The Costs (and Benefits) of Fiscal Consolidation: What Does the Experience of U.S. States Tell Us?*

Luisa Lambertini† and Steve Yamarik‡

Preliminary and Incomplete

Abstract

This paper examines the impact of fiscal consolidation on short-run economic growth using state-leve data. Unlike countries, U.S. states face some form of balanced budget requirement and share a common currency and monetary policy, which lead to a shorter and more recognizable pattern of fiscal actions. We use this pattern along with differences in state budgetary rules to identify episodes of fiscal consolidation. In controlling for the endogeneity of current fiscal policy, we find that fiscal consolidations lower short-run growth. In addition, we find that revenue-based fiscal consolidations are more contractionary than spending-based consolidations. Our results hold for multiple fiscal data sources, different definitions of fiscal consolidation.

Keywords: fiscal consolidation, austerity, state fiscal policy

JEL Classification: E32, E62, H70, R10

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†EPFL, Lausanne. Contact: luisa.lambertini@epfl.ch

‡CSULB. Contact: Steve.Yamarik@csulb.edu

1 Introduction

The recent Eurozone crisis of 2010-11 has sparked a renewed debate into the relationship between fiscal consolidation and short-term economic growth. On the one hand, standard Keynesian theory predicts that cuts in government spending or increases in taxes will reduce real aggregate demand. This decrease in aggregate demand will result in a contraction in output in the short run. On the other hand, Blanchard (1990a) argues that small tax increases today eliminates the need for a larger and more disruptive adjustment in the future. As a result, households can expect an increase in their permanent income and thus will consume more today. This and other non-Keynesian effects can lead to an expansionary fiscal consolidation in the short run.

The empirical literature on fiscal consolidation and economic growth is equally divided. In one of the earliest analysis, Giavazzi and Pagano (1990) find that sharp fiscal consolidations in Denmark during 1983-86 and Ireland during 1987-88 were accompanied by rapid economic growth. Subsequent cross-country analysis by Alesina and Perotti (1997) and Alesina and Ardagna (2010) and Alesina and Ardagna (2012) find that fiscal consolidation measured as a decrease in the cyclically-adjusted primary budget can stimulate economic growth. Using an alternative narrative approach to identify fiscal consolidations, IMF (2010) and Guajardo, Leigh and Pescatori (2014) find that fiscal consolidations are contractionary.

In this paper, we use state-level data to examine the impact of fiscal consolidation on short-run economic growth. Unlike countries, U.S. states face some form of balanced budget requirement and share a common currency and monetary policy. As a result, states must respond to unexpected negative budget shocks, which lead to a shorter and more recognizable pattern of fiscal actions. In addition, the severity or strictness of the balanced budget rules differs across states. We exploit this common pattern along with institutional differences to identify state-level fiscal consolidations.

We test the relationship between fiscal consolidation and state-level economic growth using an autoregressive distributed lag (ARDL) model similar to Alesina and Ardagna (2010) and Alesina and Ardagna (2012). We use fiscal data from two independent sources, the Census and NASBO, to create our cyclically adjusted primary budget (CAPB). Given the novelty of our state-level data, we consider a variety of fiscal consolidation (and non-consolidation) measures.

Using pooled least squares (with fixed state and time effects), we find a positive and statistically significant relationship between the change in CAPB and growth for all years. However, when we narrow our consolidation measure to a minimum (or any) increase in CAPB, the positive relationship becomes insignificant.

Our contradictory least squares results raises questions over the exogeneity of our fiscal measure. Suppose that Rhode Island is hit with a negative shock, which causes real income to decrease, tax revenues to fall and entitlement spending to rise. Given the tight budget constraints of U.S. states, Rhode Island must raise taxes and/or decrease discretionary spending. These fiscal adjustments can occur at the same time that real economic activity recovers leading to a positive correlation between fiscal tightening and economic growth.

We exploit differences in the willingness and ability of state governments to respond to past budget shortfalls and surpluses to identify current fiscal policy. We use a parsimonious set of state political variables along with budgetary conditions and rules to identify state fiscal policy. All instruments are lagged once (and sometimes twice) to insure exogeneity and allow for policy decisions to manifest themselves in the observed fiscal policy variables.

By controlling for endogeneity of state fiscal policy, our two-stage least square results show that a fiscal consolidation leads to a decrease in real income growth. The point estimates indicate that a one percent increase in $\triangle CAPB$ during a fiscal consolidation lowers the growth rate by 1.0 to 1.5 percent in three-years. When we decompose the fiscal consolidation into revenue- and spending-based components, we find that the contractionary impact of a revenue-based consolidation is larger both statistically and economically than a spending-based consolidation.

The rest of the paper proceeds as follows. Section 2 discusses the related literature. Section 3 describes the data. Section 4 presents a narrative approach of state fiscal consolidations using the state of Hawaii as an example. Section 5 presents the main results, while sections 6 and 7 show the compositional results and robustness tests.

2 Related Literature

2.1 Theory

Although there is general agreement that fiscal consolidations raise long-run economic growth, there is disagreement about its short-term effects. Keynesian economics predicts that increases in taxes or cuts to government spending will decrease real aggregate spending and thus lower output and raise unemployment. As a result, the debt-to-GDP level will not be reduced as much or even at all because of the drop in tax revenues and increases in government transfers.

During the past 30 years, the Keynesian view has been challenged by what has been called the "expectational view of fiscal policy." The expectational view of fiscal policy incorporates the intertemporal effects to generate the possibility of an expansionary fiscal consolidation. The main papers are Feldstein (1982) Blanchard (1990a) Bertola and Drazen (1993) and Sutherland (1997)

2.2 Empirical work

There is a large empirical literature on the macroeconomic effects of fiscal adjustments starting with the pioneering work of Giavazzi and Pagano (1990).[1] This empirical literature has looked at two related questions: what factors contribute to the success of a fiscal adjustment and what are the macroeconomic effects of a fiscal adjustment.

Giavazzi and Pagano (1990) document that large fiscal consolidations in Denmark and Ireland in the 1980s had expansionary effects on private consumption and GDP thanks to the reduction in current real interest rates and future expected taxes. Looking at data on OECD economies Giavazzi and Pagano (1996) suggest that fiscal policy changes may have non-Keynesian effects as long as they are large and persistent.

Subsequent studies have focused specifically on whether fiscal adjustments were successful in improving fiscal balances in the medium run. Fiscal adjustment episodes are typically selected according to the size of the improvement in the cyclically adjusted primary balance relative to GDP; success is defined as reduction in the debt-to-GDP ratio persisting after a number of years. Alesina and Perotti (1995a), Alesina and Perotti (1997), Alesina, Perotti and Tavares (1998) and

[1] For an excellent overview of this literature, see Escolano, Mulas-Granados, Terrier and Jaramillo (2014).

Alesina and Ardagna (1998) argue that fiscal adjustments that rely primarily on the reduction in transfers and government employees' compensation have a higher likelihood to be successful. On the other hand, fiscal adjustments driven by tax increases tend to be contractionary and unsuccessful. Lambertini and Tavares (2005) find that exchange rate depreciations in the two years before a fiscal consolidation significantly increase its probability of success. Hence, fiscal consolidations carried out in monetary unions are less likely to have persistent effects.

Following the euro zone debt crisis in 2009 the debate on fiscal adjustments has focused on the consequences of austerity on output. From the methodological point of view, these studies can be divided in two groups. The first group typically uses data for a cross-section of countries and selects episodes by setting a threshold for the size of the cyclically-adjusted primary balance adjustment as percentage of GDP (the standard approach). Alesina and Ardagna (2010) and Alesina and Ardagna (2012) select fiscal episodes across a large sample of OECD economies and define an adjustment as expansionary if GDP growth differential relative to the G7 during the adjustment is in the top quartile (among all adjustments) or higher relative to the two years before the consolidation. The authors observe that expansionary fiscal consolidations were primarily driven by cuts in government spending rather than tax increases. In a regression of GDP growth on its lags and a measure of fiscal adjustment, the authors find that fiscal consolidations do not have a statistically significant effect on GDP; however, government spending cuts raises GDP growth while tax increases reduces it.

The other group of papers relies on the narrative approach proposed by Romer and Romer (2010) and Ramey (2011) to identify fiscal episodes. This approach consists in looking for policy actions taken to reduce the deficit in country-specific accounts and records. IMF (2010) cover 15 advanced economies over the period 1980-2009 and estimate that the output effect of fiscal consolidation is negative and significant. A fiscal adjustment of one percent of GDP reduces real GDP by 0.5 percentage point after two years. In terms of composition, spending-based adjustments are typically less contractionary than tax-based ones: a one percent of GDP consolidation driven by higher taxes reduces GDP by 1.3 percentage points while the same consolidation driven by spending cuts has not significant effect. Guajardo, Leigh and Pescatori (2011) argue that selecting fiscal episodes using the standard approach is likely to bias the results in favor of expansionary effects of austerity. Intuitively, the fiscal balance can improve due to non-policy factors positively correlate with economic activity, thereby leading

to an upward-bias of the estimate of the effect of fiscal austerity on output. The authors also compare the standard and the narrative approach; they estimates a positive output effect for the episodes identified by the standard approach and confirm the negative effect for the episodes found by the narrative approach. Our paper focuses on the fiscal experience of the states in the United States since 1970Q1. Like the contributions in the first group, we adopt the standard approach and identify fiscal episodes by setting a threshold for the size of the consolidation; we also estimate the output effect using regressions.

