Cyclical Variability In State Government Revenue: Can Tax Reform Reduce It?

by Russell S. Sobel and Gary A. Wagner

Russell S. Sobel is associate professor of economics at West Virginia University. Gary A. Wagner is assistant professor of economics with the A.J. Palumbo School of Business, John F. Donahue Graduate School of Business, Duquesne University.

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1. Introduction

During recessions, the slowdown in economic activity tends to significantly reduce state tax revenue growth, making it difficult for states to fund their existing programs. Compounding the problem is the fact that the demand for state government expenditures tends to increase during a recession. This is particularly true for programs such as unemployment insurance, welfare, and higher education. Because of this inherent mistiming between revenue flows and expenditure flows, states generally find themselves experiencing a self-proclaimed fiscal crisis during each and every recessionary period. In this regard, the most recent recession to start off the 21st century was no different than the previous recessions of 1990-91 and 1980-82. In terms of its impact on state tax revenue, the most recent recession has been more severe than the 1990-91 recession, but somewhat less severe than the 1980-82 recession. For the second quarter of 2002, for example, state tax collections (adjusted for inflation) were down 7.1 percent from the same quarter of the previous year.[1] This has been a somewhat harsh adjustment for many states after experiencing almost a decade of steady positive revenue growth.

There are only two possible ways a state may ease the fiscal stress it faces during recessions: (1) reduce the cyclical variability of its revenue stream; or (2) build savings during booms to inject during recessions (create and *properly* use a rainy day fund). In this report, we focus on the first of these two options — the possibility of reforming a state's tax structure in an attempt to reduce the variability of the revenue stream.

2. State Revenue Sources

While states do receive substantial money from the federal government, the vast majority of state revenue is still derived from own-source taxes. Thus, reducing revenue variability requires making changes to the tax structure that will lessen the ups and downs in particular tax sources. The true contribution of a specific stability enhancing tax reform to the state's overall budget situation will depend primarily on the degree to which that specific tax is a major revenue source. Reforming a tax that provides only 1 percent of state tax revenue, for example, will not have much of an impact on reducing overall revenue variability in the state budget. Table 1 (next page) shows the dollar amounts and percentage breakdown of state tax revenue sources for 2001, when looking at the combined revenue of all 50 U.S. states.

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The data presented in Table 1 show that well over half of all state tax revenue comes from just two sources: general sales taxes and income taxes. Sales and gross receipts taxes — a category that includes general sales tax revenue from the state's retail sales tax, and also tax revenue from selective sales taxes imposed on particular items, such as motor fuels and alcoholic beverages — accounted for 46.2 percent of all state tax revenue in 2001. This category of revenue is heavily dominated by state general retail sales tax revenue, weighing in by itself at 32.1 percent of state tax revenue. Other sales taxes levied on specific

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[1] Data from *Quarterly Summary of State and Local Tax Revenue*, U.S. Bureau of the Census, http://www.census.gov/govs/www/qtax.html.

Table 1
State Government Tax Collections 2001
(dollar amounts in millions)

	Amount	Percent of Total
Total all taxes	$559,765	100.0%
Property Taxes	10,431	1.9%
Sales and gross receipts	258,526	46.2%
General sales and gross receipts	179,443	32.1%
Selective sales taxes	79,082	14.1%
Alcoholic beverages	4,181	0.7%
Amusements	3,816	0.7%
Insurance premiums	10,284	1.8%
Motor fuels	30,325	5.4%
Pari-mutuels	304	0.1%
Public utilities	8,995	1.6%
Tobacco products	8,651	1.5%
Other selective sales	12,525	2.2%
Licenses	32,880	5.9%
Alcoholic beverages	298	0.1%
Amusement	203	0.0%
Corporation	6,422	1.1%
Hunting and fishing	1,126	0.2%
Motor vehicle	15,160	2.7%
Motor vehicle operators	1,321	0.2%
Public utility	378	0.1%
Occupation and business, NEC	7,448	1.3%
Other	524	0.1%
Other taxes	257,929	46.1%
Individual income	207,611	37.1%
Corporation net income	31,730	5.7%
Death and gift	7,497	1.3%
Documentary and stock transfer	4,466	0.8%
Severance	6,402	1.1%
Other	224	0.0%
Source: U.S. Census Bureau, State Government Tax Collections available at http://www.census.gov/govs/www/statetax.html		

