Tax Smoothing or Buffer Stock Saving? States' Management of Unemployment Insurance Finance (VERY preliminary)

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Abstract

This paper studies how state governments manage the finances of their Unemployment Insurance (UI) programs. The operation of the UI programs is separate from states' general budgets with clearly specified rules for saving (in a trust fund operated by the treasury) and spending, although spending includes a large discretionary component. Using a panel of US states we find that UI program spending and taxes is not described well by the PIH or by the Barro tax smoothing model. Instead, we find that states increase spending when their trust fund balance is high, and that trust fund balances seem to be clearly mean reverting. This pattern suggests that the data may be explained by a buffer stock model with forward looking but highly impatient politicians as suggested by Carroll (1997) for consumers. We calibrate and simulate a version of Carroll's buffer stock model and find that a buffer stock model, where impatient politicians derive utility from increasing benefits, provides a good description of the balances of the state UI systems trust fund balances.

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1 Introduction

Do sub-national governments operate as rational forward looking agents? We examine this question considering the U.S. federal-state unemployment insurance system (UI). We briefly consider the PIH (for benefits) and Barro tax smoothing models which both have been considered for state and local public finances, and find that neither describes the data well.[1] Irrespective of how state governments manage other expenditure programs over variations in economic activity, each state's UI program is designed to include a trust fund, explicitly to allow state governments to maintain their level of benefits even if tax revenues fall during a recession. We perform ad hoc VAR and dynamic regressions finding that state governments increase generosity of benefits when trust fund balances are high, consistent with impatience. We then calibrate and simulate a version of Carrol's (1997) buffer stock model and show that the average levels of state UI trust fund balances are well explained by this model. We believe this is the first paper that successfully models the net savings of a sub-national government. So the answer to the question which opened this article is: yes, politicians are forward looking but highly impatient.

The UI program consists of fifty individual programs, one per state, although within a federal government policy umbrella. States are allowed to vary both the eligibility rules, and benefit amounts, within certain parameters (Craig and Palumbo, 1989). If a person has been working and loses their job due to "inadequate demand," that person may receive benefits from the state UI fund. Benefits are generally paid to equal about 60 percent of prior wages.

[1] These models employ different assumptions: in the PIH, income is exogenous and consumption is smoothed and in the Barro model, expenditure is exogenous and taxes are smoothed.

States finance their UI program with an earmarked tax on employers. The tax rate varies between firms since it is partially experience rated, and it is typically only levied against the first $9,000 in annual wages. [2] In this way the tax is essentially a lump sum tax per employee. Recognizing that the share of the workforce that is unemployed is cyclical, states maintain a trust fund for UI. The earmarked tax is paid into the UI trust fund while benefits are paid out of the UI trust fund, and in theory there is no interaction with the general fund of the state and thus no inter-play between various other taxes and expenditures.

States' unemployment taxes are deposited with the US Treasury and states' UI systems are able to borrow from the treasury if their Unemployment Insurance Trust Fund account goes to zero. The federal government charges states interest and additionally there is a requirement that state Unemployment Insurance systems must be fundamentally solvent, as determined by the Department of Labor (DOL).[3] Thus, the primary impediment to state borrowing is in the form of the implicit regulation by the DOL. This suggests that the shadow price on borrowing for states could be extremely high and indeed, state borrowing from the Treasury is limited—this is important because a crucial feature of the buffer-stock model is that agents are unable to borrow beyond a fixed limit.[4]

Conversely, a UI program that is consistent with the Barro (1979) tax smoothing model is also possible, if state governments keep UI tax rates con-

[2] In fact, the tax base varies between $7,000 and $16,000 in annual wages.

[3] In the environment of 2010-11 Congress has passed a waiver on interest payment on loans for all states.