A number of recent papers estimates the effect of fiscal policy on economic activity exploiting exogenous variation in subnational government outlays.[2]. Our paper is closest to Clemens and Miran (2012), who estimate the fiscal multipliers on state government spending. They recover deficit shocks by using mid-year adjustments in outlays and revenues and then estimate the different spending response for states with strong and weak fiscal requirements. The government multiplier is then estimated by exploiting such variation in spending response. The on-impact multiplier is estimated at around 0.4, which suggests a contractionary impact of subnational fiscal adjustments on subnational output. We analyze state fiscal policy and its effect on economic activity; our focus, however, is on large budgetary changes, no matter whether they stem from spending cuts or tax increases or a combination of them. Like Clemens and Miran (2012), we also exploit exogenous differences in U.S. states' budgetary requirements to study the effect of fiscal adjustment on output.

3 Data

Our dependent variable is the growth rate of real per capita state personal income net of transfers between calendar year $t-1$ and t. Data sources are detailed in Appendix **??**. We use personal income rather than Gross Domestic Product because the latter is an estimate built upon the Bureau of Economic Analysis's (BEA) state personal income accounts. We exclude transfer receipts; which include Social Security, Medicare and Medicaid, and unemployment insurance; in an effort to eliminate the effect of redistributive policies.

We use state-level fiscal data from two independent sources: *State Government Finances* of the

[2]See, e. g. Nakamura and Steinsson (2014), Cohen, Coval and Malloy (2011), Chodorow-Reich, Feiveson, Liscow and Woolston (2012).

U.S. Census Bureau (Census) and *The Fiscal Survey of the States* of the National Association of State Budget Officers (NASBO). Census financial data are presented within four broad activity sectors: general government, utilities, liquor stores, and insurance trust sectors. We use the general revenue and expenditure accounts since they are reported by function and are under the control of legislators. Utility and liquor store revenues and expenditures are negligible amounts (less than 0.1% of total revenues and 0.3% of total expenditures); insurance trust items, on the other hand, are large and extremely volatile. The reason behind this volatility is that U.S. states sometime use them as a stabilization devices by withdrawing in bad economic times and contributing to them in good economic times. The Census data are reported by fiscal year and are available from 1970 to 2013.

The Fiscal Survey of the States of NASBO presents data on states' general fund receipts, expenditure and balances. The biannual survey reports enacted budgets for the next year, preliminary actual budgets for the current year, and actual budget figures for the previous year. We use the actual figures. An advantage of NASBO data is the reporting of stabilization (rainy day) funds and their end-of-year balance. The NASBO data are reported by fiscal year and are available from 1979 to 2013.

There are some important differences between the Census and NASBO data. The Census data is more comprehensive, well-documented and longer-running. Census includes most expenditures out of intergovernmental revenues and capital outlays in its general expenditure concept. In addition, Census includes a large variety of programs (e.g., payments to non-public hospitals, expenditures on toll highways and bridges, etc.) that some states typically exclude from their general fund expenditures. Among the weaknesses, Census provides no information about policy changes and it uses functional analysis to classify expenditures, independent of its funding. NASBO data, on the other hand, focuses on general fund spending and revenues. General fund spending represents the primary component of discretionary expenditures from sources that have not been earmarked for specific purposes. On average, this accounts for 40 percent of total state spending. General fund revenues include most tax revenues but exclude funds received from the federal government and the proceeds from the sale of bonds. One strength of the NASBO data is that it provides information on enacted policy changes and revenue implications. One weakness however is that expenditures and revenues for NASBO are reported only in aggregate and not broken down by function. For these reasons; spending,

revenues and budget balance data from Census and NASBO are not comparable and are thus used independently by us.

We aim to estimate the effect of fiscal adjustments on economic conditions by estimating regressions with real income growth on the left-hand side and measures of fiscal consolidations on the right-hand side. Current economic conditions, however, affect current fiscal outcomes due to the existence of automatic stabilizers. During economic expansions tax revenues are high and certain categories of public outlays are low and vice versa during downturns. To account for the role of economic conditions on the budget balance, we cyclically adjust our fiscal measures, as also done by previous contributions.

We use the cyclically-adjusted primary budget (CAPB) procedure of Blanchard (1990b) to measure discretionary fiscal policy. By adjusting for the economic cycle, the CAPB removes the impact of automatic stabilizers from actual budget balances. The main alternative is the "narrative" approach of Romer and Romer (2010) and Devries, Guajardo, Leigh and Pescatori (2011) which relies on announced fiscal plans drawn from budget documents. Relative to the narrative approach, the CAPB procedure has the advantages of (i) possessing uniform methodology, (ii) recording *actual* fiscal adjustments, and (iii) capturing all policy changes (Escolano et al., 2014).

We follow the EU, IMF and OECD approach, detailed in European-Community (1995), of estimating the elasticities of selected categories of revenue and expenditure with respect to output. We first apply a HP filter to each revenue, $R_{s,t}$, and expenditure, $X_{s,t}$, series and also to real personal income, $Y_{s,t}$, to generate a trend and cyclical component for each state. We then estimate the following model to generate the cyclical elasticity of each category of revenue and expenditure:

$$r^c_{s,t} = e\, y^c_{s,t}, \tag{1}$$

where $r^c_{s,t} = \ln R_{s,t} - \ln R^*_{s,t}$, $y^c_t = \ln Y_{s,t} - \ln Y^*_{s,t}$, e is the elasticity measure, and starred variables are HP trends. The estimated elasticities, $\widehat{e}$, are then used to adjust each fiscal category

$$R^A_{s,t} = R_{s,t} \exp(-\widehat{e}\, y^c_{s,t}).$$

We compute the cyclically-adjusted primary budget balance by adding up the cyclically-adjusted revenue categories, subtracting out the cyclically-adjusted expenditure categories and adding

in interest payments. Lastly, we divide the cyclically-adjusted primary budget balance by trend income in the same period and then take the difference relative to the previous period to obtain the change in the cyclically-adjusted primary budget balance ratio, $\Delta CAPB$.

Figures 3 and 4 plot the distribution of $\Delta CAPB$ for the Census and NASBO samples, respectively. Both distributions are fairly balanced and centered around zero with a mean value of 0.014 percent for Census and 0.002 percent for NASABO.[3] The range of values for the NASBO data (-2.01 to 2.53 percent) is narrower than for the Census data (-2.98 to 3.45 percent) given that NASBO covers only the discretionary budgetary items.

In the cross-country literature, most authors define a fiscal consolidation as a minimum increase in $\Delta CAPB$ for one or more years.[4] U.S. states however face much tighter budget constraints due to balanced-budget and debt limit laws. As a result, we define a state-level fiscal consolidation as a one-year increase in $\Delta CAPB$ of 1.0 percent or greater for Census and 0.5 percent or greater for NASBO. These fiscal consolidation thresholds generate 93 episodes for the Census sample and 82 episodes for the NASBO sample. The resulting incident rates of 4.4 percent and 5.1 percent are lower than the past estimates of Alesina and Perotti (1995b) and Alesina and Ardagna (1998, 2010), but are consistent with the more recent estimates of Devries et al. (2011), Escolano et al. (2014) and Eichengreen and Panizza (2014). [5]

Given the novelty of our state-level data, we do not limit ourselves to a single fiscal consolidation measure, but rather consider a variety of fiscal consolidation (and non-consolidation) measures of Alesina and Ardagna (1998, 2010, 2012); IMF (2010); and Guajardo et al. (2014). The first measure, $\Delta CAPB$, is the change in the cyclically-adjusted primary budget balance during all years. The second measure, $FCdummy$, is a fiscal consolidation dummy that is 1 when $\Delta CAPB$ exceeds the threshold of 1.0 or 0.5 percent and 0 otherwise. The third measure is an interaction term, $\triangle CAPB^{FC}$, which is $\Delta CAPB$ when $\Delta CAPB$ exceeds the threshold and 0 otherwise. Unlike $FCdummy$, $\triangle CAPB^{FC}$ allows the impact of a fiscal consolidation to vary depending upon its magnitude. The fourth measure is an interaction term, $\triangle CAPB^{NFC}$,

[3]In contrast, the mean values for the *level* of $CAPB$ are 0.663 and 0.015 percent for Census and NASBO, indicating an average budget stance of a slight budget surplus.

[4]Escolano et al. (2014), Table 1 shows that the definition of a fiscal consolidation varies considerably across the variables used and the threshold set. However, out of the 32 papers reviewed, 18 of them use a criteria of a minimum increase in $\Delta CAPB$ to define a consolidation.

[5]Using the data from Escolano et al. (2014), Table 1, the incident rates are 10.0, 7.3 and 13.4 percent for the older papers; but 6.4, 3.8 and 1.7 percent for the newer papers.

which is $\Delta CAPB$ when $\Delta CAPB$ is less than the consolidation threshold and 0 otherwise. As such, the $\triangle CAPB^{NFC}$ variable records all fiscal deteriorations ($\triangle CAPB < 0$) and fiscal improvements below the threshold.

