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LOST Stability? Consumption Taxes and the Cyclical Variability of State and Local Revenues

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Abstract

States and localities continue moving towards consumption taxes. Georgia's local governments displace a portion of their property tax receipts with revenue from the Local Option Sales Tax. This paper employs a panel dataset of Georgia counties across two economic cycles to examine the effects of consumption taxes on the long- and short-run volatility of local own-source revenues. We offer a mean-variance approach for considering correct revenue portfolio shares across tax-instruments. Holding revenues constant we find that permanent substitution towards a consumption tax amplifies variability of own-source revenues, implying that consumption taxes are overweighed in current revenue portfolios.

Key words: state/local government, own-source revenue, volatility, cyclical variability

JEL codes: H20, H21, H71

I. INTRODUCTION

Currently, many state and local governments in the United States continue to debate moving away from the individual income and the property taxes, towards consumption taxes to finance the public sector. Locally a limited substitution towards consumption taxes has been occurring for roughly thirty years. One particular program is worthy of note because it makes such a substitution direct and specific. Since the mid-1970s, Georgia's local governments have had the option of substituting a sales tax for a portion of their property tax receipts. This program, known as the Local Option Sales Tax (LOST), is now employed by the vast majority (all but two) of Georgia counties. An additional program, the Special Purpose Local Option Sales Tax (SPLOST), allows temporary increases in sales taxes to finance the construction of community infrastructure.

In this paper we examine the revenue volatility of these popular taxes and their observed effect on both long-run volatility and short-run cyclical variability of local own-source revenues across the business cycle. Volatility is important to consider because reductions in the predictability of revenues can confound local governments fiscal planning and administration. We note that volatility in and of its self is not necessarily that concerning, indeed positive revenue shocks are of course potentially useful, and can be rebated to taxpayers. Further, a government that anticipates revenue shocks can create a fund to provide for negative revenue shocks. However, if local governments do not anticipate increases in volatility there is cause for concern. Local governments limited tax base and access to credit both work to reduce their ability to compensate for negative revenue shocks. Because of this concern we investigate revenue volatility answering the question, "*On the margin, is the consumption tax a more volatile revenue instrument than the property tax that it replaces?*" To learn the answer we engage panel data which includes all Georgia counties [i] over the two most recent economic cycles (1985-2005) to estimate the impacts of consumption taxes on measures of volatility of tax revenues. Previous empirical work on tax elasticity has identified time-series

procedures which allow consideration of both long-term and short-term volatility measures by tax instrument. We are interested in both because long-term volatility can impact tax capacity over time and short-term volatility can impact cash flow and financing requirements, in particular during downturns.

A priori it is unclear whether substitution towards a consumption tax should amplify or damp the volatility of local revenue portfolios. Modern portfolio theory suggests that diversification across tax instruments should stabilize revenues — at least up to a point. Just as an investor might consider the risk-and-return dynamics of individual instruments to orient their portfolio toward the efficiency frontier, policy makers may consider instrument volatility directly when setting revenue policies. In this sense, our method and findings have direct tax-policy implications.

Across the United States, two-fifths of the states currently allow their local governments to levy local option sales taxes (LOST) on top of the state portion of the general sales tax. And in general, local communities continue to increase their reliance on consumption taxes. Revenue applications from LOST-like consumption tax programs vary from state to state and include rolling back property taxes (as in Georgia), funding capital projects, covering operating expenses of the general government, and funding schools. A better understanding of consumption tax dynamics can allow policy makers better perspective on whether projected revenue streams are adequate for particular expenditure purposes. As well, a better understanding of the revenue dynamics associated with changes in the portfolio composition should allow for planning around manageable deficiencies. For example if, as has been found elsewhere, consumption taxes prove to be more volatile revenue instruments over the short run, a local government that wanted to increase its reliance on this revenue instrument might wish to increase reserves (so called "rainy day funds"), or communicate volatility expectations to the financial intermediaries who supply marginal short-run capital (and with whom they negotiate terms).[ii]

Georgia's LOST program stands out as very close to ideal for measuring volatility changes resulting from revenue portfolio composition because the LOST program is engineered to keep revenues roughly equivalent,[iii] allowing us to focus on the volatility exclusive of changes to expected returns, as illustrated by Figure 1.

[Figure 1 about here]

Georgia's local policy makers are somewhat limited in adjusting the components of their local revenue portfolio, as local communities generally face a three percent cap on sales taxes. (These taxes are on top of a fixed state consumption tax of four percent. [iv]) Notably, the cap on local sales tax authority is binding in the vast majority of Georgia's counties at present, but while this is evidence of the popularity of local sales taxes, it does not necessarily follow generically that the constraint should be adjusted or done away with entirely. In this paper we address this point directly. Our working question is expressed as follows: *Starting from current revenue portfolio positions, is moving further in the direction of a consumption tax likely to move local governments towards or away from optimal revenue portfolio diversification? That is, to enhance or reduce revenue stability?*

To answer this query we present average elasticity estimates across our panel. Elasticities are central to current active policy debates which must begin from current law and marginal impacts of change. Interest in expanding consumption taxes is certainly evident within Georgia, where there are currently two separate proposals to eliminate both the state personal income tax and the property tax. These proposals go much further towards a consumption tax than our marginal short- and long-run analyses do. We here describe two current proposals in Georgia for the reader who may otherwise be unfamiliar with them:

1. The "Georgia One Tax," State Senate Resolution 282, provides a 6.5 percent tax on all goods and services, "for state revenue in lieu of state ad valorem taxes and state income taxes. Such

taxes shall be repealed in their entirety not later than January 1, 2010, and the subsequent levy thereof shall be specifically prohibited." When combined with current local sales taxes, SR282 would lift consumption taxes to a top rate of roughly 10 percent in Georgia.