[4] Of course, the law does not set a fix limit on the lending of the UI systems but neither is there any fixed limit on how much consumers can borrow, and in our view the borrowing constraint is a better approximation for the UI systems than it is for consumers.

stant over fluctuations in state income, keep the algorithm covering benefits per worker constant over the business cycle, and allow the UI trust fund balance to fluctuate in response to overall tax receipts and benefits paid. We test the underlying structure of state government choices to assess the likelihood of each of these choices. In fact, however, the isolation of the UI program from the state governments' general fund is only as strong as the politicians desire to keep it segmented. There are, for example, many other taxes on firms. The state government could, therefore, lower UI taxes and raise other business taxes, and use the new general fund tax revenue to finance other expenditures while running down the state's UI trust fund balance. Similarly, if general fund revenues are low and there is political resistance to tax increases, a state government potentially may reap a political benefit from increases in UI benefits paid out, even if the UI trust fund is reduced. Thus the segmentation of the UI program from state fiscal policy in other policy dimensions is a political choice, rather than an institutional necessity.

Our examination of state government UI financial management starts by testing the PIH and the Barro tax smoothing models (1979). Several papers have rejected the PIH model for state governments and include a "rule of thumb" non-forward looking aspect (see, e.g., Dahlberg, Matz, and Tomas Lindstrom 1998), although this involves an unsatisfactory deviation from optimizing behavior. The Barro tax smoothing model assumes that deadweight loss from taxation is increasing in the tax rate, in which case the intertemporally efficient path is to leave the tax rate constant at a level just sufficient to fund the expected cost of publicly provided goods. Numerous papers have tested the Barro tax smoothing model for state (and country) governments and rejected it (references needed). In the UI case, this level should be straightforward since the present value of UI benefits are the only burden. Barro shows that a simple testable implication is that the tax rate is a martingale (typically, if imprecisely, referred to as a random walk). We therefore use a panel of U.S. states from 1976 to 2008 to test if tax rates are approximately martingale by performing a test of unit roots. If tax rates are martingales, an autoregressive model fitted to tax rates should display a unit root. To distinguish tax smoothing from pay-as-you go financing of benefits, we show that the expenditure pattern of benefits is not a unit root process, but that neither is the pattern of taxes.

We next estimate a Vector AutoRegressive (VAR) model for expenditures and taxes and illustrate the intertemporal patterns in taxes and benefits using Impulse Response Functions (IRF), although we do not interpret error terms as structual innovations.[5] The VAR model is a reduced form model without structural interpretation, but it allows us to observe the adjustment pattern for both taxes and expenditures over time (Craig and Hoang, 2011). Estimating a broader specification we find evidence that states become more generous when the balance of the unemployment trust fund is high, both by granting increases in benefits to unemployed workers and by cutting taxes to employers. Such a pattern is consistent with impatience, as politicians with a discount rate higher than market interest rates would desire to spend all the savings in the UI trust fund. This view would be overly simplistic, however, because in general states do not exhaust their trust fund in its entirety, implying that politicians are forward looking to some extent and so anticipate the loss of utility in future periods.

[5]Our preferred specification normalizes both taxes and expenditures by covered wages, although we show our conclusion is not sensitive to the normalization specification.

Models of impatient consumers that have an aversion to exhausting their savings have been popularized by Carroll (1997) and Deaton (1991). The only direct test of buffer stock savings behavior is a recent paper by Japelli, Pistaferri, and Padula (2008) that directly examines if consumers are prone to spend more if their savings exceed their (self-reported) desired stock of savings. We interpret (the discretionary part of) benefits as providing utility to politicians (likely due to higher benefit leading to higher chance of reelection, but we do not model the deeper meaning of politicians' "utility" in this paper). To our knowledge, we provide the first empirical evidence that governments may also exhibit buffer stock savings behavior, and in fact may show it more clearly than typical individual consumers.

2 Data

The goal of our empirical test is to show how state governments manage their UI finances in the face of fluctuations in income. To do so, we use a panel of the 48 mainland U.S. states from 1976-2008. The start date is dictated by the absence of state specific unemployment rates before 1976, although experimentation with other parts of the model suggest this restriction is not central to the results.

The Unemployment Insurance program information is available from the BLS as all of the states run their UI program under the federal policy umbrella. The federal portion dictates that states have a similar framework of their tax and benefit structures, although they are free to make significant policy choices on the margin that cause significant policy differences between states (Craig and Palumbo, 1989). Also important is that the federal policy creates the UI

Trust Fund for each state. The trust fund balances we use are reported as of the first of the year, which is why we sum the Trust Fund Balance with current taxes in our test of the buffer stock model.