Given the strict budget constraints of U.S. states, we also specify that a consolidation be any positive change in the cyclically-adjusted budget balance. Therefore, our last two measures are two interaction terms: $\triangle CAPB^{+}$ which is $\triangle CAPB$ when $\triangle CAPB > 0$ and 0 otherwise and $\triangle CAPB^{-}$ which is $\triangle CAPB$ when $\triangle CAPB < 0$ and 0 otherwise. In particular, the variable $\triangle CAPB^{+}$ records all positive fiscal *improvements* where $CAPB$ is rising, while $\triangle CAPB^{-}$ records all negative fiscal *deteriorations* where $CAPB$ is falling.

Table 1 presents the summary statistics of our fiscal consolidation measures. Each entry provides the statistics for the non-zero values of each variable. For the Census sample, the average $\Delta CAPB$ is 1.53 percent during the fiscal consolidations and -0.06 percent during the non-consolidations. Likewise, for the NASBO data, the average $\Delta CAPB$ is 0.81 percent during the fiscal consolidations and -0.04 percent during the non-consolidations. When we specify that a fiscal consolidation be any positive change in $CAPB$, the average fiscal improvement $\triangle CAPB^{+}$ and fiscal deterioration $\triangle CAPB^{-}$ are similar in magnitude: 0.43 and -0.42 for Census and 0.21 and -0.23 for NASBO. The last four entries in each panel are the composition measures, which will be discussed in section 6.

Table 3 presents the correlation matrix of our fiscal consolidation measures. The results in the upper-left and lower-right triangles are the correlation coefficients (and p-values) *within* each sample, while those for the lower-left square are those for *across* the samples. Not surprisingly, there is strong correlation between the consolidation measures - $\triangle CAPB$, $\triangle CAPB^{FC}$ and $\triangle CAPB^{+}$ - within each sample. However, across the two samples, there is moderate correlation between like consolidation measures. This moderate correlation can be interpreted as that the two data sources generate related budgetary outcomes that are independent in important ways.

4 The case of Hawaii

The state of Hawaii had fiscal consolidations in the fiscal years (FYs) 1996, 2005 2011 and 2013. These episodes emerge as fiscal adjustments both under Census and NASBO. In this section we develop a narrative approach to these four episodes.

The state of Hawaii works on a biennial budget process. The governor submits the biennial budget to the legislature in an odd-numbered year that specifies proposed expenditures and anticipated revenues for the ensuing fiscal biennium; the supplemental budget is submitted in the following even-numbered year. The constitution of the state of Hawaii establishes a ceiling for general fund expenditures. The general fund expenditure ceiling is determined by adjusting the expenditure ceiling of the prior FY by the average annual percentage change in state personal income for the three calendar years immediately preceding. The expenditure ceiling limits the rate of growth of general fund appropriations; moreover, the ceiling is pro-cyclical – higher following periods with growth but lower following recessions. The constitution also provides a debt limit equal to 18.5% of the average net general fund revenues of the three preceding years. General obligation bonds may be issued by the state provided that such bonds would not cause the total amount of principal and interest payable in the current or any future fiscal year, whichever is higher, to exceed the debt limit.

4.1 The consolidation of 1996

Starting in 1993 Hawaii suffered a severe economic downturn due to dwindling tourism, shrinking construction and contracting industries in the state, such as cane sugar. The FY1995 budget worsened substantially relative to its appropriated counterpart and a large deficit materialized. The expenditure ceiling and the debt limit were reduced in the FY1996 as a result of three consecutive years of recession. The supplemental budget of 1996 enacted a large fiscal adjustment driven primarily by cuts in government spending, as documented in the Fall 1996 Fiscal Survey of States. The supplemental budget called for layoffs and furloughs of state employees and other cuts across the board for several programs. The state budget improved significantly from 1995 to 1996, moving from a large deficit to a sizable surplus.[6] Hence, the state fiscal response to the economic downturn of 1993 to 1996 was pro-cyclical in nature.

Figure 1 shows our fiscal measure $\Delta CAPB$ for Census and NASBO and the growth of real personal income net of transfers for the state of Hawaii; the vertical lines indicate the dates of fiscal adjustments and the dot-dash horizontal lines indicate the threshold for adjustment in the Census (1%) and in NASBO (0.5%). The fiscal consolidation of 1996 came after three

[6]The budget (not cyclically adjusted) improved by 135% under NASBO and 156% under Census.

consecutive years of recession. Real personal income growth fell to -3.5%, the lowest rate for the state since the 1981-82 recession, from -2.4% in 1995. The deep recession in Hawaii contrasts with economic conditions in the rest of the United States, where real personal income grew at more than 2%, as shown in Figure 2.

4.2 The consolidation of 2005

The 2001 recession hit the state of Hawaii particularly hard but the economy rebounded in the FY2002 and showed continuing improvements in the FY2003 and 2004. As the economy continued to expand, official revenue estimates were revised upward. In addition to the cyclical improvement, the state of Hawaii enacted a number of revenue measures[7] that further improved the state budget. The FY balance evolved from an estimated deficit of 6 million to an actual surplus of 400 million USD. Although this consolidation was carried out in an expansionary period, real GDP growth almost halved in 2005, going from 4% to 2.2%.

4.3 The consolidation of 2010

Hawaii's FY2010 budget was in deficit before it began in July 2009. From March 2008 through August 2009, the Council on Revenues, which forecasts the state's tax revenues, projected that Hawaii would have nearly $3 billion less revenue than anticipated through the end of June 2011. In September 2009 Republican Governor Lingle announced that the Administration had reduced spending by $2 billion with several measures; nevertheless, the state still faced a $496 million shortfall in the following nine months and an additional $529 million in the FY2011. The loss in tax revenues due to the Great Recession during the fiscal biennium would exceed $1 billion. Starting in August 2009 the state of Hawaii laid off approximately 1,100 state employees and furlough for three days per month of additional 900 state employees were implemented starting in September.[8] In October 2009 the largest public employee union in Hawaii, the Hawaii Government Employees Association, ratified a new contract with 42 furlough days over the next two years, approximately an 8% cut. In addition to budget spending cuts, the state also enacted an increase in personal income and cigarettes/tobacco tax. Overall 75% of the

[7]The fiscal measures included increase in fees and charges; a change in income tax withholding remittance date; and debt service restructuring. See the Fiscal Survey of States, Fall 2004.

[8]See Ballotpedia, Hawaii state budget (2009-1010).