2. The "GREAT" Tax ("Georgia Repealing Every Ad Valorem Tax"), State House Resolution 900, would eliminate most state and local taxes, including property taxes, which would be replaced by a flat tax consisting of "a personal income tax at the initial rate of 5.75 percent and a business value added tax at the initial rate of 5.75 percent."

Both proposals are very provocative and are currently being debated in public and private forums. The value of our current work is as follows: Since eliminating either of these taxes is in fact an extreme case of expanding the revenue portfolio towards consumption taxes, a marginal analysis is useful. If we find that marginal increases from the current proportion of consumption taxes are destabilizing, we cannot recommend any further increase in consumption tax proportions on these grounds. Should evidence suggest that marginal increases in the reliance on the consumption tax improve revenue stability through marginal expansion of the consumption tax, we could not comment on what proportion of consumption tax is optimal.

Moving away from direct focus on any set of policy proposals, generally it is clear that the sales tax adds to local own-source revenue and can diversify local revenue sources; it is also clear that sales tax revenues must follow consumption trajectories. From these general tenets the sales tax may be expected to be more volatile in the local revenue stream over the business cycle – this point has been made often, and by many over time, especially as concerns sales and property tax substitutions. In this case assuming no political preference over instruments, the policy recommendation would likely be to diversify so as to minimize impacts – leading in general to a diminished role for the consumption tax. However, while consumption value trajectories differ from property value and income trajectories, they may do so in a useful way – as an extreme, take

the case of equivalent and simultaneous compensating variation across tax instruments over the short run (business cycle). Clearly, if the consumption tax is found to vary in ways which counter other forms, then diversification towards the consumption tax may be warranted – even if consumption taxes are found to have a higher overall volatility.[v] One can think of these revenue paths as being organic (that is, relating to underlying prices and preference), or as being structurally related (synthetic), as in the case of the current Georgia LOST program. Indeed, to a large extent, Georgia's LOST program should be considered well engineered, since property tax discounts are adjusted dynamically, annually. As such, the majority of risks appear to exist in the short run.

While the short run would seem most important, Seligman and Hou (2005) suggest that we should not disregard the long-run program dynamics. As described therein, medium- to long-run trends in price evolution can translate a persistent bias into underlying tax capacity under current Georgia law. Because the LOST program's direct substitution between the consumption and property taxes exists more or less over any time-frame, it is fairly straightforward to compare the volatility of competing tax instruments over the longer term as well; so we estimate both long- and short-run marginal impacts. The next section provides a brief summary of previous literature to help place our work in context. Section III discusses our data and methodology. Section IV presents and discusses our results. The final section concludes with a summary and policy implications – both for Georgia and the state-local sector in general.

II. PREVIOUS LITERATURE

The literature on sales tax elasticity dates back to the early 1950s at least. Groves and Kahn (1952) document one of the first estimates of the income elasticity of state and local tax revenues from the 1930s to the late 1940s. Their focus was tax revenue stability of state and local governments for smooth operation and provision of public services. Mikesell (1977) considers

income elasticities of state sales tax components. Fox and Campbell (1984) estimate detailed elasticities of ten categories of goods. They find that though the average long-run elasticity of the goods was only about 0.6, the categories showed varying annual fluctuations with the business cycle. This finding partly triggered subsequent studies that separated the long run from the short run. Dye and McGuire (1991) work to estimate both the elasticity and stability of personal income and sales taxes, and find significant variation from the components of the structure of the two taxes. Building on previous studies, Sobel and Holcombe (1996) make methodological improvements for the estimation of separate long-run and short-run elasticities by correcting biases from trend non-stationarity as well as difference non-stationarity problems. More recently Bruce et al. (2006) use annual time series data from 1967 to 2000 to estimate long- and short-run elasticities as well as adjustment parameters. Their improvement is to consider state-specific tax environments. They obtain a long-run state mean value of 0.811; the short-run mean above equilibrium is 1.804 and the short-run mean below equilibrium is 0.149.

