THE CAUSAL RELATIONSHIP BETWEEN TAX REVENUES AND EXPENDITURES: EVIDENCE FROM NEW YORK STATE

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ABSTRACT

As smaller state budgets become popular among voters, a better understanding of the factors affecting budget balances becomes imperative. This paper tries to shed some light on the issue by analyzing New York State budget data. The results of a Granger-Causality test in conjunction with variance decomposition techniques show that tax revenues, as opposed to expenditures, are the leading factor in creating bigger budgets in New York.

INTRODUCTION

As the size of the federal government budget shrinks and the burden of social programs is shifted to the states, a clear understanding of the factors affecting state budget balances becomes imperative. This is especially true in the face of the recent public outcry for fiscal responsibility at the state level. Besides the peculiarities of state politics, there are a number of state level economic variables that are important in forecasting revenues and expenditures and, in general, managing the budget. Recent New York State budget surpluses following years of huge deficits have raised the important question of what is more relevant for fiscal responsibility: the revenue system, the institutionalized expenditures, or both?

The public finance literature offers three hypotheses about the growth of a government's budget. The first is that governments change expenditures and taxes concurrently (Meltzer & Richard, 1981). Under this hypothesis, the community determines the optimal level of spending and taxes by comparing the marginal benefits of government to its marginal cost. Under the second hypothesis, taxes lead government spending (Ward, 1982; VonFurstenberg et al., 1986). This hypothesis is based on political convenience rather than economic efficiency. It has been advanced traditionally in the analysis of revenue-constrained spending at state and local levels. The third hypothesis is that taxes may gradually adjust to expenditures (Peacock and Wiseman, 1979). It is conceivable that expenditure increases caused by a crisis or supported by a political majority would shift the revenue constraint.

There have been several causality tests of these hypotheses at the federal level. The results of the tests using federal data are mixed. For example, Blackley (1986) concluded that increases in tax revenues might not lead to smaller deficits. In contrast, VonFurstenberg et al. (1986) found that spending

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increases resulted in tax increases. There are only two state level studies, Joulfaian and Mookerjee (1989) on Massachusetts, and DeLoughy (1999) on Connecticut. Both studies show unidirectional causality running from revenues to expenditures. Perhaps, the reasons for the paucity of research at the state level are that budget deficits have only recently become an issue in the larger states and that appropriate data have not readily been available.

The purpose of the present study is to add to the body of empirical evidence on the causal relationship between government revenues and expenditures at the state level, using New York State as a case. More specifically, the Granger-Causality test (Granger, 1969) will be employed to find out whether the state's tax revenues lead (or are caused by) government expenditures. Such a finding should prove beneficial to state public policy makers in their effort to control budget growth.

EMPIRICAL ANALYSIS

To test whether revenues lead expenditures, expenditures lead revenues, revenues and expenditures are independent from one another, or revenues and expenditures are jointly determined, the basic Granger-Causality test was applied to 40 years worth of New York State data. More specifically, based on Granger (1969), the following empirical model was designed:

$$R_t = \sum_{j=1}^{n} a_j R_{t-j} + \sum_{i=1}^{m} b_i E_{t-i} + U_t \qquad (1)$$

$$E_t = \sum_{j=1}^{n} c_j E_{t-j} + \sum_{i=1}^{m} d_i R_{t-i} + V_t \qquad (2)$$

where R = Revenues, and E = Expenditures.

In the above equations if all the estimated coefficients are statistically significant, then revenue and expenditures lead one another (feedback effects). If, on the other hand, the coefficients are insignificant, revenues and expenditures are independent from one another. A statistically significant or insignificant coefficient of E in equation (1) above would imply that revenues lead or do not lead expenditures, respectively. In equation (2), if the coefficient of R is significant, then revenues are expected to lead expenditures, otherwise they do not.

Significance is determined via the Wald F test as follows:

$$F = \frac{(SSR_1 - SSR_2)/r}{SSR_2/(n-k)}$$

where SSR_1 is the sum of squared residuals from the restricted equation (when b_i or d_i are set equal to zero) and SSR_2 is the sum of squared residuals from the unrestricted equation, r is the number of restrictions, n is the number of observations, and k is the number of independent variables in the unrestricted equation. The Wald F test is a variation of the traditional F test. It is used to test the significance of a linear equality restriction in the coefficients of a regression model. A statistically significant F value means that the restricted and unrestricted regressions are different; hence one may reject the hypothesis that the parameters obey the linear restriction(s).

The data used here cover the period 1960-99. They were obtained from a series of reports published by the New York State Division of the Budget. New York has one of the largest and most complex budgets among the states. The state records its transactions in three fund types: Government, Proprietary, and Fiduciary. Among these, the Government Fund is the largest (more than 95 percent of the total) and is comprised of four categories. The first and the largest is the General Fund, which is the major operating fund of the state. The second is the Special Revenue Fund, which is used to account for state receipts from specific revenue sources such as Federal grants. The third is the Debt Service Fund, which is used to account for the accumulation of resources for, and the payment of, principal and interest on general long-term debt and payments under lease/purchase and contractual obligation financing agreements. The receipts and fund sources of the Capital Projects Fund, the fourth category of the Government Fund, are generated primarily from bond issues, dedicated taxes, and Federal grants.

For the purpose of the present study, the General Fund category was chosen because its sources and uses of funds are the most sensitive to changes in state tax and expenditure policies. The nominal values of annual receipts and payments net of Federal grants and adjusted for changes in accounting procedures over the period were used for this study. Table 1 reports the summary statistics of the studied variables.

