analyzed here using the variable COMBAS, a measure of the composition of the property tax base.[5]

ECONOMETRIC ISSUES

Bell and Bowman (1987) presented three different specifications for 1983. The aid effects have been noted above. In addition, they found that property tax capacity was positive and significant in each case. The property tax base composition variable gave mixed evidence of tax exporting. The influence of their tax price variable was negative as expected. The results for the demographic variables found PYOUNG to be positive and generally significant, POLD to be insignificant, POWNOC to be negative and significant, and PPOOR to be positive and significant. These influences are generally consistent with the expected signs.

Gramlich (1970) has warned of two econometric problems in research on intergovernmental grants. First is the choice between cross-section and time-series data sets. In cross-section studies the structure may not be constant across the units of observation and also the study may be unduly influenced by the choice of the time period. Gramlich (1970: 579) suggests, "[a] good way to circumvent the latter problems

is to estimate pooled, cross-section regressions." Second, he points out the potential for simultaneous equation bias. "It is certainly true that grants affect state and local expenditures, but it may also be true that expenditures affect grants" (Gramlich, 1970: 581). He suggests using either instrumental variables or simultaneous equation systems to address this problem. He points out that both of these problems are likely to lead to overestimates of the effect of grants.

The Bell and Bowman (1987) study is open to both of these challenges. First, it is a cross-section study for 1983 only. Second, some of the aid programs examined are, by design, related to city tax levies. In particular, it has been suggested that because the formula for the distribution of LGA and the homestead credit is based in part on city tax levies, any correlation between levies and aid is a result of these formulas rather than behavioral responses to the programs.[6] This may also be true for the circuit breaker variable because local governments and taxpayers may take the refund into account when making their decisions about local taxes. Further, the circuit breaker, state highway aid and other state aid were omitted from the Bell and Bowman study. The excluded variables should be included to eliminate the possibility of specification bias. Therefore in re-estimating Bell and Bowman's equation, careful examination of the problems of the stability of the cross-section estimates, simultaneity and specification bias need to be done.

The data source used here is the same, the cities included are almost identical and the time period of this study is 1984 to 1988 while Bell and Bowman used 1983. Because of the time element introduced, all fiscal variables are in real dollars per capita.[7]

The equations were initially estimated in separate cross-sections, but because the parameter estimates were relatively stable, it was appropriate to pool the data. This yielded substantially higher F-values and lower standard errors. In a pooled model, one option is to add dummy variables for time and space, transforming the model into a fixed effects model. Some testing of these models was done, but in the end a model without any dummy variables was chosen. The dummy variables for the years were not significant. When dummy variables were added for the cities, the adjusted R-squared rose from .602 to .957 indicating that a

substantial improvement in explanatory power was possible. However, this model changed the signs of PYOUNG and PRICE in unanticipated directions and rendered several of the other variables insignificant. Therefore, the more parsimonious yet powerful model without dummy variables was accepted.

To address the problem of simultaneity, instrumental variables were created for CREDPC, LGAPC and CBNETPC using exogenous variables. The instrument for the credit variable (CREDIVPC) was constructed with total residential market value and the percentage of the homes below the maximum credit. The instrumental variable for LGA (LGAIVPC) was created with three exogenous variables related to the aid formula: total city taxable value, population and population squared. The circuit breaker instrumental variable (CBIVPC) was constructed with two variables that are part of the aid formula: the number of filers and the qualifying property tax amounts for the refund.

RESULTS

Table 1 presents two sets of results. Model 1 is a pooled model very similar to Bell and Bowman's model. It shows a positive and significant effect of OMEQPC as expected. For the aid variables, FAIDPC is not significant, while both LGAPC and CREDPC are positive and significant. CREDPC is especially high, at 1.277. Both coefficients are quite close to those estimated by Bell and Bowman, although LGA was not significant and FAIDPC was significant in their research. The coefficient for PRICE is negative and significant as predicted. For the demographic variables, POWNOC takes the expected negative sign, indicating the relative reluctance of homeowners to choose higher property taxes. PYOUNG is positive and significant as expected, while POLD is insignificant. PPOOR, whose predicted sign was ambiguous, is positive and significant. Finally, COMBAS, the tax exporting variable, is positive and significant as predicted.

