



Federal Reserve Bank of Chicago

**Revenue Bubbles and Structural
Deficits: What's a state to do?**

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REVISED
April 2012

WP 2008-15

Revenue Bubbles and Structural Deficits: What's a state to do?

The past two recessions have both proved alarming to state government finances. In 2001, a relatively shallow national recession led to a severe downturn in state revenues that took three years to unwind. In the wake of the recent economic downturn, signs of fiscal stress are readily apparent. In this paper, we investigate whether the revenue patterns surrounding these two recessions are the result of state government revenues having grown more sensitive to economic conditions. We find that the responsiveness of revenues to measures of business cycle conditions has grown since the 1990s. We use data on state government revenues, state specific information on economic conditions, and measures of state policy to examine fiscal performance and budgeting practice over the economic cycle. Our findings suggest that increasing income cyclicality, in particular of capital gains, have made state revenues more responsive to the business cycle since the mid-1990s. We also find that changes in policy making have served to increase revenue cyclicality.

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¹ The opinions expressed in this paper are the authors' and do not reflect the opinions of the Federal Reserve Bank of Chicago or of the Federal Reserve System.

1. Introduction

The fiscal condition of the states has been garnering headlines as governments confront difficult choices in their quest to close substantial budget gaps. Budget gaps can arise because expenditures exceed anticipated levels or because revenues come in below forecasts. The 2007-2009 recession led to pressure on both sides of the government ledger -- substantial declines in tax revenues were coupled with increasing expenditure pressures. While some areas of the economy have been improving, state and local governments continue to struggle and cut over 230,000 jobs in 2011.

Throughout the recession, poor revenue numbers challenged state budgets. The deep national recession was met with sharp declines in revenues. (Dadayan and Boyd 2009b). Analysis of revenue patterns during the 2007-2009 recession point to declines in revenues that were broadly analogous to those observed during the 2001 recession. In the 2001 recession, a modest recession led to disproportionate drops in revenues

In this paper, we investigate the relationship between state government tax revenues and economic conditions and ask whether changes in this relationship can explain the extent of the weakness in state revenues during the past two downturns. We find that while government revenues have always responded to economic conditions, in the period since the late 1990s, this responsiveness has grown more pronounced. We find that this increasing responsiveness has been concentrated in the individual income tax and is due partly to increasing cyclicity of income, particularly investment income, and partly due to changes in state income tax policy making.

2. Literature

Numerous researchers have investigated the business cycle properties of state tax revenues, state tax bases, and state tax policy. Holcombe and Sobel (1997) provide a book length treatment of the measurement and sources of cyclical variability. They found that among the three major tax bases, the corporate income tax was the most procyclical followed by the general sales tax base and the individual income tax base. More recently, Dye (2004) offers a

summary of the research strands and methodological issues involved in estimating the short run elasticity of revenues to the business cycle and the related long run responsiveness of revenues to economic growth. He concludes that the methodology of Holcombe and Sobel is well suited to researching revenue cyclicality. He also stresses the heterogeneity across states in economic cycles and revenue patterns.

Interest in the business cycle properties of revenues increased in the wake of the 2001 recession as researchers questioned why a modest national recession had led to a severe drop in revenues. Maag and Merriman (2003) note that the fiscal crisis following the 2001 recession was characterized by a revenue drought rather than by a rapid expansion in expenditures. They attribute some of this pattern to reluctance among policy makers to increase major taxes during the 2001 budget crisis. Figure 1 displays net changes in the three major state tax revenue sources (sales, personal income and business income) from Fiscal Years 1988 to 2012 and shows that tax increases were modest in the period around the 2001 recession in comparison to period around the 1990 recession. The authors suggest three factors contributed to this behavior: 1) new political constraints; 2) new legal constraints; and 3) unusual access to and appeal of short-term methods of coping. A second factor that has been proposed as an explanation for the 2001 crisis is a pronounced drop in income tax revenues particularly due to declining capital gains income (Sjoquist and Wallace (2003) and Fox (2003)). This in turn was blamed on the sharp drop in the stock market. Sjoquist and Wallace (2003) further investigate the role of capital gains income by testing whether states that experienced an increase in per capita capital gains larger than the average state were more susceptible to the economic downturn. They find that states with the more capital gains per capita in 1999 were more likely to face declines in tax revenues in FY2001 to FY2002. Bruce, Fox and Luna (2009), Fox (2003) and Fox and Luna (2002) show that erosion in the sales and corporate income tax base also exacerbated the fiscal crisis of 2001. By reducing reliance on the portions of the tax base that hold up the best during downturns (such as food and drugs), states exacerbated the effects of the business cycle on their revenues. This caused the corporate and sales taxes to perform particularly poorly during the economic slowdown.

We add to this discussion by returning to the Holcombe and Sobel (1997) framework and asking whether something changed in the period surrounding the 2001 recession that led

revenues to be more responsive to changing economic conditions. We investigate three of the explanations highlighted in the literature on the revenue drought following the 2001 recession: changes in policy making, increased reliance on capital gains, and changes in the tax base outside of capital gains.

Our paper proceeds as follows: In Section 3, we discuss the state level panel data on quarterly revenue and economic conditions that we use to assess revenue cyclicality. In Section 4 we introduce our methodology that follows in the tradition of Holcombe and Sobel (1997). In Section 5, we document that a substantial increase in revenue cyclicality in the personal income tax occurred in the period leading up to the 2001 recession. Section 6 focuses on explanations for the sources of this increased cyclicality and in particular examines changes in the dynamics of personal income and in state policy making. In Section 7 we assess the relative magnitudes of the role of changing income dynamics and changing tax policy. Section 8 concludes and discusses options available to policy makers.

3. Data

We focus our investigation on the relationship between economic variables and state revenue performance from 1980-2011. We choose this time span due to issues of data availability.

For state revenues we use the U.S. Census Bureau's quarterly data on state government revenues for each state. The series is available from 1962 to 2011:Q3. The series originally covered only general sales and gross receipts, motor fuel sales, individual income, and motor vehicle taxes. In recognition of the changing revenue structure of the states, the series now covers 25 revenue sources. The Data Appendix contains further information about this data source. Throughout, we measure revenue in real per capita terms.

To measure state specific economic cycles we use the state coincident indexes produced by the Federal Reserve Bank of Philadelphia. The coincident indexes use a dynamic single-factor model to summarize state economic conditions into one single statistic. The indexes combine data on four state-level indicators -- nonfarm payroll employment, average hours worked in manufacturing, the unemployment rate, and wage and salary disbursements deflated by the consumer price index. The trend for each state's index is set to the trend of its gross

domestic product (GDP). As a result, long-term growth in the state's index matches long-term growth in its GDP and a one percentage point increase in the growth of the coincident index is roughly equivalent to a one percentage point increase in GDP growth. The index is produced monthly but for our purposes it has been converted to a quarterly series and is available from 1979-2011.² Our results are robust to using nonfarm payroll employment as an alternative measure of state economic conditions and to analyzing the longer time series for which this measure is available.³

For our investigation of the role of tax bases, we rely on annual state specific data from the Internal Revenue Service (IRS), Statistics of Income (SOI). The IRS releases total Adjusted Gross Income (AGI) by state and breakdowns of this income into numerous different subcomponents. Data on AGI is only currently available through 2009.

In Table 1, we display quarterly variable means for the state level data for 1980-2011:Q3: columns 3 and 4 show growth rates, columns 5 and 6 show levels. We display data for total tax revenues, for the three single largest state revenue sources; general sales, individual income taxes, and corporation net income taxes, for revenues excluding these three sources, which we label other revenues and for the coincident indicator. We also include the means of four measures of annual real state per capita income and their growth rates based on the SOI data – total AGI, wage and salary income, investment earnings (capital gains, interest and dividends) and other income (primarily retirement income).