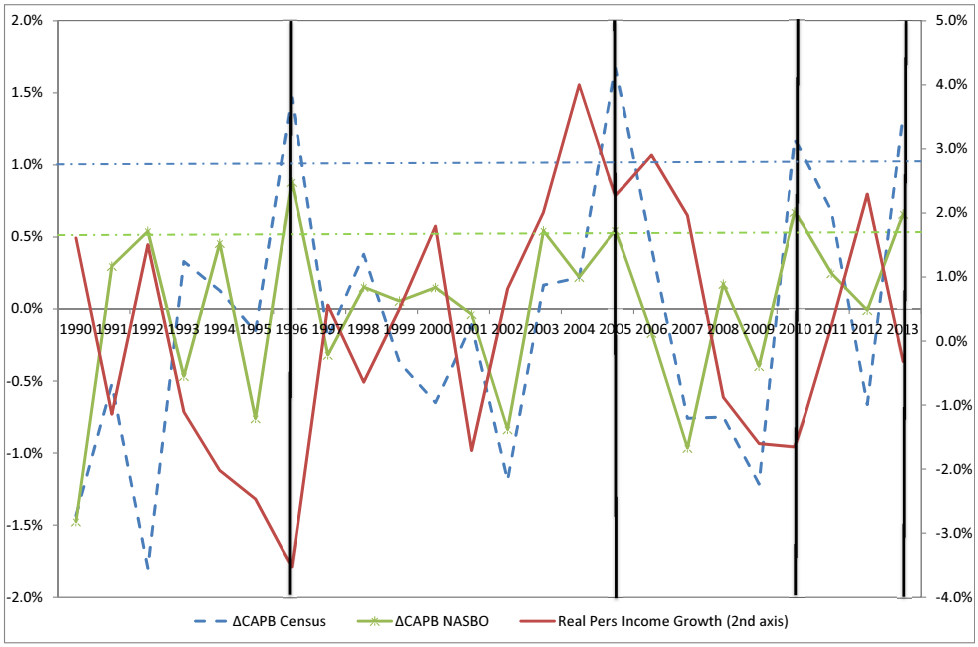

Figure 1: Fiscal consolidations and personal income in Hawaii

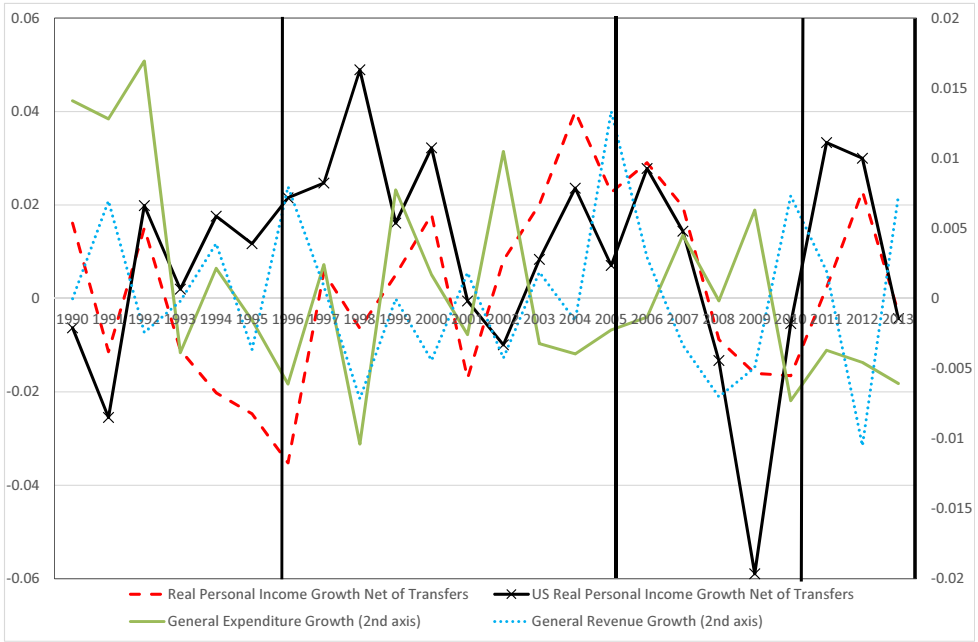

Figure 2: Government expenditure and revenue growth in Hawaii

consolidation was accounted by spending cuts and the remainder by tax increases.

Hawaii's fiscal response to the Great Recession is not atypical in the United States. Jonas (2012) documents that several states tightened their policies during the Great Recession due to the institutional constraints at the state budget level. Figure 1 lends support to the view that fiscal policy in Hawaii has often been pro-cyclical: two of four consolidation episodes have occurred during deep economic recessions. Figure 2 shows the growth rate of general expenditures, the growth rate of general revenues, and the growth rate of real personal income net of transfers; for comparison purposes, the latter variable is shown for Hawaii and the United States. During the Great Recession Hawaii experienced a milder downturn relative to the rest of the country; in the FY2010, however, government spending fell sharply and revenues increase substantially relative to the FY2009; Hawaii's income growth stalled in the FY2010 while that of the United States rebounded quickly.

4.4 The consolidation of 2013

In early 2012 tax revenue projections for the FY2013 were downgraded and a budget shortfall of $19 billion was anticipated. The original state budget for the FY2012-13 was then amended by the supplemental FY2013. Democratic Governor Abercrombie proposed supplemental budget included cost-cutting measures $20 million, including savings from contract talks between the public sector labor union and the adminstration amounting to a five percent pay cut. While the Governor did not raise taxes in his proposed supplemental budget, state legislators passed a final version that relied heavily on pending tax increases and reduced government health costs.[9] Overall, the x percent of the fiscal consolidation was revenue-funded and the state budget balance improved by $569 million during the FY2013 relative to the previous fiscal year.

Figure 2 displays a marked increase in revenue growth and moderate reduction in expenditure growth in the FY2013; personal income growth, on the other hand, worsened and turned negative.

[9]See the State of Hawaii Fiscal Budget 2011-2013 and the Hawaii state budget (2012-2013) in Ballotpedia.

5 The effect of fiscal consolidations

We follow IMF (2010), Alesina and Ardagna (2012), and Guajardo et al. (2014) and estimate the following equation

$$\triangle y_{s,t} = \alpha + \sum_{j=1}^{2} \delta_j \triangle y_{s,t-j} + \sum_{j=0}^{2} \beta_j \triangle SFP_{s,t-j} + \mu_s + \lambda_t + \nu_{s,t} \tag{2}$$

where $s = 1, ..., 49$ and $t = 1, ..., T$. The variables $\triangle y$ is the change in log real income per person, $\triangle SFP$ is the change in state fiscal policy, μ_s are state fixed effects, λ_t are year fixed effects, and $\nu_{s,t}$ is a mean zero error term. The δ's are the autoregressive coefficients capturing the dynamic adjustment of economic activity and the β's are the coefficients of the contemporaneous and lagged effects of changes in state fiscal policy on real income. We choose two lags ($j = 2$) for comparability with past research and also based on specification tests.

Table 4 presents the least squares results using Census fiscal data. Each regression includes lagged and twice-lagged growth rates, fixed state effects and fixed time effects; all of which are not shown. The coefficient and robust standard error are presented for each current and lagged fiscal policy variables. At the bottom, we show the estimated impact of a fiscal consolidation (and a non-consolidation) within three years along with its standard error computed using the delta method.

In column 1, we test the link between fiscal improvements vis-a-vie $CAPB$ and short-run growth. We find a positive and significant relationship between $\triangle CAPB$ and state-level growth. Our point estimates indicate that a one percent increase in $\triangle CAPB$ is associated with a 0.16 percent increase in growth for 1 year and a 0.59 percent increase in growth within 3-years. The sign and magnitude of our estimates are quite close to those in the cross-country literature.[10]

In columns 2 and 3, we include the fiscal consolidation measures $FCdummy$ and $\Delta CAPB$. Each consolidation measure is positive only for the 93 episodes where $\Delta CAPB$ exceeds one percent. Using this criteria, we find that none of the coefficients for the current or lagged fiscal consolidation variables are significant.

[10]Using the $\triangle CAPB$, Alesina and Ardagna (2010, 2012) estimate an *expansionary* impact of 0.05 to 0.16 percent in one-year and 0.23 to 0.40 percent in three-years. However, IMF (2010) and Guajardo et al. (2014) estimate a *contractionary* effect of 0.50 to 0.62 percent in three-years when using an action-based narrative approach.

In the last two columns, we allow the $\triangle CAPB$ to have different impacts during fiscal consolidation and non-consolidation periods. We use the $\Delta CAPB > 1.0$ threshold in column 4 and $\Delta CAPB > 0$ threshold in column 5. Surprisingly, we find that the cumulative effect within 3-years of $\triangle CAPB$ during non-consolidation periods is larger in value and in statistical significance than during consolidation periods. This result raises questions about the expansionary impact of fiscal consolidation found in column 1.

Table 5 presents the least square results using the NASBO fiscal data. The point estimates are larger due to the more narrow range of the NASBO data in Table 1. Despite the difference in magnitude, the NASBO results follow the same pattern as the Census results. We find a positive and significant relationship between $\triangle CAPB$ and growth during all years (column 1), non-consolidation years (column 4), and fiscal deterioration years (column 5). At the same time, we find no significant link between fiscal consolidations and growth (columns 2-4) and likewise between fiscal improvements and growth (columns 5).

Taken together, our least squares results provide contradictory evidence on the linkage between fiscal consolidations and real income growth. On the one hand, we find a positive relationship between increases in the $\triangle CAPB$ and growth for all years. This positive relationship holds across two independently created fiscal data sets. On the other hand, the positive relationship becomes insignificant when we narrow our consolidation measure to a one percent increase or even to any positive change. However, the positive link between the $\triangle CAPB$ and growth continues to remain during periods of non-consolidation.

This contradictory pattern of the coefficient values raise questions over the exogeneity of our variable of interest $\triangle CAPB$. First, as section 4 illustrates, the fiscal data of Census and NASBO is not completely capturing the stance a state fiscal policy. As a result, there is likely measurement error in variable of interest. Second, the cyclical-adjustment of the fiscal variables, especially the revenue data, may not be perfect. Third, the tight budget constraints leads to a more pro-cyclical pattern of state fiscal policy. As a result, state fiscal tightenings and consolidations in response to previous economic downturns can be associated with resulting economic recoveries.

We exploit differences in the willingness and ability of state governments to respond to past budget shortfalls and surpluses to identify current fiscal policy. Past research has used variations in political parties (Reed, 2006), elections (Alesina and Perotti, 1995b), stabilization (rainy day)

funds (Wagner and Elder, 2002), debt and deficit levels (Ardagna, 2007), balanced-budget or No-Carry requirements (Clemens and Miran, 2012), and Tax and Expenditure Limits or TEL (Besley and Case, 2003) to instrument for state and national fiscal adjustments. In particular, we use a parsimonious set of state political variables along with budgetary conditions and rules to identify state fiscal policy. All instruments are lagged once (and sometimes twice) to insure exogeneity and allow for policy decisions to manifest themselves in the observed fiscal policy variables.

For state politics, we include a dummy for a state-wide election in that year and also a dichotomous variable $(-2, -1, 0, 1, 2)$ that records a change from left-to-right (Democratic to Split to Republican) in political control of state government. We expect that an election will loosen fiscal policy and thus decrease $\triangle CAPB$, while a shift to the political right will increase $\triangle CAPB$. Given the tighter budget constraints faced by U.S. states, our main measure for budgetary conditions is last year's budget balance as a percent of income. We include separate budget surplus and deficit variables to allow for asymmetric responses by state policymakers. In addition, we include the debt level and a dummy for the presence of a stabilization fund for the Census sample and the stabilization fund balance for the NASBO sample.