In another regression, the instrumental variables for LGA and the credit were introduced with no other changes. The homestead credit coefficient changed from 1.277 to -.161, significant in both cases, while the LGA coefficient changed in value from .174 to -.345, again significant in both cases. These changes in sign reverse the earlier

TABLE 1
Two Models Explaining Net Property Tax Levy Per Capita

	Expected Sign	Model 1	Model 2
Intercept		-52.245*	-8.880
		(19.750)	(40.022)
OMEQPC	+	15.703*	19.262*
		(.477)	(1.843)
FAIDPC	0/+	.012	.055
		(.012)	(.045)
LGAPC/LGAIVPC	-	.174*	.055
		(.053)	(.157)
CREDPC/CREDIVPC	-	1.277*	-.234
		(.116)	(.227)
CBIVPC	+	--	.374*
			(.185)
HYRPC	-	--	-.020
			(.100)
OTHRPC	0/+	--	.130
			(.124)
PRICE	-	-41.020*	-71.721*
		(7.822)	(24.795)
PCINC	+	--	-4.326*
			(1.427)
POWNOC	-	-.764*	-.080
		(.167)	(.384)
PYOUNG	+	2.220*	1.377*
		(.323)	(.671)
POLD	-	-.074	.946
		(.255)	(.489)
PPOOR	?	2.676*	1.931*
		(.386)	(.771)
COMBAS	+	.603*	.174
		(.144)	(.280)
N		880	311
R-squared		.6061	.5143
Adjusted R-squared		.6016	.4914
F		133.886	22.46

Note: Numbers in parentheses are standard errors; and
* Indicates significant at the .95 confidence level.

conclusion by Bell and Bowman. They indicate that the effect of both aid programs work as hypothesized here, reducing rather than increasing local tax levies. The tax price variable stayed negative and significant and FAIDPC was still insignificant.

Several other variables are included in Model 2. Because the data available on the circuit breaker are limited to 104 cities from 1984 to 1986, the number of observations drops substantially.[8] The capacity variable, OMEQPC stays positive and significant. FAIDPC is still not significant. LGAIVPC and CREDIVPC lose their significance, suggesting that their effect on property taxes may be zero rather than negative. CBIVPC is positive and significant as expected, indicating that about a third of this aid finds its way from refund recipients' pockets into higher property taxes. Neither HYRPC nor OTHRPC is significant. PRICE continues to be negative and significant. PCINC takes on an unexpected negative sign. POWNOC loses its significance but keeps its expected negative sign. The sign and significance of PYOUNG and PPOOR are unchanged and POLD changes sign but stays insignificant. COMBAS becomes insignificant.

The results for the aid coefficients are more consistent with what theory predicts. A negative impact of aid on net levies indicates that some part of the aid goes into the private sector. High positive and significant coefficients suggest that all of the aid plus additional local sources of revenue are captured by the city. Over the long run this cannot be explained by the standard model of grants. This suggests that Bell and Bowman's results for the homestead credit and LGA were overstated because of the simultaneity with the dependent variable, leading to erroneous conclusions about the effect of these aid programs on local property tax levies.

A MODEL OF CITY BUDGETS

Moving beyond the Bell and Bowman study, the full budgetary impact of the aid programs is examined to tell a more complete story about the effect of aid on city budgets. Until now, the only dependent variable has been property tax levies, so we have been unable to tell how aid affects other parts of city budgets.