Table 1. Descriptive Statistics (in millions) of Variables, 1960-99

	N	Minimum	Maximum	Mean	Std. Deviation
REV	40	$1828000.00	$36477682.00	$15967531.50	$11549877.20
EXP	40	$1827400.00	$35166032.00	$16252941.00	$11660995.60

Two null hypotheses, R does not Granger-cause E and E does not Granger-cause R, were tested using three lags of R and E. Previous studies indicated that a maximum of three lags is sufficient and appropriate for annual data (e.g., Joulfaian and Mookerjee, 1989). In addition, each of the variables is differenced by checking for the existence of unit roots that are indicative of non-stationary variables. A unit root exists in time series data when the mean or variance varies over time or is not finite (Grewal et al., 2001). It is important to test the unit roots before testing the causal relationships. Granger causality tests require data to be stationary. If this assumption is violated, the tests may produce spurious and misleading results (Grewal et al., 2001). Therefore, this study employed the Augmented Dickey and Fuller (ADF) test to examine the presence of unit roots. The ADF test results suggest the absence of a unit root

for all variables when expressed in logarithmic first differences, satisfying the stationary variable assumption of Granger tests.

Table 2. Granger Causality Test Results

Variable	Estimated Coef.	Std. Error	t-statistic	P-value
REV(-1)	0.844	0.232	3.641	[.001]
REV(-2)	-0.199	0.263	-0.757	[.455]
REV(-3)	0.033	0.241	0.136	[.892]
EXP(-1)	0.179	0.223	0.800	[.430]
EXP(-2)	0.174	0.238	0.729	[.471]
EXP(-3)	-0.061	0.223	-0.272	[.788]
C	0.548	0.210	2.606	[.014]
F_1 =	**.7493 (p=.531)**			
REV(-1)	0.660	0.229	2.886	[.007]
REV(-2)	0.198	0.259	0.766	[.450]
REV(-3)	-0.080	0.238	-0.338	[.738]
EXP(-1)	0.533	0.220	2.419	[.022]
EXP(-2)	-0.105	0.235	-0.448	[.657]
EXP(-3)	-0.219	0.220	-0.995	[.328]
C	0.268	0.208	1.290	[.207]
F_2 =	**4.315 (p=.012)**			

Granger causality test results run by using TSP software are reported in Table 2. The following F statistics of Granger causality tests were calculated for equation 1 and 2: F_1 = 0.7493 (p= .531); F_2 = 4.3154 (p=.012) as indicated in Table 2. Since F_2 is significant at 5 percent level while F_1 is not, the first null hypothesis can be rejected while the second null hypothesis cannot be. In other words, the data seem to indicate that New York revenues are good predictors of expenditure levels, while expenditures do not Granger cause revenues in New York.

Recent application of Granger tests also computes the associated variance decomposition (VDC), since VDC can calibrate the strength of the causal relationship from Granger tests. The VDC is able to shed light on how much of the forecast error variance of the variable can be explained by its own innovations and how much by shocks to the other variables in the model (Darrat et al., 1996; Grewal et al., 2001). For instance, it answers question such as what percentage of the forecast error variance of New York State revenues can be attributed to government expenditures. Table 3 reports the VDC results for time horizons ranging from one to ten years.

Table 3. Variance Decomposition Test Results

	Time (Years later)	REV	EXP
REV	1	100.00	**0.00**
	2	98.98	**1.02**
	3	95.43	**4.57**
	4	94.00	**6.00**
	5	94.10	**5.90**
	6	94.39	**5.61**
	7	94.47	**5.53**
	8	94.43	**5.57**
	9	94.41	**5.59**
	10	94.41	**5.59**
EXP	1	**36.60**	63.40
	2	**62.37**	37.63
	3	**77.78**	22.22
	4	**83.05**	16.95
	5	**85.02**	14.98
	6	**86.02**	13.98
	7	**86.89**	13.11
	8	**87.68**	12.32
	9	**88.29**	11.71
	10	**88.74**	11.26

It can be noted that the effects of expenditures (EXP) on revenues (REV) are very small and not significant. Expenditures explain nothing of the first year variance of revenues. The predicting effects increase slightly but are still less than 6 percent at the end of ten years. On the other hand, the effects of revenues on expenditure are far larger and significant, increasing from 36 percent in the first year to 88 percent in the end of ten years as shown in Table 3. Therefore, the VDC results further confirm that New York State revenues lead expenditure levels without any feedback.

SUMMARY AND CONCLUSION

As smaller state budgets become popular among voters, a better understanding of the factors affecting budget balance has become imperative. The results of a Granger-Causality test applied to New York State budget data of the past three decades shed some light on the issue. According to these results, tax revenues rather than expenditures seem to be a leading factor in creating bigger budgets in New York. The policy implication is that the best remedy for balancing the budget and reining in expenditures is to cut taxes. There are, however, two major factors that could hinder the effectiveness or appropriateness of the remedy. Historically, the effectiveness of tax cuts as a means of reducing New York State budget deficits has often been undercut by state borrowing. Although, the state constitution requires balanced budget and limits the use of borrowed funds, the Government has been enormously resourceful in finding ways around these restrictions. The second is that the appropriateness of tax cuts in dealing with budget deficits depends on the timing of such cuts vis-à-vis business cycles. It can be

argued that deep tax cuts during an upswing might provide unnecessary fuel for inflationary forces (or vice versa during a downturn).

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