Though there has been literature showing that the sales tax is pro-cyclical, there has not been much empirical evidence on the effects of the adoption of local sales tax programs on the volatility of government revenue over the business cycle. Seligman and Hou (2005) provide details on the particular laws governing substitution and estimate net average impacts of Georgia's LOST program, in a panel data setting. This paper continues the long line of attention to revenue stability that started from Groves and Kahn (1952), incorporating the methodological improvements of Sobel and Holcombe (1996) and Bruce et al. (2006), and the county-level data developed by the University of Georgia's Tax and Expenditure Data (TED) Center. The potential contributions of this paper fill gaps in the previous literature regarding the stability of revenues from LOST programs, in terms of both the long-run income elasticity collections and the short-run cyclical variability. Thus we expect to contribute to the literature on sales tax elasticities and to the literature on local revenue

diversification. Finally this work should help inform policy makers regarding possible consequences of the two current proposed major tax reform efforts mentioned in Section I.

II. DATA AND METHODOLOGY

Our data and methods follow from the previous literature as described in Section II. We document them more carefully here. Data come from several sources: Georgia Department of Revenue (DoR), Georgia Department of Community Affairs (DCA), the *Georgia County Guide* (GCG) – an annual publication series about local governments in Georgia,[vi] the US Bureau of Economic Analysis (BEA), the US Census, and the Bureau of Labor Statistics (BLS). The University of Georgia's Tax and Expenditure Data (TED) Center pre-assembled data from the Census, the Georgia DoR, and DCA for this project. From these sources we construct a panel of all 159 county governments in Georgia; among these, two counties are dropped for missing observations, making the total 157. The sample years run from 1985 through 2005, a period that covers two recent macroeconomic business cycles.

General conditions of local demography, wealth, and economy are considered via population, personal income, and unemployment rates. Population in thousands is a proxy for the size of a county; per-capita personal income in thousands of year-2000 dollars is a proxy for relative returns to human and physical capital, and in this sense, then, wealth. We do not model economic cycles directly using a series like that available from the Business Cycle Dating Committee of the National Bureau of Economic Research (NBER), because those data are designed to address the national economy and thereby less likely to capture economic fluctuations at the regional and local level. Instead we account for the regional economy and its influence on local income and revenue indirectly via the local unemployment rates from BLS, and via a standard set of county- and year-fixed effects.

Revenues and debt financed cash-flows are obtained and considered as follows. We obtain annual license and fee data, as well as per-capita LOST revenue and SPLOST revenue from Georgia DCA, and generate a set of binary variables to record the adoption of LOST and SPLOST across time. Also obtained from this source are direct federal grants and state grants, as well as new issues of revenue bonds, general obligation bonds, and lease-purchase agreement obligations. Property tax effort is considered via the millage rate, which is collected from Georgia DoR and verified against the *Georgia County Guide* (GCG). Finance details come from Georgia DCA. The last three are all placed in per-capita real dollars. We adjust revenues and expenditures by the state-local goods-and-service deflator to year-2000 dollar equivalents. Summary county income data are adjusted via the consumer price index for urban areas (CPI-U) in the South. This series arguably better encompasses dynamics than the state-local or more closely competing Urban-Atlanta series might for much of rural Georgia. Table 1 lists variables used, their definition, as well as summary statistics.

[Table 1 about here]

Beyond the method described above we additionally bring to bear the rich literature on measurement of the income elasticity of tax revenues that we have detailed in section II. In particular we emphasize the necessity of accounting for non-stationarity issues within our panel – even after adjustment to real and per-capita measures. Non-stationarity is important in this context because overall levels of taxation, and in particular sales tax rates, are upward trending over much of the period of study within our panel. Following conventional literature and the standard technique of calculating the long-run income elasticity of taxes (Groves and Kahn 1952; Friedlaender et al. 1973; Legler and Shapiro 1968; and Fox and Campbell 1984), generally the model is:

$$ln(\tau_{it}) = \alpha + \beta_1 \, ln(y_{it}) + \varepsilon_{it} \qquad (1)$$

This model regresses the log form of tax revenue, τ_{it} , against the log form of income, y_{it} . Here $\hat{\beta}$ is our long-run elasticity measure which directly estimates how much tax revenues increase for each percentage increase of income. In such a setting estimates for particular taxes may be conducted either separately or in unison depending on the composition of τ_{it} . Herein we construct it to be a broad measure of own-source revenues, comprised of property taxes, Local Option Sales Tax receipts (LOST and SPLOST), excise use taxes, license and permit fees, service charges, and "other" revenues, in per-capita dollars.

Sobel and Holcombe (1996) point out the distinction between measures of long-run elasticity and short-run cyclical variability. The former is a measure of the long-term variation; the latter is the short-term, or cyclical, variability in tax revenue. Their model for short-run cyclical variability is:

$$[ln(\tau_{it}) - ln(\tau_{it-1})] = \alpha + \beta_2[ln(y_{it}) - ln(y_{it-1})] + \varepsilon_{it} \quad (2)$$

Thus formulae (1) and (2) describe the generally accepted approaches to modeling long-run elasticity (via the log, log form of formula (1)), and short-run variation (via the first-differencing of (1)) in revenue as a function of income. From this starting point, however, because our focus is on volatility about these values we consider the magnitudes of errors in predicted values.