The sample sizes for the growth rate calculations differ slightly across the different revenue sources due to missing data, because certain states do not levy some taxes or because revenues are negative and thus we cannot compute growth rates, and because we delete some observations.⁴ In particular, we delete observations for a given tax that are based on changes

² Our quarterly index is the average of the monthly indexes. For more information on the State Coincident Indexes see Federal Reserve Bank of Philadelphia, 2011.

³ The Employment data is available for the whole time period for which the revenue data is available (1962-2011). We prefer the coincident measure because it is a more comprehensive measure of state economic conditions.

⁴ In the absence of missing data we would have 6350 observations (50 states for 4 quarters in 31.75 years (1980-2011:Q3)). For total tax revenues, we lose 69 observations due to missing revenue data and four due to huge swings in revenues – three of these in Alaska. For income tax revenues, we lose 64 due to missing data, twelve for negative realizations of revenues, and 891 due to zero revenues (states that do not levy an income tax in a given quarter), 25 due to large swings in revenues, and 244 due to the deletion of NH and TN. In the regressions, we lose an additional 8 observations due to missing data on the coincident indicators for some states in 1979. Including the observations with big swings does not alter our conclusions although the coefficients change modestly.

from the first quarter when a new tax was introduced. We also delete observations where revenue growth was over 200% or below -200% from one year to the next. Most of these observations are also related to the introduction of new taxes or to changes in the collection cycle. For the individual income tax, we also delete observations for New Hampshire and Tennessee because the tax base is far narrower in these than in other states.⁵

The variable means show that revenues have been growing over the sample period, with revenue growth averaging 1.5%. Sales tax revenue growth has been below individual income tax revenue growth on average, while corporate income tax revenues have been shrinking. The coincident indicators have been trending up, by 2.2% on average. Annual data on state per capita income show income has been growing as well with other income growing faster than wage and salary income and investment income.

In Table 2, we present similar information for one cross section of the data – 1995:Q1, close to the midpoint of our sample. We provide this second table of means to highlight the variation in revenue growth rates across states at a given point in time. For instance while average total revenue growth was close to zero, the standard deviation was 0.12. There is substantially less heterogeneity in revenue levels and in income amounts and growth rates.

4. Model

We are interested in assessing the relationship of tax revenues to economic conditions. A basic model capturing this relationship is:

$$\ln R_{i,t} = \alpha_i + \beta \ln EC_{i,t} + \varepsilon_{i,t} \quad (1.1)$$

Equation (1.1) relates state revenues (R) in state i at time t to economic conditions (EC) in the state at time t . The variable β represents the elasticity of revenues to economic conditions.

We do not estimate this equation, but instead estimate a transformed version of this equation:

⁵ New Hampshire and Tennessee tax only dividend and interest income.

$$\Delta \ln R_{i,t+4} = \alpha + \beta \Delta \ln EC_{i,t+4} + \varepsilon_{i,t+4} \quad (1.2)$$

Where $\Delta \ln R_{i,t+4}$ is the log difference in revenues between period t and period t+4, and $\Delta \ln EC_{i,t+4}$ the log difference in economic conditions.

We choose this transformation for three reasons. First, estimates of β in equation (1.1) will be biased if the measures of revenues or of economic conditions are non-stationary. By using growth rates, we transform these non-stationary series to ones that are stationary. Relatedly, the use of growth rates allows us to capture the short run, or cyclical, responsiveness of revenues because we are abstracting away from the long term relationship between economic conditions and revenues. Most previous researchers investigating the business cycle properties of revenues have estimated equations in growth rates for these reasons.⁶ Our third rationale for this transformation is the result of our use of quarterly revenue data. Quarterly revenue collections vary dramatically and systematically across the quarters of the calendar year. For instance sales tax receipts are particularly high in the fourth quarter due to holiday spending and income tax revenues are particularly high in the second quarter due to final tax payments. By calculating growth rates relative to the same calendar quarter one year prior, we minimize the role of these seasonal variations. An alternative method to dealing with this timing issue would be to use annual revenue data. We choose to use quarterly data rather than annual data because economic conditions often change within a calendar year and the quarterly data allow us to exploit the within year variation.

The coefficient β in equation (1.2) represents the average responsiveness of state government revenue growth to changes in state economic conditions or the economic condition elasticity of state government revenues. If economic growth increases by 1 percentage point, we expect tax revenue growth to increase by β percentage points. We label this responsiveness revenue cyclicity. Tax revenue is procyclical if $\beta > 0$ while tax revenue is countercyclical if $\beta < 0$.

⁶ This is the transformation used in Holcombe and Sobel (1997). It is also used in studies of business cycle revenue responses with data other than that for U.S. states. See for example Priesmeier et. al. 2011. Holcombe and Sobel (1997) also investigate an error correction model. As Dye (1994) points out, the results from the error correction model are quite close to those from the log-difference model presented here.

5. Revenue Cyclicity

In Table 3, we show estimates of equation 1.2. Traditional OLS regression is not appropriate in this context if errors are correlated within a given state over time or across states at a point in time. We consider two potential standard error corrections. First we consider panel corrected standard errors allowing for state specific AR(1) processes. This correction allows for correlation across states a point in time as well as serial persistence within states. Second, we use a cluster covariance matrix estimator following the work of Bester, Conley, and Hansen (2009). In particular, we cluster the standard errors by region by half-decade. Bester, Conley, and Hansen (2009) shows that inference based on clustering in this manner in the face of potentially serially and spatially correlated data performs well. We choose the later standard error correction because it captures the spatial nature of our data. In addition, the standard errors from this procedure tend to be modestly larger than the panel corrected standard errors indicating that this is a more conservative approach. The panel corrected standard errors lead to substantively similar conclusions.

From the table we see that total tax revenue as well as revenue from each of the component tax sources is responsive to changing economic conditions. The number 0.888 in the first column indicates that a 1 percentage point increase in the growth of the coincident index is related to a 0.9 percentage point increase in the growth of revenues. Corporate income tax revenue is the most cyclically sensitive revenue source, followed by personal income tax revenues, and sales tax revenues. Other tax revenues are the least responsive to economic conditions.

We have established the link between revenues and economic conditions at the state level. Next we turn to the issue of whether this relationship changed as we approached the 2001 recession. Rather than assume that a break occurred at a particular juncture, we allow the data to tell us whether a break occurred and if so when. In particular, following Andrews (1993), we use Quandt Likelihood Ratio tests (QLR) with 15% trimming to both determine whether there was a break in the data and also to discover when the break occurred. We look for a break using the data on total tax revenues and allowing breaks to occur between one year and the next (between the fourth quarter of one year and the first quarter of the next year). A break is defined as a change in the average growth rate of revenues across all states as well as a change in the cyclicity of revenues. In particular, we estimate the following equation:

$$\Delta \ln R_{i,t+4} = \alpha_1 + \alpha_2 \text{break} + \beta_1 \Delta \ln EC_{i,t+4} + \beta_2 [\text{break} \times \Delta \ln EC_{i,t+4}] + \varepsilon_{i,t+4} \quad (1.3)$$