items pale in comparison, with the largest being motor fuels at 5.4 percent. License revenue accounts for just under 6 percent of all state tax revenue, and about half of that category is accounted for by motor vehicle license fees. Rounding out the list, individual income taxes account for 37.1 percent of state tax revenue, while corporate income taxes account for 5.7 percent. Thus, combined, state retail sales taxes and state individual income taxes account for over two-thirds of all state tax revenue in the United States. Table 2 (next page) shows how this heavy reliance on sales and income taxes varies across the individual states.

While there is some variance across states, the vast majority of states rely about equally on these two taxes, each accounting for about one-third of state tax revenue. Some states, however, rely much more heavily on one than the other, particularly those

states without one of these two taxes (Florida, for example, has no state individual income tax, while Montana has no retail sales tax). Table 2 should make it clear that when searching for tax reforms that might have a noticeable impact on revenue variability, the focus should be on reforms that target state income and sales taxes.

3. Measuring Cyclical Variability

Following Sobel and Holcombe (1996b) and Holcombe and Sobel (1997), the cyclical variability of a tax is appropriately measured by estimating a regression of the form:

$$\%\Delta R_t = \alpha + \beta \cdot \%\Delta Y_t + \varepsilon t$$

to obtain the coefficient β that can be interpreted as the "short-run elasticity" of the tax. In the equation, $\%\Delta R_t$ is the

Table 2 State Reliance on Sales and Income Taxes 2001 (percentages of state tax revenue)		
	General Sales	**Individual Income**	**Total**
Alabama	26.7%	33.0%	59.7%
Alaska			0.0%
Arizona	46.4%	27.2%	73.7%
Arkansas	36.1%	31.9%	67.9%
California	26.9%	49.3%	76.2%
Colorado	26.0%	51.5%	77.5%
Connecticut	32.8%	42.2%	75.0%
Delaware		33.1%	33.1%
Florida	59.0%		59.0%
Georgia	34.1%	48.2%	82.4%
Hawaii	46.8%	31.5%	78.3%
Idaho	30.6%	40.3%	70.9%
Illinois	27.3%	33.1%	60.4%
Indiana	35.3%	37.0%	72.4%
Iowa	34.0%	36.6%	70.7%
Kansas	34.9%	39.8%	74.8%
Kentucky	28.8%	33.8%	62.5%
Louisiana	33.4%	24.3%	57.7%
Maine	30.6%	43.5%	74.2%
Maryland	24.5%	43.8%	68.3%
Massachusetts	21.8%	57.5%	79.3%
Michigan	34.7%	30.5%	65.2%
Minnesota	27.9%	43.6%	71.5%
Mississippi	49.0%	21.8%	70.7%
Missouri	31.7%	43.2%	74.9%
Montana		37.2%	37.2%
Nebraska	33.8%	40.5%	74.3%
Nevada	53.5%		53.5%
New Hampshire		4.3%	4.3%
New Jersey	29.9%	41.5%	71.4%
New Mexico	40.5%	20.7%	61.2%
New York	19.6%	59.0%	78.5%
North Carolina	22.1%	48.2%	70.3%
North Dakota	27.6%	17.3%	45.0%
Ohio	32.1%	42.3%	74.4%
Oklahoma	24.2%	35.9%	60.2%
Oregon		74.4%	74.4%
Pennsylvania	32.1%	31.7%	63.8%
Rhode Island	31.0%	41.4%	72.4%
South Carolina	40.5%	34.6%	75.1%
South Dakota	52.7%		52.7%
Tennessee	57.3%	2.5%	59.8%
Texas	50.0%		50.0%
Utah	36.4%	41.9%	78.4%
Vermont	13.8%	31.1%	44.9%
Virginia	20.2%	55.2%	75.4%
Washington	63.6%		63.6%
West Virginia	27.1%	29.8%	56.9%
Wisconsin	30.7%	43.8%	74.4%
Wyoming	36.1%		36.1%
Average	34.5%	37.4%	63.3%
Source: U.S. Census Bureau, State Government Tax Collections available at http://www.census.gov/govs/www/statetax.html		