The budgetary rules are captured by the presence of No-Carry and TEL requirements. A No-Carry requirement prohibits the carrying deficits through the next budget cycle. TEL's are laws that specify how much taxes or expenditures can increase from one year to the next. We interact the No-Carry requirement with the budget deficit and the TEL requirement with the budget deficit and the surplus variables to allow for different responses. We expect that states with No-Carry rules will have a larger positive response of lagged deficit on $\triangle CAPB$. Similarly, we expect that states with TEL's to have a larger positive response of lagged deficit on $\triangle CAPB$ but a smaller response of lagged surplus on $\triangle CAPB$. With U.S. states following different one- and two-year budgetary cycles, we include both one-period and two-period lags of each interaction term.

We test the validity of our instruments by the Cragg-Donald test and Hansen overidentification test. The Cragg-Donald statistic is the matrix-analog of the first-stage F-statistic and can be used to assess the strength of the instruments. For a single endogenous variable, the Cragg-Donald statistic collapses to the F-statistic and the threshold of 10 by (Staiger and Stock, 1997) can be used. For two or more endogenous variables, (Stock and Yogo, 2005) have

estimated critical values to assess the instrument strength. The Hansen overidentification test tests the exogeneity of the instruments by regressing the first-stage residuals in the second-stage regression. A rejection of the Hansen overidentification indicates a lack of exogeneity of the instruments.

Table 6 presents the 2SLS results using the Census data. The first-stage results (available upon request) generally conform with our theoretical predictions. The specification test results shown at the bottom indicate that our instruments are valid. The Cragg-Donald statistic exceeds the threshold of 10 in the first three column, but falls between the critical values of 10 and 20 percent.[11] With regards to the Hansen test, we fail to reject the null of exogeneity at any conventional level.

By controlling for endogeneity, the 2SLS results show that a fiscal consolidation leads to a decrease in real income growth. The coefficient for each contemporaneous and cumulative measure of fiscal consolidation is negative and statistically significant. In column 1, the point estimates indicate that a one percent increase in $\triangle CAPB$ during all years leads to a 0.66 percent decrease in three-year growth. In columns 2 and 3, a fiscal consolidation of $\triangle CAPB > 1.0$ reduces growth. More importantly, we find that a fiscal consolidation or improvement in columns 4-5 reduces growth, while a fiscal non-consolidation or deterioration has no significant effect within 3-years. The point estimates imply that a one percent increase in $\triangle CAPB$ during a fiscal consolidation or improvement lowers the growth rate by about 1.5 percent in three-years.

Table 7 presents the 2SLS results using the NASBO data. These results confirm that a fiscal consolidation leads to lower real income growth. As before, the coefficient for each contemporaneous and cumulative measure of fiscal consolidation is negative and statistically significant. There are two minor differences however. First, with the exception of column 1, the estimated magnitudes are lower. For instance, a one percent increase in $\triangle CAPB$ during a fiscal consolidation (improvement) in column (4) lowers the growth rate by 1.32 (1.16) percent within 3-years. Second, across the different definitions of a fiscal consolidation, the three-year impact of $\triangle CAPB$ are closer in value. A one percent increase in $\triangle CAPB$ decreases growth by 1.07 percent during any period and by 1.53 during a fiscal consolidation episode. As evidenced by the much higher Cragg-Donald statistics, these two differences are likely due to the greater

[11]The critical values of (Stock and Yogo, 2005) depend upon the acceptable bias level, number of endogenous regressors and the number of instruments used. In our example, the critical value of rejecting the null hypothesis that the maximum relative bias due to weak instruments is 10 percent is 10.78 and 6.22 for 20 percent.

strength of our instruments in explaining fiscal consolidations under NASBO.

6 Compositional effects of fiscal consolidations

We next investigate how the response of economic activity depends on the composition of the fiscal consolidation. In the cross-country literature, Alesina and Ardagna (2010, 2012) find that fiscal consolidations resulting from spending cuts are associated with higher real GDP growth, while those resulting from tax increases are associated with decreases in real GDP growth. At the same time, IMF (2010) and Guajardo et al. (2014) find that both spending- and revenue-based fiscal consolidations are associated with decreases in growth.

To estimate the compositional effect of fiscal consolidation, we repeat our estimation procedure using separate revenue-based and spending-based fiscal measures

$$\triangle y_{s,t} = \alpha + \sum_{j=1}^{2} \delta_j \triangle y_{s,t-j} + \sum_{j=0}^{2} \alpha_j \triangle RBFC_{s,t-j} + \sum_{j=0}^{2} \gamma_j \triangle SBFC_{s,t-j} + \mu_s + \lambda_t + \nu_{s,t} \qquad (3)$$

where $\triangle RBFC$ and $\triangle SBFC$ are the changes in the revenue-based and spending-based portions of the cyclically-adjusted budget balance during periods of fiscal consolidation. We demarcate the revenue vs. spending portions of the fiscal consolidation in two separate ways. Following Alesina and Ardagna (2010, 2012) (AA), we split the $\triangle CAPB^{FC}$ between $\triangle RBFC$ and $\triangle SBFC$ using the percentage attributed to each component. We also follow Guajardo et al. (2011) (IMF) and have one compositional measure equal $\triangle CAPB^{FC}$ and the other compositional measure equal 0 depending upon which component contributed the majority of $\triangle CAPB^{FC}$.[12]

The last four rows of 1 show the summary statistics of our budget composition measures. As with $\triangle CAPB^{FC}$, there are 93 non-zero values of $\triangle RBFC$ and $\triangle SBFC$ under Census and 82 under NASBO. Of these, the majority of the fiscal consolidations are attributed to revenue increases. For the AA compositional measures, the mean value of $\triangle RBFC^{AA}$ is greater than $\triangle SBFC^{AA}$ in both samples. Likewise, the number of $\triangle RBFC^{IMF}$ exceeds the number of

[12]In particular, the AA compositional measures are $\triangle RBFC = (\triangle revenue / \triangle CAPB^{FC}) \times \triangle CAPB^{FC}$ and $\triangle SBFC = (-\triangle spend / \triangle CAPB^{FC}) \times \triangle CAPB^{FC}$ where $\triangle revenue - \triangle spend = \triangle CAPB$. The IMF compositional measures are $\triangle RBFC = \triangle CAPB^{FC}$ if $(\triangle revenue / \triangle CAPB^{FC}) > 0.50$ and 0 otherwise and $\triangle SBFC = \triangle CAPB^{FC}$ if $(\triangle spend / \triangle CAPB^{FC}) > 0.50$ and 0 otherwise where $\triangle revenue - \triangle spend = \triangle CAPB^{FC}$.

$\triangle SBFC^{IMF}$ in both samples.

Table 8 presents the least squares estimates for the budget composition measures. The results for the AA demarcation are shown in the first two columns and those for the IMF are shown in the last two columns. The results show little significance except for an expansionary revenue-based fiscal consolidation under NASBO. In columns 1 and 3, the point estimates indicate that a one percent increase in $\triangle RBFC$ under NASBO is associated with a 1.03 to 1.56 percent increase in growth within three years. However, as before, the possibility of reverse causality running from growth to contemporaneous fiscal policy is biasing the OLS results.

Table 9 presents the 2SLS results for the budget composition effects. We use the same instrument set as before except that we include separate interaction terms for tax limits and spending limits. By controlling for endogeneity, the impact of a revenue-based fiscal consolidation becomes *contractionary*. In each column but the first, the contemporaneous and three-year coefficient for $\triangle RBFC$ is negative and statistically significant. The point estimates indicate that a one percent increase in $\triangle RBFC$ leads to a 2.06 to 3.17 decrease in real income growth within 3-years. At the same time, the impact of a spending-based consolidation is negative but insignificant. Nevertheless, our results support the past findings that revenue-based consolidations are contractionary, but contradict the past findings that spending-based consolidations are expansionary.

7 Robustness Checks

Our results suggest that fiscal consolidations, especially when led by tax increases, are contractionary. There is a possibility however that our results are simply a byproduct of our choice of fiscal consolidation episodes. In addition, a specific sub-sample of states could be driving our results. We therefore run a series of robustness tests to examine these possibilities.

Tables 10 and **??** present the robustness test results. We use 2SLS with the same instrument set. For brevity, we report the estimated cumulative effect (and standard error) of a fiscal consolidation within 3-years on real personal income per person. The results for the Census data are shown in the top panel while those for the NASBO data are shown in the bottom panel. The fiscal consolidation specifications in 10 correspond to columns (1), (2), (4) and (5) of 6 and 7. The compositional specifications of the top panel in **??** correspond to columns (1)

and (2) in 9, while those of the bottom panel correspond to columns (3) and (4) of that same table. For comparison purposes, we include the baseline result in the first row of each panel.