This approach runs six related regressions. The dependent variables are: total current spending (TCEPC), total capital spending (TKEPC), "other spending" (OTHEXPC -- composed of fund transfers, debt service, debt redemption, and the difference between total revenues and total expenditures), property tax revenues (PTAXPC), borrowing and transfers (BORTRNPC), and other revenues less intergovernmental revenues (OTHREVPC -- composed of local sales and lodging taxes, special assessments, tax increment revenues, fines, licenses, permits, fees, charges and interest).

Because of the relationship between the dependent variables, more efficient estimates are possible if a system of six equations are estimated (Pindyck & Rubinfeld, 1981). The seemingly unrelated regression model (SUR) used takes into account the correlation of the error terms that arises because of the relationship among the dependent variables.

The construction of these dependent variables account for all city funds other than aid revenues. By construction, the net impact on these budget categories should equal the total for each aid program. Thus the sum of the aid coefficients across all six equations should equal one. A test of the hypothesis that the sum of the coefficients is one was performed. For the circuit breaker the examination is not appropriate because the funds are paid to individuals rather than to governments. These tests of the hypothesis were not rejected for LGA, federal aid, highway aid and other state aid, but was rejected for the homestead credit.

Three features of this model should be noted. First, the property tax variable used here (PTAXPC) is different from the per capita tax levy because of the timing of property tax payments and because of the unique property tax base sharing law affecting cities in the Minneapolis-Saint Paul metropolitan area. PTAXPC is used here because it better fits in the budgetary model. Second, the instrumental variables LGAIVPC, CREDIVPC and CBIVPC are used only in the property tax equation. As the other dependent variables are not mechanically related to these aid programs, the regular values of these three aid variables are used in the other equations to allow for more precise estimates. Third, OMEQPC is not present in the OTHREVPC and BORTRNPC equations and COMBAS is not present in the TCEPC, TKEPC and OTHEXPC

equations because there is no theoretical reason for these two variables to influence the respective dependent variables.

Table 2 presents Model 3. The results for the aid variables find that a dollar of federal aid funds both capital spending and other spending. While none of the effects on the revenue side are significant for this variable, borrowing and transfers is close and helps explain the spending response. LGA funds current spending on approximately a one-for-one basis and has no other significant effects. The homestead credit is associated with a very large amount of both current and other spending, as well as non-property tax revenues. There is no indication of any property tax stimulation.

The results for the circuit breaker indicate a very large (1.394) response in current spending as well as a positive response in borrowing and transfers. It would seem unlikely that this much of the aid would be shifted to the public sector. However, the high standard errors do indicate that more plausible amounts are within the confidence intervals. Each dollar of highway aid is associated with approximately equal amounts of borrowing/transfers and capital spending. These results are sensible, since much of this aid is designed to fund capital spending and the issuance and redemption of debt for this function. Other state and local aid funds current spending on a dollar-for-dollar basis, and also stimulates other revenues. The tax price coefficient remains negative and significant in the property tax equation and also has a negative influence on current spending.

The tax capacity variable (OMEQPC) and per capita income give the expected results, except for the negative influence of PCINC on property tax revenues. The tax exporting variable (COMBAS) now has an unexpected negative effect on property taxes and significant effects on the other two revenue variables.

The demographic variables tell an interesting story. In the property tax equation POWNOC continues to be negative and is significant as expected. Elsewhere it is not significant. PYOUNG remains positive and significant in the property tax equation and also has positive effects on other revenues and capital spending. This is a reasonable result because one would expect a variety of capital needs in cities with larger

TABLE 2
Model 3: Pooled SUR Model, 1984-1986 (N=311)