Table 3	
Short-Run Elasticities of Major State Tax Bases	
Tax Base	**Short-Run Elasticity**
Personal Taxable Income	1.164
Corporate Taxable Income	3.369
Retail Sales	1.229
Nonfood Retail Sales	1.612
Motor Fuels Usage	0.729
Source: Sobel and Holcombe (1996b)	

(Text continued from p. 570.)

percentage change in tax revenue between time periods t-1 and t, and %ΔY_t is the percentage change in a measure of economic activity between time periods t-1 and t. The interpretation of the coefficient β is fairly straightforward. For example, $\beta = 2$ would mean that for every 1 percentage point change in state economic activity, revenue can be expected to change by 2 percent. Thus, if a recession causes state income to fall by 3 percent, then state revenue would fall by 6 percent.

There is, however, one major practical concern in implementing the estimation technique above. The problem lies in the fact that tax revenue data include *both* changes in the underlying economic activity and discretionary changes in state tax policy. For example, if a state generally raises its retail sales tax rate during a recession to boost falling revenue, the revenue data will incorporate this and it will result in actual revenue not appearing as variable as it really is. For this reason, it is generally preferable to use some measure of the underlying tax base, rather than tax revenue, in the estimation process. In addition, for the standard reasons in economic measurement, the percentage changes are calculated as the change in the log of the variables, thus %$\Delta R_t = \ln(R_t) - \ln(R_t$-1).

In some cases, we may be more interested in whether a particular state's revenues, for example, tend to vary more over the business cycle than the average of all states. When comparisons of this nature are called for, the revenue from the state of interest would be on the left-hand side of the equation while the average revenue of all states would be on the right-hand side. Within this context, specific values of the coefficient β take on even more meaning. A $\beta > 1$ would imply that the state's revenues fluctuate more than average, while a $\beta < 1$ would imply that the state's revenues fluctuate less than average.[2]

4. The Variability of State Revenue Sources

As we have already seen, states rely very heavily on state individual income taxes and retail sales taxes. The only other marginally significant sources of revenue are state corporate income taxes and motor fuels taxes. Using the technique outlined above, Sobel and Holcombe (1996b) estimate the short-run elasticities for each of these major tax bases (aggregated to a national level), and their results are presented in Table 3 above.

From the results shown in Table 3, it is clear that the corporate income tax is by far the most variable of all major state tax sources, while motor fuels taxes are the most stable. Personal income taxes exhibit about the same variability as retail sales taxes, although when states exempt food purchases from the sales tax, the variability of the sales tax rises significantly. Several policy prescriptions are obvious from these estimates. First, for a state that currently has both an individual income tax and a retail sales tax that includes food, shifting the reliance more heavily toward one and away from the other will not have a significant impact on overall revenue variability. This also suggests that for the several states that currently do not have one or the other of these two taxes, not much is to be gained by adopting the lacking tax.

For a state that currently has both an individual income tax and a retail sales tax that includes food, shifting the reliance more heavily toward one and away from the other will not have a significant impact on overall revenue variability.

Second, states can reduce the variability of their sales tax revenue by making food purchases taxable under the retail sales tax. Currently, 26 states exempt food purchases, and three tax it at a lower retail sales tax rate. The justification for this is that taxing food and other items such as prescription drugs tends to be regressive. However, federal law requires food purchases made with food stamps be exempt from state sales taxes, so this concern is significantly mitigated by federal law. Thus, purchases of food by those in poverty would remain exempt even if the state tax code was reformed to include food purchases under the retail sales tax. For a state that nonetheless decides to exempt food purchases from the retail sales tax, stability can be enhanced by shifting reliance away from the retail sales tax and toward the individual income tax. Finally, the estimates for the two smaller taxes, corporate income and motor fuels, suggest that lower reliance on corporate income taxes and heavier reliance on motor fuels taxes might also work to lessen state revenue variability.