Where $\text{break}=1$ if the observation occurs after the hypothesized break time. The coefficient α_2 allows for a different level of revenue growth before and after the break while the coefficient β_2 allows for different cyclicalities. We jointly test the coefficients α_2 and β_2 . For total tax revenues, the data point to a break occurring in 2000. Going forward, we assume that a break occurred in 2000.⁷ As a result, the version of equation (1.3) that we present is:

$$\Delta \ln R_{i,t+4} = \alpha_1 + \alpha_2 (\text{post } 1999) + \beta_1 \Delta \ln EC_{i,t+4} + \beta_2 [(\text{post } 1999) \times \Delta \ln EC_{i,t+4}] + \varepsilon_{i,t+4} \quad (1.4)$$

Table 4 shows estimates of α_1 , α_2 , β_1 , and β_2 for total tax revenues and for the four different subcategories of tax revenues. We see that overall revenues are more sensitive to economic conditions in the later period than they were in the earlier period. Prior to 2000, a one percentage point increase in economic growth was related to a 0.7 percentage point increase in tax revenue growth. In 2000 and after, a one percentage point increase in economic growth was related to a 1.3 percentage point increase in revenue growth. While sales tax revenue cyclicalities and other tax revenue sensitivity has been essentially unchanged, individual income tax revenue cyclicalities has quadrupled. While a one percentage point change in the growth of the coincident index was related to a 0.6 percentage point change in individual income tax revenue growth prior to 2000, it corresponds to a 2.1 percentage point change during the 2000-2011:Q3 period. This confirms the findings of other studies that a change in income tax receipts has dominated revenue patterns (see Sjoquist and Wallace, 2003). We also find a large negative coefficient on the post 2000 dummy in the individual income tax regression. In the later period, annual income tax revenue growth rates declined by 3 percentage points relative to the earlier period. This may be the result of legislated income tax reductions during the 1990s (see Figure 1) or national changes in the income tax base that affected most states. Corporate income tax revenue shows a similar pattern to individual income tax revenues – cyclicalities has doubled. In the remainder of

⁷ The 1% threshold for the QLR statistic with 2 restrictions is 7.8, the 10% threshold is 5. The QLR for overall tax revenue is 19.3 (in 2000). It is 36.6 for the income tax (in 2000). Quarterly data point to breaks for overall taxation in 1999:Q4 and for the income tax in 2000:Q1. We don't want to interpret this result as indication that something specific occurred in 2000 because the underlying Wald test is above 7.8 for the entire period from 1991-2005 for the income tax and above 7.8 from 1998-2005 for overall tax revenues. The QLR for the sales tax is 8.4 in 1987. Insofar as there was a change in the sales tax it occurred earlier. The QLR is below 5 for other taxes.

this paper we focus on the growing sensitivity of individual income tax revenues because it is a large revenue source (about five times corporate collections) that has grown far more sensitive.

In Table 5, we show that this increase in individual income tax cyclicity is robust to the inclusion of state and date fixed effects in our regression. Inclusion of state dummies (column 2) has a very small impact on our estimated coefficients. We fail to reject that the state fixed effects have no effect on income tax revenue growth. We find similar results for the other types of taxes. We estimate the remaining regressions in the paper without state fixed effects. Including date fixed effects in the form of year-quarter dummies reduces our estimates of cyclicity (column 3), but we continue to see an increase in cyclicity after 2000. When we include the date fixed effects we are relying on cross state variation in economic conditions. Going forward, we estimate our models without these date effects and interpret our coefficient on the coincident index as measuring the effect of both national and state specific economic conditions.

In Table 6, we show the cyclicity of individual income tax revenues separately for each of the expansions and contractions over the past three decades based on National Bureau of Economic Research (NBER) business cycle dates. We do this to investigate whether the change in cyclicity occurred primarily in one phase of the business cycle. This table shows that the increased responsiveness of income tax revenues to economic conditions occurred during both the expansionary and contractionary periods since 2001:Q1.

6. Sources of Increasing Sensitivity

Having established that individual income tax sensitivity to business cycle conditions has increased both during recent recessions and recent contractions, we seek to address why this increase has occurred. Tax revenues derive from an intersection between the tax base and tax rate. The base is measured by what and who we tax while tax rates are determined by state tax

policies.⁸ In the next two sections, we separately investigate increased sensitivity of the income tax base and the income tax rate.

Changes in the Base

There are two potential ways to think about the income tax base. We can think of the base as the income of individuals who reside in the state or are otherwise obligated to pay taxes to the state. We call this the exogenous base. Alternative, we can think about the base as the income that policy makers subject to the tax. We call this the selected base. For example, retirement income is not subject to income tax in Illinois. Retirement income is part of the exogenous base, but not part of the selected base.

We investigate increasing cyclicalities for both types of base measurement. In order to measure the exogenous base, we use AGI per capita of state residents as reported to the IRS on Federal returns and released to the public in the Statistic of Income data. We choose this measure of the tax base because it is collected in a consistent manner across all states, is available for a substantial enough period of time to address our question of interest, and contains information about income earned from different sources. In particular, the data contains information on wage and salary income, investment income, and other income separately. However, this is not a perfect measure of the exogenous base for two reasons. First, it may include some income reported to the IRS by state residents that the state cannot tax. This is the case because a resident may owe taxes to a state different from the one in which he resides. This is particularly true of states that do not have reciprocal agreements with other states. Second, this measure of income may not be exogenous to the tax rate. Research on tax rates shows a positive relationship between tax rates and Federal AGI indicating that state policy may influence the reported base. (Bruce, Fox and Yang 2010). We use this measure of the base keeping in mind these weaknesses.

⁸ Federal tax policies are also potentially quite important because states often piggyback on Federal decisions. We label all of these state tax policies because states can choose how to incorporate Federal choices into their tax systems.

As our measure of the selected base, we follow Bruce, Fox and Yang (2010) and calculate the per capita base as income tax revenues per capita divided by the top marginal tax rate.⁹ Bruce, Fox and Yang (2010) justify using of the top marginal rate because in most states, this rate kicks in at a fairly low level of income. There are some weaknesses with this measure as well. First, it is not available for those states that lack an income tax. Second, we only calculate one measure so we cannot break the base down by the different sources of income. Finally, this measure of the base has a systematic relationship with economic conditions because better economic conditions imply that more income is covered by the top marginal rate due to tax progressivity. As a result, this measure understates the tax base to a greater degree when incomes are low.

In this section, we ask whether growth in real AGI per capita or its components, or the selected base have become more sensitive to economic conditions. To do so, we use various measures of income as the dependent variable and estimate the following equation.

$$\Delta \ln Inc_{i,y+1} = \alpha_1 + \alpha_2(post1999) + \beta_1 \Delta \ln EC_{i,y+1} + \beta_2 [(post1999) \times \Delta \ln EC_{i,y+1}] + \varepsilon_{i,y+1} \quad (1.5)$$

Inc refers to adjusted gross income or one of its components, or to the selected base. The variable *y* refers to the year, as opposed to the quarterly *t*. We estimate this equation on annual data because AGI is only available annually. We measure annual economic conditions based on an annual version of the coincident index.