First, we consider alternative threshold values to change the frequency of fiscal consolidations. In the second row, we lower the threshold of a fiscal consolidation to 0.50 percent for Census and 0.25 percent for NASBO. As a result, we raise the incidence rate to around 15 percent for each sample. In the third row, we raise the threshold to 1.40 and 0.70 percent and thus lower the incidence rate to 2 percent. Regardless of the threshold value, a fiscal consolidation whether measured by a dummy $FCdummy$ or by $\triangle CAPB^{+}$ continues to have a recessionary impact. Relative to the baseline, a consolidation under the higher threshold has a larger impact, while a consolidation under the lower threshold has a smaller impact.[13] For the compositional effects, a revenue-based consolidation $\triangle RBFC$ generally lead to a larger (economically and statistically) decrease in real income relative to the corresponding spending-based consolidation $\triangle SBFC$.

Second, we test the sensitivity of our result to the removal of high- or low-frequency consolidation states. In the fourth row, we remove 4 states from Census and 7 from NASBO that experience fiscal consolidations in more than 15 percent of the years. In the fifth row, we remove 14 states from Census and 21 states from NASBO that never experienced a consolidation. Although there is less statistical significance overall, a fiscal consolidation whether measured as $FCdummy$ or $\triangle CAPB^{FC}$ or $\triangle CAPB^{+}$ decreases real income. At the same time, revenue-based consolidations have more significant effects than spending-based consolidations.

Third, our identification scheme relies on U.S. states responding to budgetary shortfalls due to institutional and budgetary constraints. We test the plausibility of these assumptions by restricting our sample to those 41 states with strong no-carry rules and to those 27 states with annual budgetary cycles throughout the sample. If this identification scheme is correct, then the estimated effects should be more or less the same for these sub-samples relative to the 49 state sample.[14]

[13] By definition, the threshold value has no effect on $\triangle CAPB$ and $\triangle CAPB^{+}$.

[14] A more appropriate test would be test the effects for states with and without these constraints. Unfortunately, we cannot do so since there are only 8 states with weak no-carry and the 22 states without annual budgets.

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Tables

Table 1: Summary Statistics of Census

Variable	Mean	Std. Dev.	Min.	Max.	N
$\triangle CAPB$	0.00014	0.00603	-0.02984	0.03453	2107
$FCdummy$	0.04414	0.20545	0	1	2107
$\triangle CAPB^{FC}$	0.01527	0.00522	0.01001	0.03454	93
$\triangle CAPB^{NFC}$	-0.00055	0.00508	-0.02984	0.00988	2014
$\triangle CAPB^{+}$	0.00435	0.00440	0.00001	0.03454	1072
$\triangle CAPB^{-}$	-0.00421	0.00410	-0.02984	-0.00001	1035
$\triangle RBFC^{AA}$	0.00882	0.00827	-0.00119	0.04431	93
$\triangle SBFC^{AA}$	0.00614	0.00765	-0.01116	0.02514	93
$\triangle RBFC^{IMF}$	0.01489	0.00408	0.01001	0.03453	58
$\triangle SBFC^{IMF}$	0.01591	0.00578	0.01038	0.03227	35

Table 2: Summary Statistics of NASBO

Variable	Mean	Std. Dev.	Min.	Max.	N
$\triangle CAPB$	0.00002	0.00341	-0.02010	0.02536	1617
$FCdummy$	0.05071	0.21947	0	1	1617
$\triangle CAPB^{FC}$	0.00811	0.00432	0.00506	0.02536	82
$\triangle CAPB^{NFC}$	-0.00041	0.00275	-0.02010	0.00486	1487
$\triangle CAPB^{+}$	0.00211	0.00263	1.21e-06	0.02536	851
$\triangle CAPB^{-}$	-0.00230	0.00257	-0.02001	-5.29e-07	766
$\triangle RBFC^{AA}$	0.00449	0.00548	-0.00850	0.02234	82
$\triangle SBFC^{AA}$	0.00358	0.00494	-0.01205	0.019884	82
$\triangle RBFC^{IMF}$	0.00831	0.00409	0.00506	0.02449	42
$\triangle SBFC^{IMF}$	0.00790	0.00459	0.00507	0.02536	40

Table 3: **Correlation Matrix of Fiscal Consolidation Measures**

	Census Data					NASBO Data				
	$\triangle CAPB$	$\triangle CAPB^{FC}$	$\triangle CAPB^{NFC}$	$\triangle CAPB^{+}$	$\triangle CAPB^{-}$	$\triangle CAPB$	$\triangle CAPB^{FC}$	$\triangle CAPB^{NFC}$	$\triangle CAPB^{+}$	$\triangle CAPB^{-}$
Census Data										
$\triangle CAPB$	1									
$\triangle CAPB^{FC}$	**0.568**	1								
	0.000									
$\triangle CAPB^{NFC}$	**0.835**	0.022	1							
	0.000	*0.307*								
$\triangle CAPB^{+}$	**0.831**	**0.789**	**0.483**	1						
	0.000	*0.000*	*0.000*							
$\triangle CAPB^{-}$	**0.803**	**0.118**	**0.897**	**0.336**	1					
	0.000	*0.000*	*0.000*	*0.000*						
NASBO Data										
$\triangle CAPB$	**0.356**	**0.180**	**0.313**	**0.291**	**0.288**	1				
	0.000	*0.000*	*0.000*	*0.000*	*0.000*					
$\triangle CAPB^{FC}$	**0.214**	**0.284**	**0.073**	**0.278**	**0.068**	**0.624**	1			
	0.000	*0.000*	*0.007*	*0.000*	*0.000*	*0.000*				
$\triangle CAPB^{NFC}$	**0.291**	0.011	**0.344**	**0.158**	**0.316**	**0.798**	0.027	1		
	0.000	*0.649*	*0.000*	*0.000*	*0.000*	*0.000*	*0.279*			
$\triangle CAPB^{+}$	**0.290**	**0.269**	**0.175**	**0.335**	**0.135**	**0.808**	**0.865**	**0.367**	1	
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*		
$\triangle CAPB^{-}$	**0.276**	0.010	**0.327**	**0.120**	**0.329**	**0.781**	**0.105**	**0.918**	**0.262**	1
	0.000	*0.704*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	

The time period is 1981-2013. Each number is the Pearson correlation coefficient with the p-values in italics below.

Table 4: OLS Results for Census Budget

VARIABLES	(1)	(2)	(3)	(4)	(5)
$\triangle CAPB_t$	0.1665*				
	(0.0947)				
$\triangle CAPB_{t-1}$	0.4216***				
	(0.1556)				
$\triangle CAPB_{t-2}$	0.2215**				
	(0.0878)				
$FCdummy_t$		0.0010			
		(0.0034)			
$FCdummy_{t-1}$		0.0003			
		(0.0027)			
$FCdummy_{t-2}$		-0.0011			
		(0.0029)			
$\triangle CAPB_t^{FC}$			0.0529	0.2005	
			(0.2082)	(0.1918)	
$\triangle CAPB_{t-1}^{FC}$			0.0878	0.1882	
			(0.1928)	(0.1943)	
$\triangle CAPB_{t-2}^{FC}$			-0.0301	0.0777	
			(0.2141)	(0.1924)	
$\triangle CAPB_t^{NFC}$				0.1490	
				(0.0942)	
$\triangle CAPB_{t-1}^{NFC}$				0.5299***	
				(0.1729)	
$\triangle CAPB_{t-2}^{NFC}$				0.2768***	
				(0.0728)	
$\triangle CAPB_t^{+}$					0.1493
					(0.1385)
$\triangle CAPB_t^{+}$					0.2710*
					(0.1483)
$\triangle CAPB_{t-2}^{+}$					0.2003
					(0.1518)
$\triangle CAPB_t^{-}$					0.1843
					(0.1246)
$\triangle CAPB_{t-1}^{-}$					0.5882**
					(0.2642)
$\triangle CAPB_{t-2}^{-}$					0.2493*
					(0.1303)
Cumulative effect of fiscal	0.5958***	0.0013	0.1434	0.3979	0.4272**
consolidation within 3-years	(0.1837)	(0.0044)	(0.2422)	(0.2454)	(0.1985)
Cumulative effect of no fiscal				0.6857**	0.7811**
consolidation within 3-years				(0.2177)	(0.3203)
Observations	2,009	2,009	2,009	2,009	2,009
R-squared	0.573	0.569	0.569	0.574	0.574

The model is estimated using OLS with lagged and twice-lagged growth rates along with fixed state and time effects. The robust standard errors clustered on each state are in parentheses where $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table 5: OLS Results for NASBO Budget