Dependent Variables	Parameter Estimates (Standard Error)					
	PTAXPC	OTHREVPC	BORTRNPC	TCEPC	TKEPC	OTHEXPC
Intercept	76.56	-167.76	162.98	-33.72	54.57	90.45
	(43.47)	(86.58)	(201)	(69.6)	(95.2)	(194.9)
OMEQPC	19.98*	--	--	15.60*	-.51	8.25
	(1.97)			(2.92)	(4.16)	(4.55)
FAIDPC	.034	.156	.485	.164	.913*	.595*
	(.049)	(.109)	(.270)	(.095)	(.130)	(.267)
LGAPC/	.128	-.201	-.406	1.260*	-.034	-.583
LGAIVPC	(.159)	(.224)	(.552)	(.188)	(.264)	(.543)
CREDPC/	-.245	2.166*	.994	3.207*	.686	2.100*
CREDIVPC	(.229)	(.441)	(1.074)	(.370)	(.520)	(1.058)
CBNETPC/	.376	.435	2.513*	1.394*	-.475	1.757
CBIVPC	(.196)	(.459)	(1.136)	(.400)	(.551)	(1.124)
HYRPC	-.016	.416	1.235*	0.356	1.275*	1.033
	(.111)	(.246)	(.608)	(.216)	(.295)	(.602)
OTHRPC	.166	.635*	.984	1.017*	.657	.916
	(.137)	(.304)	(.753)	(.269)	(.367)	(.746)
PRICE	-81.50*	-59.95	4.42	-82.6*	-70.4	45.4
	(26.27)	(45.59)	(112.7)	(39.8)	(54.4)	(111.5)
PCINC	-3.80*	12.85*	13.29*	4.88	7.47*	7.54
(thousands)	(1.53)	(2.25)	(5.51)	(2.49)	(3.46)	(5.95)
POWNOC	-.82*	-.64	-3.03	-1.31	-1.75	-2.19
	(.41)	(.85)	(1.98)	(.69)	(.938)	(1.92)
PYOUNG	1.46*	5.42*	3.43	2.80	4.82*	2.57
	(.74)	(1.66)	(4.10)	(1.45)	(1.98)	(4.06)
POLD	1.00	-7.50*	-5.15	-2.83*	-3.25*	-6.38*
	(.54)	(1.30)	(3.22)	(1.13)	(1.55)	(3.19)
PPOOR	.93	2.64	-0.76	3.22	0.31	-1.08
	(.85)	(1.90)	(4.71)	(1.67)	(2.28)	(4.66)
COMBAS	-.80*	2.92*	-1.96*	--	--	--
	(.29)	(.54)	(.63)			

System R-squared=.6403
* Indicates significant at the .95 confidence level.

proportions of children. POLD has a negative and significant effect on all spending categories, as well as on other revenues, suggesting that the elderly exert pressure to keep local spending down. Finally, PPOOR has no significant effects.

DISCUSSION

This research corrected Bell and Bowman's study for simultaneity and found that the homestead credit and LGA fund current spending but do not directly stimulate additional property taxes. The negative effect of the tax price variable on property taxes agrees with their results and suggests that the homestead credit and the circuit breaker as designed have an important indirect effect on local tax decisions by reducing the local tax price residents perceive.

The circuit breaker program may have a positive effect on property taxes and also funds public spending. This finding provides new evidence relevant to the persistent question of the "flypaper effect." This type of aid appears to more easily find its way into the public sector than does private income. Although the money in this case does not "stick where it hits," recipients and cities may be quicker to perceive it as "public money" than other sources of private income.

Aggregate federal aid, state highway aid, and other state and local aid have no significant effects on property taxes, but fund the type of spending anticipated and do so in large proportions. In all these cases a dollar of aid funds at least a dollar of spending.

Property tax capacity is a consistently important variable in explaining property tax levels. Per capita income does the same for non-property tax revenues and capital spending, although is curiously negative for property taxes. The results on tax exporting are mixed. The demographic variables generally behave as expected.

CONCLUSIONS

The influence of the tax price variable indicates the importance of state aid design on local fiscal behavior. Other things equal, property taxes are higher in those cities where state aid programs reduce the local

marginal tax price. This suggests that programs such as the pre-reform homestead credit and the circuit breaker that are meant to reduce property taxes actually help stimulate these taxes. While certain types of aid are designed to increase spending on certain functions, it is hard to imagine that it would be desirable to create this incentive for the entire local budget.