The estimates presented above use data aggregated to the national level. Thus, it is worthwhile to explore whether significant variation exists between states in these estimates. Table 4 shows these estimates, taken from Holcombe and Sobel (1997), for the tax bases of each state.

First, looking at the average estimate across all states, it still appears that exempting food from the retail sales tax base significantly increases the variability of state retail sales tax revenue. One difference, however, is that it now appears that the retail sales tax, when it includes food, is quite a bit more stable than is the individual income tax, and that when it excludes food it is about as variable as the income tax. Thus, while it is clear that the food exemption makes a difference for the variability of the retail sales tax, the results remain somewhat mixed as to whether simply shifting reliance between income and sales taxes has the potential to have any real impact

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[2] Readers familiar with financial market analysis will note a striking similarity in this interpretation to the "beta" calculated for specific stocks.

Table 4
Short-Run Elasticity Estimates for State Income and Sales Tax Bases

	Individual Income Tax	Retail Sales Tax (including food)	Retail Sales Tax (excluding food)
Alabama	1.436	1.301	1.606
Alaska	0.652	0.695	0.744
Arizona	1.176	0.669	0.734
Arkansas	1.071	0.776	0.750
California	1.894	0.583	0.727
Colorado	0.488	1.254	1.104
Connecticut	1.590	0.784	0.904
Delaware	1.471	1.526	1.720
Florida	1.210	1.568	1.616
Georgia	1.375	1.720	1.923
Hawaii	0.953	2.037	2.149
Idaho	0.685	0.703	0.738
Illinois	1.581	1.231	1.471
Indiana	1.293	1.144	1.306
Iowa	0.635	-0.100	-0.176
Kansas	0.679	0.202	0.092
Kentucky	0.573	1.332	1.318
Louisiana	0.790	0.231	0.256
Maine	1.282	0.724	0.945
Maryland	1.256	0.728	0.993
Massachusetts	1.499	1.271	1.479
Michigan	1.436	1.156	1.378
Minnesota	0.715	0.701	0.762
Mississippi	0.681	1.537	1.572
Missouri	1.252	1.233	1.367
Montana	0.653	1.173	1.256
Nebraska	0.314	-0.257	-0.263
Nevada	1.176	1.134	1.327
New Hampshire	1.439	1.143	1.341
New Jersey	1.608	0.855	1.061
New Mexico	0.894	1.579	1.562
New York	1.227	0.844	1.016
North Carolina	1.386	1.109	1.197
North Dakota	0.325	-0.043	-0.034
Ohio	1.617	1.864	2.220
Oklahoma	0.611	0.487	0.303
Oregon	1.249	1.328	1.644
Pennsylvania	0.575	0.630	0.652
Rhode Island	1.591	1.455	1.726
South Carolina	1.466	1.718	1.812
South Dakota	0.765	-0.068	-0.080
Tennessee	1.529	1.555	1.966
Texas	0.773	0.856	0.885
Utah	0.835	0.443	0.502
Vermont	1.185	0.397	0.588
Virginia	1.734	1.064	1.090
Washington	1.034	0.565	0.864
West Virginia	0.714	0.951	0.870
Wisconsin	1.563	1.621	1.917
Wyoming	0.673	0.950	0.888
Average	1.092	0.967	1.076
Source: Holcombe and Sobel (1997)			

Table 5	
Short-Run Elasticities of Income by Income Range	
Income Range	**Short-Run Elasticity**
0-4,999	0.14
5,000-9,999	0.22
10,000-14,999	0.32
15,000-24,999	0.43
25,000-34,999	0.67
35,000-49,999	1.08
50,000-74,999	1.49
75,000-99,999	1.84
100,000 and up	4.21
Source: Dye and McGuire (1998)	

(Text continued from p. 572.)

on the overall variability of state revenue.[3] Because the estimates are calculated using data on the tax bases, rather than actual tax revenue, it becomes possible to see the potential variability of a tax that a state does not have. For example, Montana does not have a general retail sales tax, but it does have an individual income tax. The estimates in Table 4 would suggest that Montana could not lower its revenue variability by enacting a sales tax; in fact, revenue variability would increase.