In Table 7 we show estimates of equation (1.5) for AGI, wage and salary income, investment income, other income, and the selected base. Investment income includes capital gains, interest and dividends. Other income is primarily comprised of retirement income. The table shows that overall income cyclicalities nearly doubled and that while wage and salary income grew modestly more cyclical, investment income grew massively more cyclical. While prior to 2000, a one percentage point increase in economic growth was related to a 0.5 percentage point increase in investment income growth, after 2000, it was related to a 5.6

⁹ We cannot use the state base as reported to tax authorities as is done in Bruce, Fox and Yang (2010) because the data are not available for enough time or states.

percentage point increase. In the final column of the table, we show that the cyclicalities of the selected base also increased.¹⁰

While some of the increase in cyclicalities of investment income is probably due to increasing cyclicalities and volatility of stock market returns, some may be due to issues related to the strategic timing of capital gains realizations. Capital gains are reported to the IRS and taxed based on when they are realized rather than when they accrue. As a result, taxpayers have some ability to time capital gains realizations at the most tax advantaged juncture. In particular, taxpayers have an incentive to time gains when they face a lower tax rate which can occur either because they are in a lower bracket in some years than others or because the entire capital gains structure is lower in some years than in others. One factor that may have influenced the pattern of capital gains income in our data series is the drop in tax rates in 2003. Insofar as this was anticipated, taxpayers had an incentive to hold off on realizing gains until the lower tax rates went into effect. This may partly explain the substantial drops in capital gains realizations in 2001 and 2002, which also corresponded to a period of economic weakness. Tax rates on dividends fell at the same time giving shareholders an incentive to ask corporations to delay dividends. We investigate this further by adding year fixed effects into the regressions predicting our various measures of the base. We present results in Table 8. In the case of investment income, these fixed effects control for federal capital gains policy, annual stock market behavior, and other features that were consistent across states. These estimates depend solely on cross sectional heterogeneity in changes in economic conditions. We now observe a modest and insignificant increase in cyclicalities, rather than the nearly 11 fold increase presented earlier. This suggests that features that varied over time, including both federal tax policy and other things such as stock market returns, rather than across states, explain a large portion, of the increase in investment income cyclicalities.¹¹

Our analysis of changes in the base confirms that increased cyclicalities of income can partly explain the increase cyclicalities of income tax revenues. We next investigate the effects of

¹⁰ One issue with this equation is that wage and salary income is one of the components coincident index. To move away from worry that we are regressing the growth of wage and salary income a transformed version of itself, we also regressed our measures of base growth rates on growth rates of state employment and observed a similar pattern of results.

¹¹ We also investigated whether changes in the distribution of income affected revenue cyclicalities by dividing states into groups based on their income dispersion. We find some differences across groups of states but conclude that the increase in cyclicalities was a broad based phenomenon.

changes in income tax rate setting policy on revenue sensitivity. We conjecture that since 2000, one of the reasons for the increase in business cycle sensitivity has been changes in policy making as highlighted by Magg and Merriman (2003). Even if the income tax base had not become more cyclical, if the method of determining tax rates had changed we could observe changes in income tax revenue cyclicalities.

Changes in Rates

In order to investigate whether tax rate setting policy has changed we look at income tax policy parameters using data from three sources. First, we divide annual income tax revenues by annual state AGI to find out the portion of resident income that is collected by the state. We label this the average effective tax rate. Second, we use the measures of marginal tax rates calculated from the TAXSIM model developed by Dan Feenberg at the NBER. The model provides information on the maximum marginal state tax rate paid on wage income, long term capital gain income and mortgage interest by state through 2011. The model also provides the average (dollar weighted) marginal state tax rate on wage income, capital gains income, pension income and other sources of income through 2011. The average marginal tax rate data is provided in three ways – based on the actual state distribution of income in the year in question, based on the state distribution of income in 1995, and based on the national distribution of income in 1995. We use tax rates based on the 1995 national income distribution because we believe it best isolates the role of state tax policy.¹² Third, we use data on the top marginal income tax rate on the state's tax schedule.¹³ The top rate on the schedule and the top rate paid differ because the top paid rate takes the deductibility of state taxes paid to federal authorities into account.

We use these data to look at whether the determination of effective, average and maximum state tax rates has changed since 1999. To do this, we use changes in the tax rate as the dependent variable. We investigate the relationship between the change in economic conditions and the change in tax rates, by estimating the following equation:

¹² Data is available from the NBER at <http://www.nber.org/~taxsim/marginal-tax-rates/>.

¹³ This data was collected from The Tax Foundation (2011), the World Almanac and Book of Facts (Various Years), and the Book of the States (Various Years).

$$\Delta \ln Rate_{i,y+1} = \alpha_1 + \alpha_2(post\ 1999) + \beta_1 \Delta \ln EC_{i,y+1} + \beta_2 [post\ 1999 \times \Delta \ln EC_{i,y+1}] + \varepsilon_{i,y+1} \quad (1.6)$$

The results for our different measures of tax rates are presented in Table 9. In the first column of Table 9, we show that effective tax rates went from being modestly countercyclical prior to 2000 to very procyclical. Prior to 2000, a one percentage point increase in the coincident index corresponded to a 0.5 percentage point drop in effective rates. After 2000, the same increase in the coincident index corresponded to a 1.1 percentage point increase in rates. Changes in effective rates cofound two phenomena; effective rates may change due to policy decisions, alternatively rates may change because of changes in the distribution of income across individuals or sources. For example, a transfer of one dollar from a poor household to a higher income household that is taxed at a higher marginal rate would increase revenues but would not increase AGI so it would lead to an increase in effective rates. In order to isolate the effects of policy, in columns (2)-(6) we present rates that are not a function of changes in the distribution of income. In Column (2), we present results based on changes in maximum marginal tax rates on wages from the TAXSIM model. We find that rates were strongly countercyclical prior to 2000. When the economy was shrinking more quickly, legislators increased rates to stabilize revenues. By contrast, when economic conditions improved more rapidly rates were reduced. By contrast, beginning in 2000, rates became less countercyclical. We discern a similar pattern for average marginal rates on wages (Column 4), and top marginal rates (Column 7). For rates on capital income (Columns(3) and (5)), we observe that rates were consistently countercyclical before and after 2000. For pension income (Column 6) we find that average rates changed from being countercyclical to being acyclical.¹⁴

We can also see evidence of the change in policy making if we look at enacted revenue changes as displayed in Figure 1. During the 1990-1991 recession, 13 states enacted revenue increases while four states enacted decreases yielding a net \$2.9 Billion increase in personal income tax revenues for Fiscal Year 1991. (NASBO September 1990). By contrast, during the 2001 recession, three states increased personal income taxes and 12 states decreased them leading to a net \$0.7 Billion drop in revenues for Fiscal Year 2002 (NASBO December 2001). The tax increases for FY2010 (NASBO December 2009) were also fairly dramatic, but they are difficult to compare because the recession was much more severe. Our investigation of tax rates

¹⁴ There is no data on maximum marginal rates on pension income.

indicates that changes in tax policy also work in the correct direction to partly explain the increase in cyclicity since 1999. While policy had traditionally been strongly countercyclical, in particular in terms of tax rates on wages and pensions, and would serve to dampen the response of revenues to the economic cycle, policy became less countercyclical in the later period.

7. Contributions of the Rate and the Base

From the previous two sections we learn that changes in the tax base, particular in capital income, served to increase revenue cyclicity while changes in tax rate policy, particularly pertaining to wage and pension income also served to increase revenue cyclicity. Both of these can partially explain the changes in revenue cyclicity we have observed. In order to bring the information in the previous two sections together, we perform some calculations where we compare the magnitude of these two effects.

We can break annual revenue growth into that attributed to the base and that attributed to the rate recognizing that average revenues are equal to the average base times the average rate and taking advantage of the convenient properties of logarithms:

$$\Delta \ln R_{t,t+1} = \ln(Rate_{t+1} \times Base_{t+1}) - \ln(Rate_t \times Base_t) = \Delta \ln Rate_{t,t+1} + \Delta \ln Base_{t,t+1}$$

Because revenue growth is equal to the sum of base growth and rate growth, we can divide revenue growth into base and rate growth and as a result can divide revenue cyclicity and increases in cyclicity into that attributable to the rate and the base. To do this we need a measure of revenues, the rate, and the base that are consistent with one another. In other words, we need a measure of revenues that is equal to a measure of the base multiplied by a measure of the rate. However, the measures of revenues, rates, and bases used in the previous sections are from different sources and not consistent with one another. We develop four combinations of revenues, income tax rates, and the income tax base that are internally consistent to investigate the relative contributions of the tax rate and tax base to revenue cyclicity.