VARIABLES	(1)	(2)	(3)	(4)	(5)
$\triangle CAPB_t$	0.5199**				
	(0.2414)				
$\triangle CAPB_{t-1}$	0.8850**				
	(0.4208)				
$\triangle CAPB_{t-2}$	0.4638				
	(0.2900)				
$FCdummy_t$		-0.0017			
		(0.0024)			
$FCdummy_{t-1}$		0.0017			
		(0.0020)			
$FCdummy_{t-2}$		-0.0012			
		(0.0033)			
$\triangle CAPB_t^{FC}$			-0.1799	0.0885	
			(0.2030)	(0.2802)	
$\triangle CAPB_{t-1}^{FC}$			0.6373	1.1868**	
			(0.4583)	(0.5586)	
$\triangle CAPB_{t-2}^{FC}$			-0.4680*	-0.1891	
			(0.2509)	(0.2727)	
$\triangle CAPB_t^{NFC}$				0.7344**	
				(0.2805)	
$\triangle CAPB_{t-1}^{NFC}$				0.6797*	
				(0.3430)	
$\triangle CAPB_{t-2}^{NFC}$				0.8288**	
				(0.3891)	
$\triangle CAPB_t^{+}$					0.2886
					(0.2560)
$\triangle CAPB_{t-1}^{+}$					1.0351
					(0.6521)
$\triangle CAPB_{t-2}^{+}$					-0.2210
					(0.2774)
$\triangle CAPB^{-}$					0.7078**
					(0.3489)
$\triangle CAPB_{t-1}^{-}$					0.6918**
					(0.2991)
$\triangle CAPB_{t-2}^{-}$					1.1876*
					(0.6471)
Cumulative effect of fiscal	1.4688**	-0.0002	0.4333	1.2867	1.3595
consolidation within 3-years	(0.6246)	(0.0043	(0.5707)	(0.8125)	(0.8671)
Cumulative effect of no fiscal				1.5086**	1.4874**
consolidation within 3-years				(0.5798)	(0.5771)
Observations	1,519	1,519	1,519	1,519	1,519
R-squared	0.593	0.587	0.590	0.597	0.596

The model is estimated using OLS with lagged and twice-lagged growth rates along with fixed state and time effects. The robust standard errors clustered on each state are in parentheses where $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table 6: 2SLS Results for Census Budget

VARIABLES	(1)	(2)	(3)	(4)	(5)
$\triangle CAPB$	-0.7549***				
	(0.2805)				
$\triangle CAPB_{t-1}$	0.1261				
	(0.1288)				
$\triangle CAPB_{t-2}$	0.0531				
	(0.1059)				
$FCdummy_t$		-0.0425***			
		(0.0099)			
$FCdummy_{t-1}$		-0.0043			
		(0.0029)			
$FCdummy_{t-2}$		-0.0041			
		(0.0028)			
$\triangle CAPB_t^{FC}$			-2.4260***	-1.4203**	
			(0.5944)	(0.7151)	
$\triangle CAPB_{t-1}^{FC}$			-0.1892	-0.1571	
			(0.1796)	(0.1932)	
$\triangle CAPB_{t-2}^{FC}$			-0.1193	-0.0745	
			(0.1679)	(0.1687)	
$\triangle CAPB_t^{NFC}$				-0.5057	
				(0.3854)	
$\triangle CAPB_{t-1}^{NFC}$				0.2089	
				(0.1461)	
$\triangle CAPB_{t-2}^{NFC}$				0.1089	
				(0.1290)	
$\triangle CAPB_t^{+}$					-1.4907**
					(0.6297)
$\triangle CAPB_{t-1}^{+}$					0.0228
					(0.1919)
$\triangle CAPB_{t-2}^{+}$					0.1001
					(0.1622)
$\triangle CAPB_t^{-}$					0.0443
					(0.6740)
$\triangle CAPB_{t-1}^{-}$					0.2633
					(0.1934)
$\triangle CAPB_{t-2}^{-}$					0.0015
					(0.1849)
Cumulative effect of fiscal	-0.6560*	-0.0482***	-2.7140***	-1.6290**	-1.5268**
consolidation within 3-years	(0.3899)	(0.0115)	(0.7029)	(0.8153)	(0.6811)
Cumulative effect of no fiscal				-0.3151	0.3094
consolidation within 3-years				(0.4594)	(0.7253)
Cragg-Donald Statistic	20.5621	13.4923	14.2664	8.0910	8.9568
Overidentification p-value	0.4534	0.4445	0.3132	0.6151	0.6070

The model is estimated using 2SLS with fixed state and time effects. The standard errors are in parentheses where ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. The excluded instruments used are lagged state debt ratio, current election dummy, lagged party change, lagged stabilization fund balance, lagged positive budget ratio, lagged negative budget ratio, lagged and twice-lagged negative budget ratio × No Carry Rule, lagged and twice-lagged negative budget ratio × TEL Rule, lagged and twice-lagged positive budget ratio × TEL Rule.

Table 7: 2SLS Results for NASBO Budget

VARIABLES	(1)	(2)	(3)	(4)	(5)
$\triangle CAPB_t$	-0.9781***				
	(0.2976)				
$\triangle CAPB_{t-1}$	0.0338				
	(0.2417)				
$\triangle CAPB_{t-2}$	0.0554				
	(0.1889)				
$FCdummy_t$		-0.0189***			
		(0.0047)			
$FCdummy_{t-1}$		-0.0010			
		(0.0026)			
$FCdummy_{t-2}$		-0.0026			
		(0.0025)			
$\triangle CAPB_t^{FC}$			-1.7537***	-1.4867***	
			(0.4602)	(0.5575)	
$\triangle CAPB_{t-1}^{FC}$			0.4535*	0.3678	
			(0.2644)	(0.3205)	
$\triangle CAPB_{t-2}^{FC}$			-0.5452**	-0.7011**	
			(0.2570)	(0.2870)	
$\triangle CAPB_t^{NFC}$				-0.7656*	
				(0.4425)	
$\triangle CAPB_{t-1}^{NFC}$				-0.2186	
				(0.2801)	
$\triangle CAPB_{t-2}^{NFC}$				0.4675**	
				(0.2248)	
$\triangle CAPB_t^{+}$					-1.1733**
					(0.5219)
$\triangle CAPB_{t-1}^{-}$					-0.8935
					(0.5825)
$\triangle CAPB_{t-2}^{+}$					0.1591
					(0.3526)
$\triangle CAPB_t^{-}$					-0.7379**
					(0.2948)
$\triangle CAPB_{t-1}^{-}$					-0.1701
					(0.3643)
$\triangle CAPB_{t-2}^{-}$					0.8819***
					(0.2977)
Cumulative effect of fiscal	-1.0685**	-0.0223***	-1.5349**	-1.3177*	-1.1648*
consolidation within 3-years	(0.5348)	(0.0065)	(0.6319)	(0.7372)	(0.6713)
Cumulative effect of no fiscal				-1.0866	-1.1783
consolidation within 3-years				(0.6691)	(0.7380)
Cragg-Donald Statistic	81.5447	50.0906	65.9957	30.3105	43.6081
Overidentification p-value	0.4868	0.1158	0.1583	0.4513	0.3595

The model is estimated using 2SLS with lagged and twice-lagged growth rates along with fixed state and time effects. The standard errors are in parentheses where ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. The excluded instruments used are lagged state debt ratio, current election dummy, lagged party change, lagged stabilization fund balance, lagged positive budget ratio, lagged negative budget ratio, lagged and twice-lagged negative budget ratio × No Carry Rule, lagged and twice-lagged negative budget ratio × TEL Rule, lagged and twice-lagged positive budget ratio × TEL Rule.

Table 8: OLS Results for Budget Composition

VARIABLES	(1)	(2)	(3)	(4)
$\triangle RBFC_t$	-0.1968	0.0417	-0.1392	-0.1078
	(0.1514)	(0.3345)	(0.1924)	(0.3822)
$\triangle RBFC_{t-1}$	0.1463	0.9873*	0.2040	1.5438**
	(0.3181)	(0.5747)	(0.2677)	(0.6408)
$\triangle RBFC_{t-2}$	-0.0938	-0.8121	-0.2543	-0.7680
	(0.3746)	(0.5175)	(0.3331)	(0.5886)
$\triangle SBFC_t$	0.4823	-0.5774**	0.3845	-0.4015
	(0.3992)	(0.2812)	(0.4066)	(0.2974)
$\triangle SBFC_{t-1}$	-0.0105	0.1243	-0.0761	-0.2704
	(0.2872)	(0.3863)	(0.2905)	(0.5955)
$\triangle SBFC_{t-2}$	0.1581	0.0119	0.3065	-0.1947
	(0.2951)	(0.5572)	(0.2599)	(0.4592)
Cumulative effect of revenue-based	-0.0600	1.0347*	0.0579	1.4213***
fiscal consolidation within 3-years	(0.3627)	(0.5125)	(0.3760)	(0.4713)
Cumulative effect of spending-based	0.4953	-0.5313	0.3275	-0.7264
fiscal consolidation within 3-years	(0.5531)	(0.6798)	(0.5578)	(0.8367)
Specification of composition	AA	AA	IMF	IMF
State Budget Data Source	Census	NASBO	Census	NASBO
Observations	2,009	1,519	2,009	1,519
R-squared	0.570	0.593	0.570	0.595

The model is estimated using OLS with lagged and twice-lagged growth rates along with fixed state and time effects. The robust standard errors clustered on each state are in parentheses where $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table 9: 2SLS Results for Budget Composition