5. Income Tax Progressivity and Revenue Variability

Just as changes in the food exemption are a possible way to change the variability of sales tax revenue, changes in the progressivity of a state's income tax can change the variability of income tax revenue. As might be imagined, fluctuations in economic activity hit individuals of different income levels differently. Dye and McGuire (1998) have estimated the short-run elasticities for individual income for different income brackets and their results are shown in Table 5 above.

The estimates in Table 5 clearly show that income variability rises with income level. Thus, the more progressive a state's income tax is, the more heavily it will rely on taxing income in the higher brackets, and thus, the more variable its total income tax revenue will be. Some quick calculations from their data show there is substantial potential for income tax reform to lower the cyclical variability of income tax revenue. Using an average of all state income tax codes interacted with the data above suggests an average variability of 1.14 that could potentially be reduced to 0.87 simply by adopting a completely proportional income tax. While that may not be politically feasible, it demonstrates that any flattening of the state income tax code can have substantial impact on lowering the variability of income tax revenue.

6. Managing a Portfolio of Taxes

Anyone who has ever received advice on how to manage a stock portfolio knows that diversification is the key to reducing the variability of the financial return provided by the portfolio. Proper diversification requires not only that investment funds be spread widely over many different stocks, but also that the returns for these stocks are not too highly correlated. In other words, it wouldn't be much help if diversification took the form of purchasing stock in many different firms, but all the firms were in the same industry. This same principle can be applied to how a state chooses to manage its portfolio of taxes. It would imply that a state should rely on many different taxes for its revenue and also that it should attempt to rely on taxes that tend not to be too heavily correlated. The first problem with this analogy, however, is that states are unavoidably faced with very little room to diversify. As we have seen earlier, the typical state receives the vast majority of its revenue from just two tax sources, the individual income tax and retail sales tax. The second problem is that because all taxes are levied on economic activity, their revenue flows tend to be highly correlated.[4] The very high correlation between changes in individual income tax revenue and changes in retail sales tax revenue, for example, means that a state with only one of these taxes could not get the benefit of diversification simply by adopting the other.

It now appears that the retail sales tax, when it includes food, is quite a bit more stable than is the individual income tax, and that when it excludes food it is about as variable as the income tax.

Despite these difficulties, there are some portfolio management practices that can reduce the potential fiscal problems faced by a state.[5] States generally tend to have multiple funds into which tax revenue flows. The first of these is the general fund, which the state legislature can use to fund state programs at its discretion. Generally the revenue from most state taxes goes into this fund. States also have other special funds that can only be used for a specific purpose, such as a state road fund used for road construction. These other funds are generally financed by a single tax that is "earmarked" specifically for that fund. The motor fuels tax, for example, is earmarked for the state road fund in most states. For the state general fund, states should attempt to make sure that some of the least variable tax sources are included here so as to reduce the overall variability of the general fund. For the specific earmarked funds, the strategy is quite different. Because the expenditure levels for some programs can be cut or delayed more easily than others, it is important to match the most highly variable revenue sources with the programs that can be cut most easily. The programs that are the most difficult to cut during recessions should be funded by the more stable revenue sources.

7. The Role of Rainy Day Funds

Although we have identified several tax reforms that can help states reduce the cyclical variability of revenue, it is impossible to eliminate completely the effects of business cycle swings on revenue streams. For this reason, most states also have some form of a rainy day fund in place to save unspent surpluses during periods of growth that may later be used to

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[3] For additional evidence on this issue, *see* Holcombe and Sobel (1997).

[4] Alcohol taxes, however, do tend to rise during recessions and fall during booms; *see* Sobel and Holcombe (1996b).

[5] *See* Sobel (1996) for an application of these ideas to the state of West Virginia.

avoid (or reduce) spending cuts or tax increases during future downturns. This section of the report briefly describes how states may use rainy day funds to complement tax reform as part of an overall strategy to mitigate periods of fiscal stress.