Generally one has the correct intuition that absolute deviations from predicted values, the ε_{it} , become important to consider given our working hypothesis. Indeed we are concerned with volatility of revenues in this paper, and so to estimate the effects of the programs of the local option sales taxes, we next build dependent variables from the preliminary regressions. Specifically, from equation (1), having obtained our elasticity estimate, $\hat{\beta}_1$ we next interact income, y_{it} , and obtain the expected tax revenue, $\hat{\tau}_{1it}$. Then, we derive the absolute difference between actual tax revenue and

expected tax revenue $\tau'_{it} = |\tau_{it} - \hat{\tau}_{it}|$. This error-in-prediction is our dependent variable for the long-run effect of LOST programs:

$$ln(\tau'_{1it}) = \alpha + \beta_3 ln(\tau_{kit}) + \gamma\, ln(X_{it}) + \varepsilon_{it} \quad (3)$$

where γ measures the relationship between revenue volatility and additional independent controls, X_{it}.

Following a similar procedure from equation (2) using $\hat{\beta}_2$, we obtain a dependent variable for the short-run cyclical variability of tax revenue, τ'_{2it}. Our two-step procedure [(2), (4)], thus yields a short- term volatility measure:

$$[ln(\tau'_{2it}) - ln(\tau'_{2it-1})] = \alpha + \beta_4 [ln(\tau_{kit}) - ln(\tau_{kit-1})] + \gamma (X_{it} - X_{it-1}) + \varepsilon_{it} \quad (4)$$

In the latter two formulas, (3), (4) the constructed measures, τ_{kit}, are the emphasized variable of interest, and subscript *k* references the tax instruments of particular interest. Elements of *X* may include log transforms, and/or other scaling transforms.

Summary statistics of the two dependent variables are also included in Table 1. Our first dependent variable, the long-run volatility measure constructed via Formula (1), gives us an initial mean by which to evaluate the regression estimates included as tables 2 and 3; we will discuss these in greater detail, but importantly the reader should observe that the standard deviation about these baseline measures is itself very high in relative terms, suggesting that revenue volatility is a more serious concern in some local communities than in others.

Independent variables are organized into groups of sales taxes, property taxes, alternate financing instruments, and summary economic indicators. The sales tax group includes both the Local Option Sales Tax (LOST) and the Special Purpose Local Option Sales Tax (SPLOST). We

observe 90 percent of counties levy a LOST, and two-thirds of counties levy a SPLOST. Per-capita LOST revenues average about $54.5, SPLOST revenues are roughly equivalent. This makes sense as both taxes are levied at the rate of one percent. Variation about the mean is higher for SPLOST levies than for LOST levies – this is likely due to the quarterly nature of the SPLOST; some collection mandates expire mid-year, whereas our data series are annual. [vii]

The property tax group considers both millage rates and collections. Millage rates average about 25 mills per thousand dollars of assessed property value; the standard deviation about this mean is relatively low. Per-capita revenues are about $184; thus, LOST average about 3/10ths of the per capita property tax revenue; however, volatility of LOST is proportionally higher being close to 38 percent of the volatility of property tax. To the casual observer, volatility of the property tax looks higher over this period – perhaps especially because variation about this mean is a bit higher than variation in the mills would otherwise suggest. In these summary measures, however, the variation observed is due to variation in property values and variation in household population densities.

Alternate financing instruments we consider include three basic instruments, local bonds, lease-purchase agreements, and grants from the state and federal governments. Both general obligation and revenue bonds are not very popular; however, in a few cases the levels of per-capita debt are very high. This pattern of low average usage, with much higher levels in top percentiles generally, is true for lease-purchase agreements and for grants as well. State grants are generally the most popular alternate finance mechanism; even for these instruments, however, the standard deviation overwhelms the mean, suggesting they are rather discriminately employed to finance expenditures at the local level.

Our final group of economic indicators highlights the variation of population, income and unemployment rates experienced across Georgia counties over the sample period. On average a

county is comprised of roughly 45,000 persons earning roughly $20,000 each, and has an unemployment rate of about 6 percent; however, variation about these mean values does appear to be both statistically and economically large.

IV. RESULTS AND DISCUSSION

Tables 2 and 3 present the results of empirical analyses. We emphasize two basic sets of regressions for each of the formulae in each table. The first and third columns focus on binary treatment of sales tax instrument(s) and property tax millage rates, with the first column (I) focusing on the long-run (elasticity-based) dependent variable, and the third column (III) focusing on the short-run (first-difference-) based dependent variable. Columns II and IV focus on dollar measures of collections from these revenue instruments in the long and short run, respectively. Table 3 differs from Table 2 in that here we exclude the SPLOST instrument. Theoretically we exclude SPLOST because it is by nature not a permanent instrument, and so we fear it may appear to amplify undesirable volatility, when really it is expected to be temporary, and poses no real unaccounted for concern in these terms. We will discuss these results in a moment, after a focused consideration of Table 2.