All of the dollar data in our project is deflated by the CPI. For the UI tax and benefit data, we normalize by covered wages. UI does not necessarily cover all wages earned in the economy, as self employed workers are not generally covered (unless incorporated), and there are often caps on the total wages covered by UI (since benefits are a function of covered wages). Nonetheless, covered wages are over 90 percent of total wages.

3 The Buffer Stock Model

A large of amount of papers have attempted to test a key implication of the model: that "buffer stock" savings are larger when uncertainty is larger. However, a recent paper by Japelli, Padula, and Pistaferri (2008) directly focuses on the actual buffer stock (desired level of saving) and examines if consumers are prone to spend more if their saving exceed their (self-reported) desired buffer stock. Their model takes the form of a consumers maximizing

$$\Sigma_{t=1}^{\infty}\beta^t \frac{1}{1+\rho} C_t^{1-\rho}$$

where β is the time discount factor, C_t is consumption, and $\rho > 0$ is the coefficient of relative risk aversion. The dynamic budget constraint is

$$W_{t+1} = R\left(W_t - C_t + Y_t\right)$$

where R is a constant interest rate factor, W_t is non-human wealth, and Y_t is labor income (i.e., income apart from interest income). Carroll (1997) imposes $W_t \leq 0$ while we impose a low bound for W_t corresponding to a loan balance of 5 percent of the covered wage base (the lower bound observed in the sample).

Income is exogenous and is typically modeled as the sum of a persistent (random walk) component and a temporary (white noise shock) component. Crucial features of the model are a lower bound on borrowing, and a discount factor β which is lower than the interest rate factor ("impatience"). Impatience implies that the consumers' desire to consume heavily up-front and not build up savings, but because zero consumption implies very high (infinite) dis-utility, consumers will strive to maintain a "buffer-stock" of saving in order to avoid running out of funds. The innovation in Japelli, Padula, and Pistaferri (2008) is that they are able to directly make use of consumers' (desired) buffer stock and examine if consumers whose "cash-at-hand" (savings plus current income) exceeds the buffer stock tend to increase consumption, thereby reducing deviation between cash-at-hand and the desired buffer stock of savings.

The buffer-stock model has not been used as a benchmark for public finance before now, but impatience may not be a bad model for describing government savings behavior. We will therefore attempt to map our data into the buffer-stock framework and evaluate how well it fits the data. We take taxes as the income variable and the trust fund balance plus current taxes as cash-at-hand (we are currently exploring methods of imputing and allocating mandated spending as negative income). We currently model the desired buffer stock as a lagged 5-year moving average of the trust fund balance, but will explore a range of alternative specifications.

In our implementation we further need to control for the fact that unemployment benefits are not a simple choice variable in the short run, but are tied to the unemployment rate. In the context of the consumer model we would consider the obligations to pay benefits to the unemployed as a taste shock, and we account for this in our empirical work by including the unemployment rate as a regressor in the instrumental variables regression in addition to taxes (We are currently working to refine this).

Of particular interest is whether buffer stock behavior can explain the level of the trust fund balances. This is the first work to address this question, but understanding how state governments manage their finances over time is crucial for understanding governments' desire to smooth income. Our estimation of the buffer stock model will allow a comparison of the time patterns of actual trust fund balances with the trust fund balances of simulated data.

We also plan to estimate the increase in benefit payouts when available funds (trust fund balance at the start of period plus taxes plus interest income) exceeds the (calculated) target level and compare this increase with a similar number estimated from simulated data.[6]

4 Empirical Results

Table 1 provides descriptive statistics for our main variables. In Table 2, we report results of Dickey-Fuller unit root tests for log taxes and log benefits. UI benefits will be martingales, not rejecting unit roots, if benefits can be described as a consumption good for politicians with quadratic utility functions (see Hall (1978) for more details). This hypothesis may be rejected because the

[6]The will be similar to the empirical work of Japelli, Padula, and Pistaferri (2008).

design of the UI program is that benefits should be paid out counter-cyclically rather than at politicians' discretion. The test for unit roots in benefits is not only a test of the PIH, it is also important for the interpretation of the test of taxes. That is, if it is found that benefits follow a unit root, the test for UI taxes becomes uninformative since tax smoothing cannot be separated from simply budget balance. On the other hand, if the tests reject that UI benefits follow a unit root, then it is possible that our tests for UI taxes can differentiate whether taxes are designed by state governments to be smoothing taxes—i.e. whether UI taxes follow a unit root consistent with a smoothing governmental objective.