For our first combination, we create simulated revenues using the NBER TAXSIM data and the IRS SOI data. In particular, we generate an estimate of tax revenues by combining the SOI data on income by source and the NBER estimates of average (dollar weighted) marginal tax rates on income by source. We use the average marginal tax rates that are based on 1995 national income distributions to isolate the role of tax policy. We measure income tax revenues derived from wage and salary income by multiplying wage and salary income per capita from SOI by the average marginal tax rate on wage and salary income. We do this for wage income, capital gains income, interest income, dividend income, and other income and generate an estimate of total income tax revenues by summing across these sources. We multiply other income by the tax rate on pensions assuming that most other income derives from pensions. This gives us an estimate of tax revenues that measures what revenues would be if all income reported to the IRS by state residents was taxed at its average marginal rate. This alternative estimate of revenues is highly correlated (.95) with actually revenues but is higher in most cases because average marginal tax rates are higher than average tax rates due to standard deductions, personal exemptions, and tax rate progressivity. We come up with a single measure of the average tax rate across all income sources by dividing our simulated revenues by AGI.

In the first three columns of tables 10 we show regression results based on these measures. The first column shows estimates of the level and increase of cyclicalities for estimated revenues, the second for rates, and the third for the base (AGI). Using these estimates, we measure the percent of the level of revenue cyclicalities, both pre and post 2000, and the percent of the increase in revenue cyclicalities that is attributable to the base and the rate. We display these percentages in Table 11.

First, from the first three columns of row 1 of Table 10, we note that the low level of revenue cyclicalities pre-2000 is the result of cyclical income being counteracted by countercyclical rates. From the second row of Table 10, we see that the increase in cyclicalities was due to both the rates and the base. According to the second row of Table 11, 63% of the increase was due to changes in the cyclicalities of rates while 37% was due to changes in the cyclicalities of the base.¹⁵ In the final row of Table 11, we show that post-2000 nearly all of the cyclicalities was due to the base,

¹⁵ Average tax rates can change because of changes in policy or because changes in the distribution of income across sources. In practice, changes in the distribution of income across sources has very little effect on the results. We find nearly identical results if we fix the distribution of income across sources and only allow the rates to vary.

with rates being close to neutral. The drawback of this estimate is that the measures of revenue cyclicity both before and after 2000 are lower than in actual data (in Column 4). This arises because this simulation fails to take into account the increase in revenues that occurs during good times because of the interaction between the rate and the base. In particular, when economic conditions improve and incomes increase, average tax rates increase because of the progressivity of the income tax. By measuring tax policy based on a fixed income distribution and by using marginal rates rather than average rates, we lose this effect.

For our second set of estimates we use data on actual revenues as our revenue measure, data on state AGI for our base measure, and data on the effective tax rate for our rate measure. (As before, effective rates are equal to revenues divided by AGI). Results are presented in columns 4-6 of Table 10 and columns 3-4 of Table 11. The results here also point to countercyclical rates being counteracted by a cyclical base prior to 2000 and the majority of the increase in cyclicity being attributed to the increasing rate cyclicity. In contrast to the first simulation, both cyclical rates and a cyclical base contribute post 2000. In this case, because we are using actual revenues, we capture the increase in revenues in good times that results from tax progressivity. However, we attribute all of the increase in cyclicity from this interaction to rates because of our use of effective rates. As a result, this estimate overstates the role of policy because some of the increase in rate cyclicity is a direct result of income cyclicity not a result of policy choices.

Our third measure uses data on actual revenues as our measure of revenues, data on the average marginal tax rates based on the NBER data as our rate measure (as in our first combination), and calculates the base as revenues divided by the tax rate. We call the resulting base the estimated base. The measures of cyclicity of actual revenues differs modestly in this case (Column 7) from the previous example (Column 4) because the samples are slightly different. We again find that prior to 2000, a cyclical base was counteracted by countercyclical rates. We also see that both rate and base cyclicity increased post-2000. In this example we attribute about two-thirds of the increase in cyclicity to the base. The base matters more in this calculation than in the previous two because by keeping rates fixed at policy rates, this calculation assigns the increase in revenues that occurs when the economy improves to the base.

Our final measure of revenues also uses data on actual revenues as our measure of revenues. However, we use data on the top marginal rate as our measure of the tax rate, and data on the selected base (revenues divided by the top marginal rate) as our base measure. Here we find an even larger contribution of the base.

These four breakdowns reinforce the finding presented earlier that rate and base cyclicalities both contributed to increasing revenue cyclicalities. They also highlight that the challenge in assigning relative contributions to the rate and the base is how to account for the increase in effective rates that occurs when income grows due to tax progressivity. Our preferred breakdown is the third one because by using rates based on a fixed income distribution it isolates the role of policy choices. In this case, the base measurement is a residual that captures the part of revenue growth not captured by policy. Insofar as rates increase due to income changes, this breakdown assigns the resulting revenue increase to the base. This breakdown attributes 69% of the increase in cyclicalities to the base and 31% to rates.

As an additional exercise, we take advantage of the fact that the NBER provides information on marginal rates on different types of income and that the IRS data provides information on income from different sources. Using this data, we investigate increases in the cyclicalities of revenues from three different sources – wages, investment income and other income. We estimate revenues by source by multiplying NBER rates by source and SOI income by source. We then break revenue cyclicalities from these three sources into contributions due to the rate and the base. We present our findings in Table 12. We find that increases in cyclicalities occurred for revenues from both wage and investment income. Revenues from other income work in the direction opposite our main findings, namely that revenue cyclicalities fell. When we divide the growth in cyclicalities into that due to rates and that due to the base, we find that for wage income, the majority (82%) of the increase was due to rates while for investment income, the majority (95%) of the increase was due to the base.

8. Conclusion

We find that state tax revenues have become far more sensitive to changing economic conditions since 2000 and that increasing responsiveness in the individual income tax has been

an important source of this increase. We divide our discussion of individual income taxes into investigations into changes in rates and changes in the base and confirm that both were important contributors. In particular, personal income growth became more responsive to economic conditions – especially investment income, but also wage and salary income. At the same time, income tax rate policy transitioned from being countercyclical to being less countercyclical or even modestly procyclical. Our preferred breakdown attributes 69% of the increase in cyclicity to the base and 31% to rates. Further breakdowns suggest that most of the increase in the cyclicity of the base was due to investment income while most of the increase in the cyclicity of rates was due to taxes on wages.

One question that remains is what states should do about this increase in cyclicity. The state response depends on whether the increased cyclicity of revenues is likely to persist or whether revenue responsiveness is anticipated to revert back to the patterns observed through the mid-1990s. It is possible that the behavior of income in the years since 2000 has been anomalous and is unlikely to persist. For instance, we may view the run up in the NASDAQ and its subsequent decline as onetime events that influenced the cyclicity of income. In addition, some of the elevated cyclicity of capital income may be due to strategic responses to changes in tax policy that coincided with the economic cycle. Federal tax policy may again induce strategic capital gains realizations, but these may not coincide with economic conditions in the same manner. However, part of the increase in income cyclicity may be connected with structural changes in labor markets that have led to increased income and wealth inequality and increased income cyclicity at the top of the income distribution (Parker and Vissing-Jorgenson 2010). These trends are long standing and unlikely to reverse themselves. In keeping with this, the state revenue response to the current recession has certainly been dramatic and has been more consistent with the post-2000 than pre-2000 experiences. In other words, it does not appear that any reversion to pre-2000 norms has occurred yet.