[Table 2 about here]

Table 2 employs the same grouping of variables as do the summary statistics in Table 1. Here, we often magnify dollar values to be in thousands, a more useful metric when generalizing our results in terms of policy. First, before considering the variable groupings we offer the reader a chance to consider our results for measured constants, as compared to the summary statistics offered in Table 1. These are important baselines useful for interpreting the magnitudes one should associate with our results. In Table 1 recall that our measure of long-run volatility is higher than for the short run, and that standard deviation is proportionately lower. (In either case standard

deviations are quite high relative to the mean values.) When we consider the reported constants in Table 2, by contrast, we find that long-run volatility in lieu of considered factors would be much higher (0.159 and 0.27); this result is statistically significant at the one and five percent levels. By contrast, in lieu of considered factors, short-run volatility would otherwise be much lower than reported within the summary statistics; however, the experiences of counties continue to vary greatly in our panel, and even after the consideration of included independent variables these constants are not stable statistically. Given the very different dynamics of short-run and long-run constants, it is hard to compare the impacts of factors over these different time frames directly – the denominators are just too different. To allow for direct comparisons, we present results where impacts for both the short and long run are described in terms of the long-run constants. We choose the long-run measure as the base line because of both its greater magnitude and robustness. The use of a larger denominator prevents sensationalizing or misreporting of instrument impacts. [viii]

We begin with measures of sales tax. We find that the LOST is associated with increases in volatility, either when considered in binary terms or in revenue terms – that is to say, the sign on our coefficients is always positive. In the short run, both the binary implementation measure and the more continuous revenue measures are statistically significant at the one-percent level. The relative magnitude is such that the LOST reportedly increases revenue volatility by 47 percent of our long-run constant measure. Specifically, to see this result take the ratio: LOST (column III) - to - Constant (column I). [ix] When we consider revenue explicitly, LOST short-run volatility as reported in column IV measures about 185 percent of long-run constant volatility. The measure is the ratio: LOST (column IV) - to - Constant (column II). By either measure, displacing property tax revenues with sales tax revenues amplifies short-run volatility about its long-run average in economically important ways. SPLOST also seems to impact volatility in the short run, however, by damping its

level relative to the long-run constant. The associated magnitude for SPLOST existence, and collections, are 15 and 44 percent, respectively.

Our results for the property tax appear much different. All else equal we find that in the long run, increases in the millage rate increase volatility by about 2 percent of the long-run constant, whereas our long-run revenue measure of property taxes damps volatility by 56 percent (0.152/0.270). One interpretation of the disconnect (change in sign) between these two measures relates to factors first discussed in our review of results from Table 1 – that it relates to county-specific variations in wealth, property values, and household population density dynamics across the panel. Short-run results for property taxes are consistent in sign, always negative and thus suggesting a damping of measured long-run constant volatility; however, the millage rate result is so small as to appear to near zero in Table 2. The result is thus neither economically nor statistically significant. Such is not the case for our short-run revenue measure – here we find a short-run damping of revenue volatility greater than reported long-run constant volatility of 104 percent (0.282/0.270).

Considering alternate financing instruments, only the lease-purchase and state grant programs yield consistent estimated impacts. In the case of the lease purchase, we find that long-run revenue volatility increases by somewhere between about 32 percent (Col. II) and 60 percent (Col. I), while short-run volatility may be reduced. The nature of a lease-purchase agreement is such that the result is not altogether surprising. These deals may alleviate short-term financial hardship in much the same way as borrowing does. To the extent they are associated with communities plagued by less predictable revenues, we would see this long-term result whether or not the leases themselves contribute to volatility over the long run. State grants likewise predictably damp volatility, in both the short and long runs when compared to long-run constant measures. Economic magnitudes here are large by any measure, being between 43 percent (Col. IV) and 105 percent (Col. I) of the

applicable measured long-run constant. Again knowledge of the Georgia's state grant program for local counties supports this conclusion; grants tend to be issued to communities in long-term need and short-term distress. We attribute the weak statistical significance of the short-run measure to the idea that state grants have lagged effects both in terms of issuance and in terms of impact. Fertig and Seligman (2007) analyze Georgia's state grants with results in line with those reported here. [x] Considering economic indicators, we find support for the reasonable conclusion that increases in per-capita real income damp long-run revenue volatility. Results are statistically significant at the one-percent level; the magnitudes are relatively low, at 4 to 6 percent of the long-run constant volatility measure.

Table 3 replicates the regressions of table 2, omitting the SPLOST. As described above, we omitted the SPLOST with an original intuition that it might be spuriously correlated with increased volatility. However, we have found that SPLOST revenues reduce short-run volatility. We are thus even more interested in dropping SPLOST, to see whether its inclusion is more fundamentally misguided. A look across all columns shows that our results are very stable to the exclusion of SPLOST. In column I, exclusion amounts to a test of robustness to irrelevant variables, whereas in the remaining three columns (related to long-run revenues and short-run binary and revenue measures) exclusion amounts to a test of robustness of the sensitivity of volatility measures to the exclusion of a temporary capital financing sales tax instrument. Again we find the results to be remarkably consistent, a support for our measures and our basic method. With respect to these measures, we interpret our finding to suggest that the SPLOST damps short-run volatility. This result is further taken to mean that most revenue volatility is otherwise skewed downward – our measured "revenue surprises" tend to be negative.