The Minnesota legislation that removed the tax price incentive effect of the homestead credit should have beneficial effects. While it retains the desired subsidy to homeowners, the program has been redesigned so that it does not reduce local tax prices, and therefore should not stimulate property taxes. However the circuit breaker effect on tax price is still present, and if enough residents of a city receive large tax reductions from this program, the incentive to increase property taxes would still remain.

In contrast to the stimulative effect of the tax price on local levies, aid programs with only income effects either had a zero or negative net effect on city tax levies. This is further evidence that the design of aid programs is important in the ultimate fiscal impact of the program. Instead, these aid programs funded a dollar or more of spending for every dollar of aid received. This finding differs from those of previous studies that find both matching and lump sum aid programs to have small spending effects and larger tax reduction effects (U.S. Department of the Treasury, 1985; Ladd & Yinger, 1989; Fisher, 1996).

Methodologically, these results underscore Gramlich's caution of more than twenty years ago that empirical work on the effects of grants on budgets must be careful to control for simultaneity.

Financial aid to cities is a crucial part of our federal system. Aid may take a variety of forms, and these findings indicate that differences in program design affect local fiscal choice. Identifying the effects of aid on local finances and behavior continues to be part of the research agenda. Similar studies for other states could inform us about the effects of different types of aid programs on local budgets. Policymakers may then be able to craft aid policies to accomplish their desired objectives, guided by the results of such research.

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NOTES

1. This derivation is contained in an appendix which is available upon request from the author. It is drawn from Bartle (1990) and is based on Inman (1979).

2. In model 1 the circuit breaker is not included and instead PRICE is specified as: PRICE = 1 - (.54 * PHBMC).

3. The tax price variable constructed by Bell and Bowman (1987) was weighted by the share of city housing that is owner occupied (POWNOC). This does not seem warranted, especially where POWNOC is a separate independent variable in the regression. The price effect of the credit is related only to the credit percentage and the share of homes below the credit maximum. Variation in the portion of the tax base in rental housing may affect either the ability to export taxes or the propensity for voters to favor tax increases, but these effects should be accounted for separately, not in the PRICE variable. In correspondence with Michael Bell, this point was made. He responded in part, "we included POWNOC in our definition of price to provide for a weighing for how important the price variable is likely to be in the political decisionmaking process in each local jurisdiction. Perhaps an alternative way of accounting for this variation across municipalities ... would be to include a separate independent variable in the regression measuring the percent of homes that are owner occupied." This step is exactly what Bell and Bowman did, and what was done here.

4. POLD, PYOUNG and POWNOC are all formed using decennial Census data for 1980, 1990 and interpolating the values for 1984

through 1988. For PPOOR, data for 1990 were not available at the time this research commenced, so the values for all years were set equal to the 1980 figure.

5. The tax exporting variable differs from that used by Bell and Bowman. It does not break out commercial and industrial property separately and instead is equal to the rental, commercial and industrial share of total property value. In Bell and Bowman's study it was defined as the apartment, commercial, industrial and seasonal/recreational share of the tax base. The main difference here is the addition of rented homes in COMBAS.

6. John Tomlinson, former Assistant Commissioner for Tax Policy of the Minnesota Department of Revenue, wrote:

> The Bell/Bowman study shows that there is a correlation between city HC [homestead credit] per capita and city net levy per capita. But the distribution formula for HC ... makes such a correlation inevitable.... The situation [concerning LGA] is similar to the homestead credit situation; the factors shown by Bell/Bowman to be correlated (net city levy per capita and LGA per capita) are in the basic LGA formula. Thus the two factors are bound to be correlated. Bell & Bowman claim that correlation shows LGA per capita causes levy per capita. I contend that it is the other way around -- levy per capita causes LGA per capita, since that is the way the LGA formula works.