Given that states may continue to face these large swings the income tax base, policymakers should consider ways to adapt. Policy makers could return to the pre-2000 method of adjusting tax rates up during recessions and down during booms to moderate the effect of the business cycle on revenues. Alternately, states could increase their reliance on Rainy Day Funds by saving more during good times and draw down balances during recessions. Recognizing the

influence of capital gains on revenue fluctuations, Massachusetts recently arranged for excess capital gains revenues to be transferred into the state's rainy day fund (Ross 2009). Finally, the Federal government could adjust grants to provide more help during recessions and fewer resources during booms.

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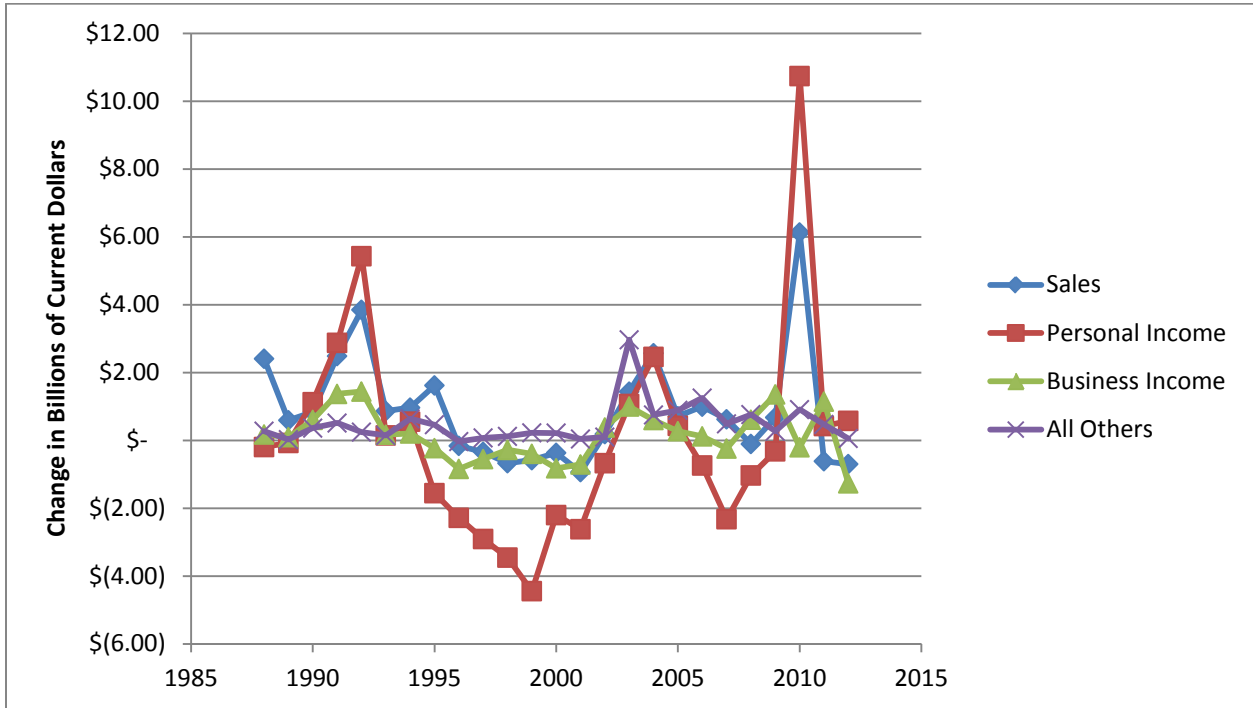
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Figure 1: Net Enacted Policy Changes in Current Dollars: FY1988-FY2012



Source: National Association of State Budget Officers, Fiscal Survey of the States, Various Issues. These are enacted revenue changes for the current fiscal year based on mid-fiscal year data. In some cases additional changes occur prior to the end of the fiscal year.

Table 1: Quarterly Variable Means, 1980-2011:Q3

	Number of Observations (For Log Differences)	Year Over Year Log Difference		Level	
		Mean	Standard Deviation	Mean	Standard Deviation
<u>Quarterly Data</u>					
Total State Tax Revenues Per Capita	6277	0.015	0.124	506.073	240.353
State Sales Tax Revenues Per Capita	5643	0.014	0.129	150.792	83.882
State Individual Income Tax Revenues Per Capita	5114	0.019	0.220	148.446	107.896
State Corporate Income Tax Revenues Per Capita	5548	-0.033	0.403	33.660	55.131
Total State Other Revenues Per Capita	6208	0.011	0.158	172.363	189.080
Coincident Indicator	6342	0.022	0.039	116.382	32.019
<u>Annual Data</u>					
Adjusted Gross Income Per Capita	1500	0.015	0.045	20324.920	5405.832
Wage and Salary Income Per Capita	1500	0.010	0.029	15248.220	3506.290
Capital Gains, Interest and Dividend Income Per Capita	1500	0.005	0.192	2337.604	1047.929
Other Income Per Capita	1484	0.054	0.314	2739.093	1528.054
**Dollar amounts are in \$2007 dollars and calculations are based on 2007\$. Level calculations include zeros for states that do not levy a given tax, outliers and all states with available data.					

Table 2: Variable Means, 1995:Q1

	Number of Observations (For Log Differences)	Year Over Year Log Difference		Level	
		Mean	Standard Deviation	Mean	Standard Deviation
<i>Quarterly Data</i>					
Total State Tax Revenues Per Capita	50	-0.003	0.122	466.26	118.833
State Sales Tax Revenues Per Capita	45	0.015	0.096	148.96	76.896
State Individual Income Tax Revenues Per Capita	40	0.010	0.130	133.55	87.691
State Corporate Income Tax Revenues Per Capita	45	0.010	0.310	26.81	18.958
Total State Other Revenues Per Capita	50	0.000	0.174	156.94	95.145
Coincident Indicator	50	0.053	0.020	113.41	5.429
<i>Annual Data</i>					
Adjusted Gross Income Per Capita	50	0.034	0.012	19622.55	3221.409
Wage and Salary Income Per Capita	50	0.021	0.012	14784.78	2559.495
Capital Gains, Interest and Dividend Income Per Capita	50	0.136	0.044	1913.07	524.624
Other Income Per Capita	50	0.035	0.026	2924.69	441.434
**Dollar amounts are in \$2007 dollars and calculations are based on 2007\$. Level calculations include zeros for states that do not levy a given tax, outliers and all states with available data.					