VARIABLES	(1)	(2)	(3)	(4)
$\triangle RBFC_t$	-2.7436	-2.9122***	-2.9619*	-3.0971***
	(1.8978)	(0.8611)	(1.6356)	(0.8969)
$\triangle RBFC_{t-1}$	-0.1533	0.8398**	-0.0982	1.4450***
	(0.2264)	(0.3378)	(0.2254)	(0.3571)
$\triangle RBFC_{t-2}$	-0.1413	-1.0194***	-0.2685	-0.9833***
	(0.2248)	(0.3303)	(0.2120)	(0.3537)
$\triangle SBFC_t$	-2.0097	-0.9259	-1.5908	-1.0179
	(1.6935)	(0.8619)	(1.5378)	(0.7115)
$\triangle SBFC_{t-1}$	-0.2457	-0.0699	-0.2923	-0.5450
	(0.2777)	(0.3840)	(0.2604)	(0.3667)
$\triangle SBFC_{t-2}$	0.0274	-0.0976	0.1302	-0.3517
	(0.2938)	(0.3815)	(0.2623)	(0.3670)
Cumulative effect of revenue-based	-3.0130	-2.4533**	-3.1683*	-2.0635**
fiscal consolidation within 3-years	(1.9981)	(1.0392)	(1.7207)	(1.0870)
Cumulative effect of spending-based	-2.3405	-1.1169	-1.9412	-1.6982*
fiscal consolidation within 3-years	(1.8715)	(1.0891)	(1.6716)	(0.9243)
Specification of composition	AA	AA	IMF	IMF
State Budget Data Source	Census	NASBO	Census	NASBO
Cragg-Donald Statistic	1.1823	9.6353	1.4953	12.7697
Overidentification p-value	0.3659	0.3310	0.3944	0.3293

The model is estimated using 2SLS with lagged and twice-lagged growth rates along with fixed state and time effects. The standard errors are in parentheses where $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$. The excluded instruments used are lagged state debt ratio, current election dummy, lagged party change, lagged stabilization fund balance (or dummy), lagged positive budget ratio, lagged negative budget ratio, lagged and twice-lagged negative budget ratio × No Carry Rule, lagged and twice-lagged negative budget ratio × Tax Rule, lagged and twice-lagged positive budget ratio × Tax Rule, lagged and twice-lagged negative budget ratio × Expenditure Rule,and lagged and twice-lagged positive budget ratio × Expenditure Rule.

Table 10: Robustness - Estimated Effects of Fiscal Consolidation with 3-Years

SAMPLE	No. of States	$\triangle CAPB$	$FCdummy$	$\triangle CAPB^{FC}$	$\triangle CAPB^{+}$
Census Data					
Baseline	49	-2.7436	-2.9122***	-2.9619*	-3.0971***
		(1.8978)	(0.8611)	(1.6356)	(0.8969)
Lower Threshold	49	-0.1533	0.8398**	-0.0982	1.4450***
		(0.2264)	(0.3378)	(0.2254)	(0.3571)
Higher Threshold	49	-0.1413	-1.0194***	-0.2685	-0.9833***
		(0.2248)	(0.3303)	(0.2120)	(0.3537)
No High Frequency	45	-2.0097	-0.9259	-1.5908	-1.0179
		(1.6935)	(0.8619)	(1.5378)	(0.7115)
No Zero Frequency	34	-0.2457	-0.0699	-0.2923	-0.5450
		(0.2777)	(0.3840)	(0.2604)	(0.3667)
Strict No-Carry	41	0.0274	-0.0976	0.1302	-0.3517
		(0.2938)	(0.3815)	(0.2623)	(0.3670)
Annual Budget Cycle	27	0.0274	-0.0976	0.1302	-0.3517
		(0.2938)	(0.3815)	(0.2623)	(0.3670)
NASBO Data					
Baseline	49	-2.7436	-2.9122***	-2.9619*	-3.0971***
		(1.8978)	(0.8611)	(1.6356)	(0.8969)
Lower Threshold	49	-0.1533	0.8398**	-0.0982	1.4450***
		(0.2264)	(0.3378)	(0.2254)	(0.3571)
Higher Threshold	49	-0.1413	-1.0194***	-0.2685	-0.9833***
		(0.2248)	(0.3303)	(0.2120)	(0.3537)
No High Frequency	42	-2.0097	-0.9259	-1.5908	-1.0179
		(1.6935)	(0.8619)	(1.5378)	(0.7115)
No Zero Frequency	28	-0.2457	-0.0699	-0.2923	-0.5450
		(0.2777)	(0.3840)	(0.2604)	(0.3667)
Strict No-Carry	41	0.0274	-0.0976	0.1302	-0.3517
		(0.2938)	(0.3815)	(0.2623)	(0.3670)
Annual Budget Cycle	27	0.0274	-0.0976	0.1302	-0.3517
		(0.2938)	(0.3815)	(0.2623)	(0.3670)

A Data Definitions and Sources

Variable	Definition	Data Source
$\triangle y$	change in log of real personal income minus transfer payments per person	BEA
$\triangle CAPB$	change in the cyclically-adjusted (primary) budget balance as share of income	Census/NASBO
$FCdummy$	(0,1) indicator of a fiscal consolidation where $\triangle CAPB$ is greater than 1.0 or 0.5 percent	Census/NASBO
$\triangle CAPB^{FC}$	change in the cyclically-adjusted (primary) budget balance as share of income in periods of fiscal consolidation	Census/NASBO
$\triangle CAPB^{NFC}$	change in the cyclically-adjusted (primary) budget balance as share of income in normal periods of no fiscal consolidation	Census/NASBO
$\triangle CAPB^{+}$	change in the cyclically-adjusted (primary) budget balance as share of income in periods of fiscal improvement	Census/NASBO
$\triangle CAPB^{-}$	change in the cyclically-adjusted (primary) budget balance as share of income in periods of fiscal deterioration	Census/NASBO
$\triangle SBFC^{IMF}$	change in the spending-based cyclically-adjusted (primary) budget balance using IMF criteria	Census/NASBO
$\triangle RBFC^{IMF}$	change in the revenue-based cyclically-adjusted (primary) budget balance using IMF criteria	Census/NASBO
$\triangle SBFC^{AA}$	change in the spending-based cyclically-adjusted (primary) budget balance using Alesina-Ardagna criteria	Census/NASBO
$\triangle RBFC^{AA}$	change in the revenue-based cyclically-adjusted (primary) budget balance using Alesina-Ardagna	Census/NASBO
$election$	(0,1) indicator for a state-level election	Statistical Abstract
$\triangle party$	(-1,0,1) indicator of change in state government from Democrat to Split to Republican control	Statistical Abstract
$debtlevel$	level of state debt as share of income	Census
$stabdum$	(0,1) indicator for the presence of stabilization fund	Wagner and Elder
$stablevel$	level of stabilization fund as a share of income	NASBO
$budget^{+}$	actual budget balance as share of income when positive and zero otherwise	Census
$budget^{-}$	actual budget balance as share of income when negative and zero otherwise	Census
$NoCarry$	(0,1) indicator for a No-Carry (balanced budget) law	Clemens and Miran
TEL	(0,1) indicator for a Tax and Expenditure Limit (TEL) law	Mitchell
$budget^{+}NoCarry$	actual budget balance as share of income when positive x No-Carry rule	Census
$budget^{-}NoCarry$	actual budget balance as share of income when negative x No-Carry rule	Census
$budget^{+}TEL$	actual budget balance as share of income when positive x TEL rule	Census
$budget^{-}TEL$	actual budget balance as share of income when negative x TEL rule	Census

Notes: The Census data is from *State Government Finances* and the NASBO data is from *The Fiscal Survey of the States.* The data from Clemens and Miran (2012), Mitchell (2010) and Wagner and Elder (2002) are from their papers, as listed in the References

B Figures

Figure 3: Distribution of $\triangle CAPB$ of Census

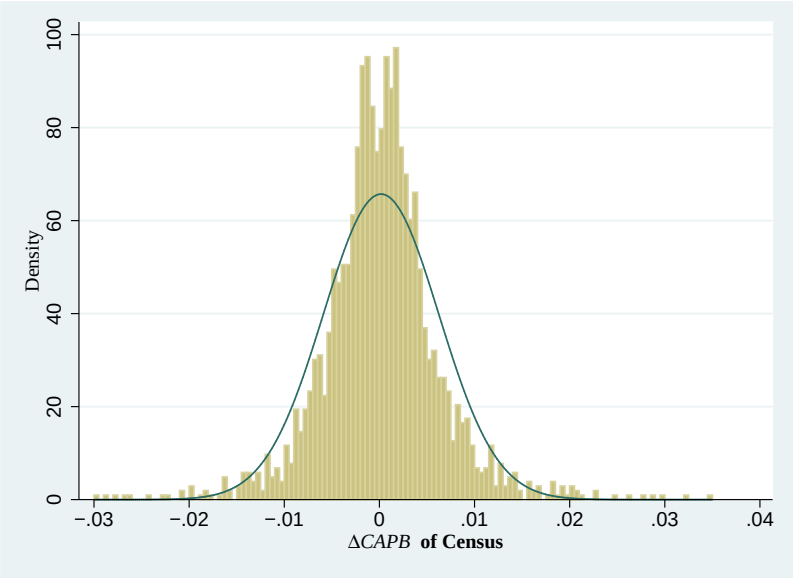

Figure 4: Distribution of $\triangle CAPB$ of NASBO