7. Data to construct both tax price variables were available only for 1986 and 1988. For 1987 PRICE was an average of 1986 and 1988; 1984 and 1985 values were set equal to the 1986 figure.

8. Because only summary data on the circuit breaker were available for 1986, data for each city were constructed from statewide data for 1986 and city data for 1985. From 1985 to 1986 the number of filers statewide dropped by 2.3% and total payments increased by 2.36%. Thus each city's 1986 filer number was calculated as 97.7% of that in 1985 and circuit breaker payments were 102.36% of the city's total in 1985. Available data indicated that total payments increased at almost the same rate from 1985 to 1986 between the seven-county Minneapolis-St. Paul metropolitan area and the non-

metropolitan area. If these are representative of the changes for each city, then the estimates should be close to the actual.

REFERENCES

Bartle, J. R. (1995, Winter), "The Fiscal Impact of Federal and State Aid to Large U.S. Cities: An Empirical Analysis of Budgetary Response," ***Public Budgeting & Finance, 15***: 56-67.

Bartle, J. R. (1990), ***The Political Economy of Intergovernmental Grants to Cities***, unpublished doctoral dissertation, Columbus< OH: Ohio State University.

Bell, M. E. (1986), "Minnesota's Local Government Aids Program," in R. D. Ebel and T. McGuire, ***Final Report of the Minnesota Tax Study Commission***, vol. 2, Staff Papers, St. Paul, MN: Butterworths.

Bell, M. E. and Bowman, J. H. (1987, July), "The Effects of Various Intergovernmental Aid Types on Local Own-Source Revenues: The Case of Property Taxes in Minnesota Cities," ***Public Finance Quarterly, 15***: 282-297.

Bradbury, K. L., Ladd, H. F., Perrault, M., Reschovsky, A., and Yinger, J. (1984, June), "State Aid to Offset Fiscal Disparities Across Communities," ***National Tax Journal, 37***: 151-170.

Carlson, A. H. (1988), ***Report of the State Auditor of Minnesota on the Revenues, Expenditures, and Debt of the Cities in Minnesota***, Saint Paul, MN: State Auditor Office.

Fisher, R. C. (1996), ***State and Local Public Finance (2nd ed.)***, Chicago IL: Irwin.

Gramlich, E. M. (1970), "The Effect of Federal Grants on State-Local Expenditures: A Review of the Econometric Literature," National Tax Association-Tax Institute of America, ***Proceedings of the Sixty-Second Annual Conference on Taxation***, Columbus, OH: Author, pp. 569-593.

Inman, R. P. (1979), "The Fiscal Performance of Local Governments: An Interpretative Review," in P. Mieszkowski and M. Straszheim, (Eds.), ***Current Issues in Urban Economics***, Baltimore, MD: The Johns Hopkins University Press, pp. 270-321.

Ladd, H. F. and Yinger, J. (1989), ***America's Ailing Cities: Fiscal Health and the Design of Urban Policy***, Baltimore, MD: The Johns Hopkins University Press.

Minnesota Department of Revenue, Tax Research Division (1987), ***Minnesota Tax Handbook***, Saint Paul, MN: Author.

Pindyck, R. S. and Rubinfeld, D. L. (1981), ***Econometric Models and Economic Forecasts, 2nd Edition***, New York: McGraw-Hill Book Co..

Simonsen, W. (1994, Spring), "Changes in Federal Aid and City Finances: A Case Study of Oregon Cities," ***Publius, 24***: 46-51.

Stine, W. F. (1994, December), "Is Local Government Revenue Response to Federal Aid Symmetrical? Evidence from Pennsylvania County Governments in an Era of Retrenchment," ***National Tax Journal 47***: 799-816.

Tomlinson, J. (1988, December 2), Letter to Glenn Dorfman.

U.S. Department of the Treasury, Office of State-Local Finance (1985, September), ***Federal-State-Local Fiscal Relations: Report to the President and the Congress***, Washington, DC: U.S. Government Printing Office.