Table 3: Cyclical Responsiveness of State Tax Revenues: 1980-2011:Q3

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Total Revenue Per Capita	Sales Tax Revenue Per Capita	Individual Income Tax Revenue Per Capita	Corporate Income Tax Revenue Per Capita	Other Tax Revenue Per Capita
Year over Year Log Difference in Coincident Indicator	0.888*** (0.0834)	0.860*** (0.0718)	1.139*** (0.178)	2.304*** (0.291)	0.488*** (0.0921)
Constant	-0.00406 (0.00377)	-0.00483 (0.00306)	-0.00489 (0.00746)	-0.0832*** (0.00986)	0.000364 (0.00364)
Observations	6,269	5,635	5,109	5,543	6,200
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					
Standard errors are clustered by region by half decade					

Table 4: Revenue Cyclicalities Before and After 2000

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Total Revenue Per Capita	Sales Tax Revenue Per Capita	Individual Income Tax Revenue Per Capita	Corporate Income Tax Revenue Per Capita	Other Tax Revenue Per Capita
Year over Year Log Difference in Coincident Indicator	0.714*** (0.0764)	0.823*** (0.0958)	0.638*** (0.111)	1.853*** (0.173)	0.544*** (0.127)
Log Difference in Coincident Indicator 2000 and After	0.610*** (0.106)	0.0761 (0.138)	1.502*** (0.178)	1.967*** (0.508)	-0.0289 (0.189)
Dummy=1 if 2000 or Later	-0.00389 (0.00625)	-0.00427 (0.00578)	-0.0298** (0.0108)	0.00791 (0.0203)	0.0139* (0.00743)
Constant	-0.000651 (0.00414)	-0.00265 (0.00389)	0.0128 (0.00811)	-0.0820*** (0.00831)	-0.00600 (0.00496)
Observations	6,269	5,635	5,109	5,543	6,200
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					
Standard errors are clustered by region by half decade					

Table 5: Income Tax Revenue Cyclicity, With State and Date Fixed Effects

	(1)	(2)	(3)	(4)
VARIABLES	Individual Income Tax Revenues	Individual Income Tax Revenues	Individual Income Tax Revenues	Individual Income Tax Revenues
Year over Year Log Difference in Coincident Indicator	0.638*** (0.111)	0.682*** (0.0987)	0.223 (0.185)	0.287 (0.183)
Log Difference in Coincident Indicator 2000 and After	1.502*** (0.178)	1.502*** (0.164)	1.019*** (0.276)	1.073*** (0.320)
Dummy=1 if 2000 or Later	-0.0298** (0.0108)	-0.0282*** (0.00932)		
Constant	0.0128 (0.00811)	0.00760 (0.0127)	0.0667*** (0.0231)	0.0570* (0.0285)
Observations	5,109	5,109	5,109	5,109
State Fixed Effects	No	Yes	No	Yes
Date Fixed Effects	No	No	Yes	Yes
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				
Standard errors are clustered by region by half decade				

Table 6: Individual Income Tax Revenue Cyclicity during Expansions and Contractions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	1980:1- 2011:3	1980:1- 1980:3	1980:4- 1981:2	1981:3- 1982:4	1983:1- 1990:2	1990:3- 1991:1	1991:2- 2000:4	2001:1- 2001:4	2002:1- 2007:3	2007:4- 2009:2	2009:3- 2011:3
VARIABLES	Entire Period	Contraction	Expansion	Contraction	Expansion	Contraction	Expansion	Contraction	Expansion	Contraction	Expansion
Year over Year Log Difference in Coincident Indicator	1.139*** (0.178)	0.497* (0.207)	-0.731 (0.784)	0.0193 (0.726)	0.394** (0.154)	0.570 (0.278)	0.632*** (0.196)	2.014** (0.347)	2.299*** (0.257)	2.634*** (0.255)	2.061*** (0.300)
Constant	-0.00489 (0.00746)	-0.00978 (0.0205)	-0.0233 (0.0338)	-0.0336 (0.0621)	0.0401** (0.0145)	-0.0123 (0.0178)	0.0125 (0.00907)	-0.0122 (0.0148)	-0.0299** (0.00963)	-0.0297 (0.0181)	0.0270* (0.0125)
Observations	5,109	117	121	244	1,209	123	1,535	164	942	286	368
Robust standard errors in parentheses											
*** p<0.01, ** p<0.05, * p<0.1											
Standard errors are clustered by region by half decade											

Table 7: Cyclicalities the Income Tax Base

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Adjusted Gross Income	Wage and Salary Income	Investment Income	Other Income	Selected Base
Year over Year Log Difference in Annual Coincident Indicator	0.667*** (0.0427)	0.535*** (0.0244)	0.519* (0.296)	2.822** (1.091)	0.796*** (0.156)
Log Difference in Annual Coincident Indicator 2000 and After	0.417*** (0.0802)	0.136** (0.0493)	5.105*** (0.427)	-2.515** (1.104)	1.510*** (0.258)
Dummy=1 if 2000 or Later	-0.0122** (0.00454)	-0.00101 (0.00177)	-0.143*** (0.0260)	0.0366 (0.0690)	-0.0454*** (0.0103)
Constant	0.00192 (0.00348)	-0.00216 (0.00153)	0.0254 (0.0233)	-0.0173 (0.0688)	0.0250*** (0.00714)
Observations	1,493	1,493	1,493	1,477	1,195
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					
Standard errors are clustered by region by half decade					

Table 8: Cyclicalities of Adjusted Gross Income and Its Components Including Year Fixed Effects: 1980-2009

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Adjusted Gross Income	Wage and Salary Income	Investment Income	Other Income	Selected Base
Year over Year Log Difference in Annual Coincident Indicator	0.499*** (0.0350)	0.493*** (0.0348)	0.581*** (0.100)	-0.621 (0.760)	0.366** (0.146)
Log Difference in Annual Coincident Indicator 2000 and After	0.0858 (0.102)	0.0466 (0.0964)	0.274 (0.304)	1.107 (0.767)	0.887** (0.370)
Constant	0.00284 (0.00330)	0.00178 (0.00468)	0.148*** (0.0287)	-0.197*** (0.0397)	0.0144 (0.0160)
Observations	1,493	1,493	1,493	1,477	1,195
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					
Including Year Dummies, Standard errors are clustered by region by half decade					

Table 9: Cyclicalities of State Income Tax Parameters: 1980-2011

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Changes in Average Effective Rates	Changes in Maximum Marginal Rates on Wages	Changes in Maximum Marginal Rates on Capital Income	Changes in Average Marginal Rates on Wages	Changes in Average Marginal Rates on Capital Income	Changes in Average Marginal Rates on Pension Income	Top Marginal Rate on Tax Schedule
Year over Year Log Difference in Annual Coincident Indicator	-0.466 (0.305)	-0.840*** (0.184)	-0.610*** (0.213)	-0.450*** (0.0995)	-0.453* (0.226)	-0.734*** (0.254)	-0.519** (0.202)
Log Difference in Annual Coincident Indicator 2000 and After	1.609*** (0.329)	0.644*** (0.195)	0.0313 (0.375)	0.372*** (0.109)	-0.0357 (0.312)	0.846*** (0.300)	0.302 (0.230)
Dummy=1 if 2000 or Later	-0.0469*** (0.0113)	-0.0341*** (0.00911)	-0.0723*** (0.0174)	-0.0243*** (0.00573)	-0.0711*** (0.0178)	-0.0466*** (0.00966)	-0.0130 (0.00988)
Constant	0.0354*** (0.0103)	0.0338*** (0.00889)	0.0631*** (0.0145)	0.0259*** (0.00551)	0.0590*** (0.0164)	0.0460*** (0.00888)	0.0133 (0.00969)
Observations	1,217	1,219	1,229	1,219	1,230	1,173	1,219
Robust standard errors in parentheses							
*** p<0.01, ** p<0.05, * p<0.1							
Standard errors are clustered by region by half decade							