[Table 3 about here]

V. POLICY IMPLICATIONS AND CONCLUSION

Our measures of revenue volatility are on whole negative, meaning that most revenue 'surprises' take the form of shortfalls. A direct implication is thus that policy makers should concern themselves with reducing volatility as they choose portfolio shares for revenue instruments. (Indeed, if revenue surprises tended towards windfalls, concern would not be as warranted.) The distinction in skew being made here is related to the distinction between the Sortino and Sharpe ratios in modern portfolio analysis, where the Sortino [xi] ratio treats up-side and down-side risks asymmetrically, appropriate whenever loss aversion is an important consideration. This is arguably the case as local governments have limited access to capital and fairly consistent public service obligations. For local governments, negative revenue shocks are unwelcome and can create hardship, at least in the short run. For this reason, local governments must care for their revenue portfolios in much the same way that an investment adviser would a financial portfolio – keeping an eye on both the short- and long-run measures of volatility in order to manage cash inventories, and the many public services on which communities rely for proper functioning.

Here we have consciously focused on two basic instruments within local government revenue portfolios, the sales and the property taxes, and placed them in the context of the broader revenue and debt finance, and transfer income portfolios available to local communities. We are fortunate to have had access to data focused on all counties in Georgia, because Georgia law creates a direct substitution between our two revenue instruments of focus which is adjusted annually. This allows us to focus on volatility in a much more controlled environment than would otherwise be possible.

Our findings that the local sales taxes are related to very significant increases in short-run volatility, and that property taxes are related to more modest decreases in both the long- and short-run volatility, are important for current debates regarding the efficacy and efficiency of revenue

collection both within Georgia and more broadly speaking. Within Georgia, the implications for the current debate regarding either the "One Tax" or the "G.R.E.A.T." tax, as well as the debate in the past few years concerning education finance, suggest that without new methods for smoothing revenues across annual budget cycles, these taxes are likely to be less stable platforms to service the needs of communities. In the case of the "One Tax" we have to additionally point out that, to the extent Georgia increases its reliance on sales taxes simultaneously, the opportunity to stabilize local finances via the current state grants program may be curtailed – placing county finances at greater risk than otherwise.

There is no reason we can find to suspect that these results are limited to counties; most Georgia municipalities manage similar revenue portfolios.[xii] Further, to the extent that sales and property taxes are constructed consistently across the United States, our findings are likely to hold in other regions – especially where direct substitution between these instruments is the norm, as it is in Georgia. Otherwise volatility impacts are likely to be felt incrementally as a result of the relative expansions or reductions of either tax's share of the revenue portfolio. Seligman and Hou (2005) mention that some of what has driven revenue collections by either the property or consumption tax is related directly to the evolution of relative prices. Over much of the period we study, goods inflation has been relatively mild and property values have risen markedly. It is unclear whether these trends will continue in the future; however, previous literature which examined periods from the 1930's forward is consistent with our work, suggesting that any current change in these relative price trends would not warrant dramatic portfolio changes for revenue instruments.

In summation we emphasize that while our results agree with much of the previous work, we find no reason to entirely do away with any revenue instrument currently in use. A prudent government will always find value in diversification of revenue sources; the issue is merely one of proportion. Our work suggests that, holding revenues to be roughly equal, further movement

towards consumption taxes cannot be justified in terms of reducing financial volatility. Any change in current law based on justification along other grounds which increases consumption taxes as a proportion of revenue portfolios should include measures to actively manage volatility and thus the expense of financing local government via this instrument.

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Table 1: Summary Statistics

	Observations	Mean	Std. Dev.	Min	Max
Dependent Variables:					
Long-Run Volitility of Total Revenues	3,234	0.097	0.096	0.000	1.379
Short-Run Volitility of Total Revenues	3,054	0.087	0.105	0.000	1.536
Independent Variables:					
Sales Taxes					
LOST tax (binary indicator)	3,236	0.90	0.30	0.00	1.00
SPLOST tax (binary indicator)	3,236	0.67	0.47	0.00	1.00
Per-Capita LOST Revenues	3,235	$54.42	$33.76	$0.00	$357.26
Per-Capita SPLOST Revenues	3,235	$53.09	$52.42	$0.00	$276.20
Property Taxes					
Millage Rate (in Mills)	3,277	24.51	5.93	5.88	50.48
Per-Capita Property Tax Revenues	3,235	$184.09	$89.64	$0.00	$895.93
Alternate Financing Instruments					
Per-Capita General Obligation Bond	2,014	$9.83	$61.57	$0.00	$1,046.87
Per-Capita Revenue Bond	2,018	$12.11	$62.51	$0.00	$1,031.46
Per-Capita Lease/Purchase Revenues	2,168	$11.51	$48.68	$0.00	$905.54
Per-Capita Georgia State Grant	3,234	$29.93	$32.60	$0.00	$762.45
Per-Capita Federal Grant	3,234	$5.83	$19.60	$0.00	$490.43
Economic Indicators					
Population	3,235	44,242	96,024	1,788	915,623
Per-Capita Real Income	3,291	$19,630.02	$3,981.30	$11,678.63	$45,916.00
Unemployment - Local Rate	3,291	6.09%	2.24%	1.40%	19.50%