A state's ability to "smooth out" revenue or expenditure fluctuations during downturns depends on the amount of savings built up during expansions. Given that all states routinely maintain surplus money (or savings) in the general fund, this "ability" boils down to the sum of the rainy day fund and general fund balance. But because rainy day funds are nothing more than an account in a state's budget (just like the general fund), a critical issue in the use of a rainy day fund is the extent to which money placed in the rainy day fund is simply replacing money that would have been saved in the general fund. In short, if a state's policymakers simply lower the general fund surplus by $1 for every $1 deposited in the rainy day fund, then the state's total amount of savings will remain unchanged and the state will be no better prepared for future recessions than it was for past recessions.

The greatest benefit from utilizing a rainy day fund comes in establishing a fund that is properly structured. That is, rather than depositing and withdrawing money from a rainy day fund at the discretion of policymakers, which is precisely how the general fund operates, states that have strict rules attached to their rainy day funds (that actually force deposits and limit withdrawals) benefit the most from using a rainy day fund. The logic behind this result is straightforward — if money is withdrawn and deposited into a state's rainy day fund at the discretion of policymakers, is there really any reason to believe that a state will be better prepared for the next downturn?[6]

The fiscal benefits accruing to states with rainy day funds governed by strict deposit and withdrawal rules are substantial when compared with the situations of states without rainy day funds *and* states with improperly structured funds. For example, Wagner (2002, 2003) and Sobel and Holcombe (1996a) find that states with strict rainy day funds save more, face lower borrowing costs, and experienced 17 percent less fiscal stress during the 1990-1991 recession than states without rainy day funds and states with rainy day funds governed by policymaker discretion.[7] In addition, Wagner and Elder (2003) find that the cyclical variability of expenditures over the period from 1969 to 1999 is lower in states with strict rainy day funds. In fact, states with strict rainy day funds are able to reduce the cyclical variability of expenditures by 44 cents for every $1 deposited in a rainy day fund, compared with states without rainy day funds and states with rainy day funds governed by policymaker discretion.

8. Conclusion

Cyclical fluctuations in economic activity pose an unyielding problem for state governments because the demand for public-sector services tends to be countercyclical, while revenue growth is procyclical. A recent report published by the National Conference of State Legislatures (NCSL) illustrates just how severely states have been affected by the current downturn. While 43 states experienced budget shortfalls during fiscal 2002, more than two-thirds of states are also facing budget shortfalls in excess of $26 billion during fiscal 2003. The NCSL report (2003) also notes that "state policymakers will work to solve unprecedented budget shortfalls for the next 15 months." This report has briefly outlined how states may reform tax structures and use rainy day funds to help alleviate these periods of fiscal stress.

Because personal income variability rises dramatically at higher levels of income, states can generate more stable personal income tax streams by reducing/eliminating exemptions and relying on a less progressive tax structure.

While it is impossible to eliminate the variability in revenue streams that result from business cycle swings, there are a number of steps that state policymakers may follow to reduce cyclical variability. First, policymakers can "broaden" tax bases by reducing or eliminating exemptions. In the case of general sales taxes, which represents more than one-third of the typical state's revenue, states can significantly lower the variability of sales tax revenue by removing exemptions on purchases of food. Next, because personal income variability rises dramatically at higher levels of income, states can generate more stable personal income tax streams by reducing/eliminating exemptions and relying on a less progressive tax structure. Finally, policymakers can practice sound tax portfolio management by financing expenditures that are difficult to cut during downturns with revenue sources that are relatively more stable. Consistent with this notion, revenue sources that are highly variable over the business cycle, such as corporate income taxes, should be used to finance general fund expenditures and other programs that can be reduced during recessions.

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[6] The majority of state rainy day funds are governed by policymaker discretion, as opposed to strict rules. Wagner and Sobel (2002) contend that some states with rainy day funds governed by discretion may have adopted such funds to circumvent existing tax and expenditure limitation laws rather than prepare for future recessions. *See* Wagner (2002) for specific information regarding the date of rainy day fund adoption and the structure of each state's deposit and withdrawal rule. In addition, government savings suffers from the common pool problem; *see* Wagner (2001) for a discussion of this issue.

[7] Sobel and Holcombe (1996a) define a state's fiscal stress as the sum of expenditure reductions and tax increases that occurred during the 1990-1991 recession.

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