Table 10: Breakdowns of Tax Cyclicity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Simulated Revenues	Average NBER Tax Rates	State AGI	Actual Revenues	Effective Tax Rates	State AGI	Actual Revenues	Average NBER Tax Rates	Estimated Base	Actual Revenues	Top Marginal Rates	Selected Base
Year over Year Log Difference in Annual Coincident Indicator	0.185* (0.107)	-0.535*** (0.111)	0.720*** (0.0422)	0.268 (0.284)	-0.463 (0.306)	0.731*** (0.0399)	0.459** (0.173)	-0.569*** (0.123)	1.027*** (0.125)	0.459** (0.173)	-0.346*** (0.0896)	0.804*** (0.177)
Coincident Indicator 2000 or After	0.874*** (0.127)	0.553*** (0.121)	0.320*** (0.0882)	1.920*** (0.314)	1.611*** (0.331)	0.309*** (0.0871)	1.656*** (0.210)	0.511*** (0.134)	1.145*** (0.189)	1.656*** (0.210)	0.116 (0.143)	1.539*** (0.269)
Dummy=1 if 2000 or Later	-0.0392*** (0.00682)	-0.0298*** (0.00566)	-0.00937** (0.00407)	-0.0566*** (0.0131)	-0.0472*** (0.0114)	-0.00942** (0.00409)	-0.0489*** (0.0113)	-0.0304*** (0.00645)	-0.0185* (0.00924)	-0.0489*** (0.0113)	-0.00315 (0.00402)	-0.0457*** (0.0108)
Constant	0.0295*** (0.00593)	0.0290*** (0.00545)	0.000546 (0.00297)	0.0359*** (0.0109)	0.0353*** (0.0103)	0.000602 (0.00299)	0.0288*** (0.00878)	0.0303*** (0.00614)	-0.00153 (0.00551)	0.0288*** (0.00878)	0.00410 (0.00346)	0.0247*** (0.00797)
Observations	1,247	1,247	1,247	1,217	1,217	1,217	1,155	1,155	1,155	1,155	1,155	1,155
Robust standard errors in parentheses												
*** p<0.01, ** p<0.05, * p<0.1												
standard errors are clustered by region by half decade												

Table 11: Breakdowns of Tax Cyclicity: Contributions of Rate and Base

	<u>Simulated Revenues</u>		<u>Actual Revenues/State AGI</u>		<u>Actual Revenues/NBER Average Rates</u>		<u>Actual Revenues/Top Marginal Rates</u>	
	Rates	Base	Rates	Base	Rates	Base	Rates	Base
	Pre-2000 Level	-289%	389%	-173%	273%	-124%	224%	-75%
Increase	63%	37%	84%	16%	31%	69%	7%	93%
Post-2000 Level	2%	98%	52%	48%	-3%	103%	-11%	111%

Table 12: Cyclicity of Revenues by Source of Income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	Revenues from Wage Income	Tax Rate on Wage Income	Wage Income	Revenues from Investment Income	Tax Rate on Investment Income	Investment Income	Revenues from Other Income	Tax Rate on Other Income	Other Income
Year over Year Log Difference in Annual Coincident Indicator	-0.0245 (0.306)	-0.572* (0.301)	0.548*** (0.0245)	0.105 (0.387)	-0.647*** (0.144)	0.751** (0.314)	2.789** (1.116)	-0.738** (0.268)	3.527*** (0.997)
Coincident Indicator 2000 or After	0.601* (0.317)	0.493 (0.304)	0.109* (0.0564)	5.304*** (0.428)	0.262 (0.181)	5.042*** (0.389)	-2.476** (1.122)	0.848** (0.313)	-3.324*** (1.009)
Dummy=1 if 2000 or Later	-0.0354** (0.0145)	-0.0346** (0.0142)	-0.000832 (0.00167)	-0.159*** (0.0304)	-0.0336*** (0.00857)	-0.126*** (0.0272)	0.0161 (0.0596)	-0.0493*** (0.00982)	0.0654 (0.0600)
Constant	0.0344** (0.0143)	0.0363** (0.0141)	-0.00191 (0.00135)	0.0478* (0.0274)	0.0360*** (0.00754)	0.0118 (0.0240)	0.00270 (0.0594)	0.0464*** (0.00909)	-0.0437 (0.0598)
Observations	1,189	1,189	1,189	1,247	1,247	1,247	1,126	1,126	1,126
Robust standard errors in parentheses									
*** p<0.01, ** p<0.05, * p<0.1									
Standard errors are clustered by region by half decade									

Data Appendix:

Quarterly Summary of State and Local Tax Revenues

1962: Q1- 1963:Q4: The Quarterly Summary of State and Local Tax Revenues was first collected by the Census Bureau in 1962:Q1. For 1962: Q1-1963:Q4, state revenues are reported for five revenue sources: General sales and gross receipts, Motor fuel sales, Individual income, Corporation net income, and Motor vehicle and operators' licenses. In each quarter, for 3-4 of the 36 states with both a corporate and individual income tax, a breakdown between individual and corporate income taxes is not available, only a combined income tax number.

1963: Q4 - 1976: Q4: Beginning in 1963: Q4, the corporation income tax number is no longer reported. From 1963:Q4-1976:Q4, four revenue sources continue to be reported (General sales and gross receipts, Motor fuel sales, Individual income, and Motor vehicle and operators' licenses.) For a couple states, the reported income tax number includes corporate income tax revenues as well:(Alabama: 1963:Q4-1969:Q1; Arizona: 1963:Q4;Georgia: 1963:Q4; Louisiana 1964:Q2-1964:Q4; Missouri: 1963:Q4-1969:Q1; New Mexico: 1963:Q4-1967:Q1; North Dakota: 1963:Q4-1964:Q3; 1966:Q1-1968:Q1). By 1969: Q2 no state income tax numbers include corporate income taxes.

1977:Q1-1992:Q2: In 1977:Q1 the survey was expanded to cover seven tax sources (General sales and gross receipts, Motor fuel sales, Individual income, Motor vehicle and operators' licenses, Corporate Income, Alcoholic Beverages, Tobacco Product Sales). The survey also reports Total tax collections which combines the seven listed sources and other tax revenue sources. This coverage continues through 1992:Q2.

1992:Q3-1993:Q2: From 1992:Q3-1993:Q2 quarterly tax revenue data is not reported by the Census Bureau due to "staff shortages". However, the Census sent us unpublished data for 1992:Q3 and we

are able to back out approximations (and in some cases data) based on year-to-date and year-end totals from the 1993 and 1994 releases for 1992:4 – 1993:Q2.

1993:Q3-1993:Q4: Published data for 1993:Q3 and 1993:Q4 is similar to the data available from 1977:Q1-1992:Q2 and covers seven sources and total revenues.

1994:Q1-present: From 1994:Q1-present, the Census Bureau reports data for 26 revenue sources. Data for 22 of these 26 sources is also available in the 1992:Q3 data sent to us. This data is released approximately 90 days after the quarter ends.

State Level IRS Data

We use IRS data on adjusted gross income, wage and salary income, dividend income, interest income, and capital gains by state.

Tax Year 1979: Data by state available in Table 5 of the Summer 1981 *Statistics of Income Bulletin*.

Tax Year 1980: Data by state available in Table 4.1 of *Individual Tax Returns, 1980*.

Tax Year 1981: Data by state available in Table 4.1 of *Individual Tax Returns, 1981*.

Tax Year 1982-1985: Data by state for AGI, salary and wages, interest and dividends available in the *Statistics of Income Bulletin* for one to three years later. Capital gains data by state was not published. We are thankful to William Gentry for sending us this unpublished data.

Tax Year 1986-1995: Data by state is available in Historical Table 2 of the *Statistics of Income Bulletin* from two or three years later (e.g. Tax Year 1987 is in Fall 1990, Tax Year 1990 is in Fall 1992). This table

has been in the Fall, Summer, Spring, and Winter Bulletin depending on the year. These Bulletins are available from the IRS website at: <http://www.irs.gov/taxstats/article/0,,id=117514,00.html>.

Tax Year 1996-present: Data by state is available in electronic format from Historical Table 2 of the Statistics of Income Bulletin. We obtained this data from the IRS website at:
<http://www.irs.gov/taxstats/article/0,,id=171535,00.html>.

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