Table 2: Volatility Impacts of Revenue Instruments -- in the Long and Short Run

Dependent Variable:	Long-Run Volatility				Short-Run Variability			
	I		II		III		IV	
Sales Taxes:								
LOST tax (binary indicator)	0.019 (0.019)				0.075 (0.023)	***		
SPLOST tax (binary indicator)	0.007 (0.008)				-0.024 (0.009)	***		
Per-Capita LOST Revenues (in thousands of dollars)			0.192 (0.15)				0.499 (0.18)	***
Per-Capita SPLOST Revenues (in thousands of dollars)			0.015 (0.059)				-0.118 (0.069)	*
Property Taxes:								
Property Tax Millage Rate (in Mills)	0.003 (0.001)	***			0.000 (0.001)			
Per-Capita Property Tax Revenues (in thousands of dollars)			-0.152 (0.052)	***			-0.282 (0.061)	***
Alternate Financing Instruments:								
Per-Capita Revenue Bond (in thousands of dollars)	-0.003 (0.031)		-0.003 (0.031)		-0.009 (0.035)		-0.016 (0.036)	
Per-Capita General Obligation Bond (in thousands of dollars)	-0.020 (0.03)		-0.023 (0.03)		-0.028 (0.034)		-0.033 (0.034)	
Per-Capita Lease/Purchase (in thousands of dollars)	0.096 (0.043)	**	0.087 (0.043)	**	-0.018 (0.049)		-0.033 (0.05)	
Per-Capita Georgia State Grant (in thousands of dollars)	-0.167 (0.06)	***	-0.153 (0.06)	**	-0.121 (0.069)	*	-0.116 (0.069)	*
Per-Capita Federal Grant (in thousands of dollars)	0.033 (0.086)		0.025 (0.086)		-0.012 (0.099)		-0.027 (0.1)	
Economic Indicators:								
Population (in thousands)	0.000 (0)		0.000 (0)		0.000 (0)		0.000 (0)	
Per-Capita Real Income (in thousands of dollars)	-0.009 (0.002)	***	-0.009 (0.002)	***	0.000 (0.003)		0.001 (0.003)	
Unemployment (Local Rate)	0.001 (0.002)		0.000 (0.002)		0.001 (0.002)		0.001 (0.002)	
Constant	0.159 (0.076)	**	0.270 (0.072)	***	0.003 (0.075)		0.101 (0.063)	
Observations	**1,848**		**1,862**		**1,847**		**1,861**	
R-squared	**0.26**		**0.26**		**0.240**		**0.240**	

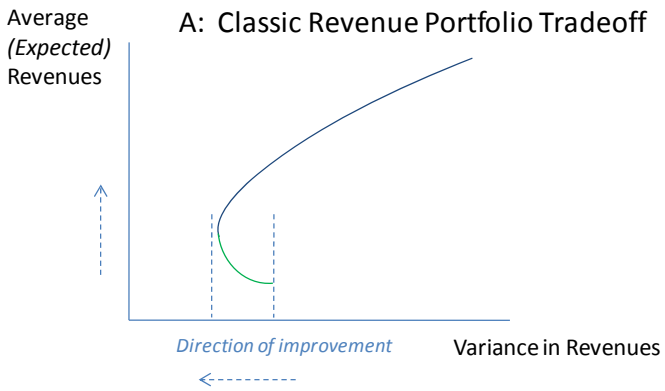
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Volatility Impacts of Non-SPLOST Revenue Instruments -- in the Long and Short Run

Dependent Variable:	Long-Run Volatility				Short-Run Volatility			
	I		II		III		IV	
Sales Taxes:								
LOST tax (binary indicator)	0.018 (0.019)				0.075 (0.023)	***		
Per-Capita LOST Revenues (in thousands of dollars)			0.194 (0.15)				0.477 (0.18)	***
Property Taxes:								
Property Tax Millage Rate (in Mills)	0.003 (0.001)	***			0.000 (0.001)			
Per-Capita Property Tax Revenues (in thousands of dollars)			-0.152 (0.052)	***			0.000 (0)	***
Alternate Financing Instruments:								
Per-Capita Revenue Bond (in thousands of dollars)	-0.003 (0.031)		-0.002 (0.031)		-0.011 (0.035)		-0.018 (0.036)	
Per-Capita General Obligation Bond (in thousands of dollars)	-0.020 (0.03)		-0.023 (0.03)		-0.030 (0.034)		-0.034 (0.034)	
Per-Capita Lease/Purchase (in thousands of dollars)	0.097 (0.043)	**	0.088 (0.043)	**	-0.021 (0.049)		-0.041 (0.049)	
Per-Capita Georgia State Grant (in thousands of dollars)	-0.165 (0.06)	***	-0.152 (0.06)	**	-0.127 (0.069)	*	-0.118 (0.069)	*
Per-Capita Federal Grant (in thousands of dollars)	0.034 (0.086)		0.025 (0.086)		-0.014 (0.099)		-0.025 (0.1)	
Economic Indicators:								
Population (in thousands)	0.000 (0)		0.000 (0)		0.000 (0)		0.000 (0)	
Per-Capita Real Income (in thousands of dollars)	-0.009 (0.002)	***	-0.009 (0.002)	***	0.000 (0.003)		0.000 (0.003)	
Unemployment - Local Rate (Local Rate)	0.001 (0.002)		0.000 (0.002)		0.002 (0.002)		0.001 (0.002)	
Constant	0.167 (0.075)	**	0.272 (0.072)	***	-0.026 (0.074)		0.096 (0.063)	
Observations	**1,848**		**1,862**		**1,847**		**1,861**	
R-squared	**0.260**		**0.260**		**0.230**		**0.240**	

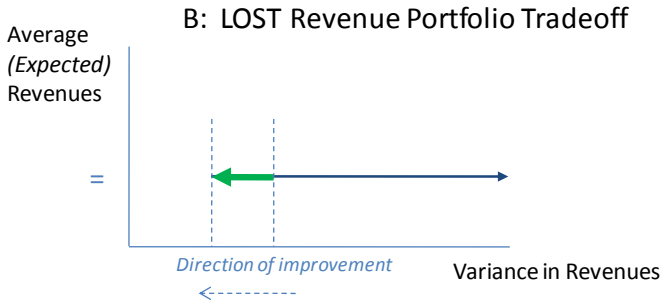
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 1: Mean and Variance in Local Government Revenue Portfolios



Applying standard portfolio theory, a curve like "A" denotes the risk-return tradeoff to increasing reliance on any one revenue source (for example, consumption taxes).

Notice that along the lowest portion of the curve (green) it is possible to increase revenues and reduce their variability at the same time by increasing reliance on an underused revenue source.



Under Georgia Law Local Option Sales Tax (LOST) revenues displace other collections, thus no tradeoff between risk and return exists. The objective in this situation is simply to minimize the variance in collections.

[i] Two of the 159 counties are dropped due to missing observations.

[ii] One should not assume that communication with lenders is meaningless. Indeed, Seligman (2006) analyzes U.S. Treasury short-term finance, identifying practices that reduce costs for cash management, even for the case of what is indisputably the very best credit risk in the world. Significantly, what lies behind true efficacy in reducing public sector costs is proper cash inventory management both by the public and private banking sectors.

[iii] Seligman and Hou (2005) investigate revenue patterns and describe why this equivalence is less than perfect. However, the isolation of relative volatility components, though review of sales tax collections and a resetting of property assessments, benchmarks the equivalence annually. Importantly the authors know of no better setting in which to isolate the second moment of the revenue distribution, variance, from expected returns.

[iv] State consumption taxes were 3 percent before 1990.

[v] Specifically consider a special case where property and income taxes have equivalent collections and resultantly equivalent magnitudes of variation, each being half as volatile as consumption taxes. A counteracting consumption tax that was seemingly twice as volatile would be valuable to hold in a very high portfolio proportion. Indeed let τ_p, τ_y, τ_c represent property, income, and consumption tax rates. Then in this special case where

$$\text{var}(P\tau_p) = \text{var}(Y\tau_y) = -\frac{1}{2}\text{var}(C\tau_c),$$

over time periods $t \in T$ holding other factors constant, consumption taxes should make up an average of 50 percent of expected collections if minimizing revenue shocks is valued by local governments

$$\frac{1}{t}\sum_T (P\tau_{p(t)} + Y\tau_{y(t)}) = \frac{1}{t}\sum_T C\tau_{c(t)}.$$

[vi] The *Georgia County Guide* is a summary statistical reference analogous to the *U.S. Statistical Abstract.*

[vii] Additionally there is variation in the geography over which the two taxes {LOST, SPLOST} may be levied within a county as a result of revenue-sharing agreements between the counties, local municipalities, and special districts.

[viii] This technique addresses the sensitivity of ratios to changes in the denominator. Specifically in our work we find short-run constants are much lower than long-run constants. Using short-run constants thus magnifies the relative impact of our short-run coefficients in ways which make them both much larger and incomparable to estimates from our long-run analysis.

[ix] This yields .474, or 47.4 percent. We suggest this to be a prudent measure when compared to using the short-run constant as a base. Using the short-run measure yields a ratio 25 times the very erratic measure of expected ("Constant") short-run volatility.

[x] Specifically, Fertig and Seligman (2007) analyze the efficacy of Georgia state grants over a five-year cycle for the Augusta region. In general they find that distress communities are more likely to hold a broader portfolio of grants both in terms of type (mechanism) and over time.

[xi] For more on the Sortino Ratio, see Sortino and Price (1994).

[xii] One caveat here, the authors note that municipalities are more likely to receive federal grants, and thus may be somewhat better shielded from volatility, should any of the current initiatives pass.