While unit roots tests are not very powerful for annual samples of only 38 years, we reject a unit root in benefits in 24 of 48 states at the 10 percent level of significance. For log taxes, the unit root is rejected for only 12 states when each is tested separately. While this would suggest that 3/4 of the states potentially are following a tax smoothing path, our interpretation is that states engage in some tax smoothing, but not to the extent of following the Barro model closely.[7]

Pooled panel unit root tests, reported in the second row of Table 2, reject a unit root for UI taxes as well as benefits. The statistical rejection is slightly stronger for benefits than it is for taxes, consistent with the impression from the individual state tests. More tellingly, the point estimate of the coefficient to the lagged level—which is zero under the unit root null—is statistically larger for benefits than taxes. In the same vein, the autocorrelation test reported in the last line of the table reports that for both UI taxes and UI benefits the

[7]State-level output and income are themselves unit root processes, see for example Asdrubali et al. (1996).

coefficient on the lagged value is statistically less than one, again more so for UI benefits than taxes.

In order to obtain a better descriptive understanding of UI taxes and benefits, we estimate a VAR model with up to six lags of both UI taxes and benefits. The coefficients from this specification are reported in Table 3 but the results are best seen in the graph of the Impulse Response Functions (IRFs) shown in Figure XXX. The results are telling and consistent with benefits being caused by unemployment shocks that build up over two years, and then revert back towards a mean. Taxes do not display economically significant shocks but adjust very slowly to cover benefit shocks. However, benefits and taxes are likely not only caused by unemployment and we explore this issue next.

Table 4 shows that both benefits and taxes adjust slowly with large coefficients to lagged variables. Benefits unsurprisingly react strongly to the unemployment, and as well to the business cycle as captured by output growth. A recession dummy further captures the need for benefits in recessions, although taxes also go up in recessions, likely capturing that politicians try to avoid excessive borrowing from the federal government when the trust fund balance is being drawn down. Benefits are found to rise with the level of GDP, which we interpret as politicians in wealthier states being more generous with unemployment benefits on average. Interestingly, benefits are found to have a highly significant positive coefficient to the trust fund balance, a finding consistent with impatience. That is, when the trust fund balance is high, we find that benefits are increased and taxes are lowered.

Our main (preliminary) result is captured by Figures 1 and 2. For reasonable values of the discount factor our model is able to predict the level of trust fund balances. The model used here is not adjusted to match the UI systems' parameters particularly well (we are working on adjusting Carroll's model to allow for non-zero credit constraints—this has been done before but we have not implemented our version yet, in this preliminary paper). We believe that the result will carry over to a better calibrated model, and we believe that our adaption of the buffer-stock model provides a novel perspective on the discussion of optimal savings in local governments.

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Empirical

Table 1: Descriptive Statistics

		State governments (1976 − 2008)
Benefits	Mean	.00915
	std1	.00306
	std2	.00365
	min	.00159
	max	.03568
Taxes	Mean	.00901
	std1	.00311
	std2	.00347
	min	.00115
	max	.02458
Trust fund balance	Mean	.01316
	std1	.00804
	std2	.01098
	min	−.04775
	max	.05414
GSP	Mean	.00296
	std1	.00033
	std2	.00015
	min	.00227
	max	.00448
Unemployment rate	Mean	5.79
	std1	1.06
	std2	1.65
	min	2.3
	max	17.4

Notes. "std1" (cross-section): time average of $\left[(1/n)\sum_i (X_{it} - \bar{X}_t)^2\right]^{1/2}$ where $\bar{X}_t$ is the period t average of X_{it} across states, and n is the number of states. "std2" (time-series): average over i of $\left[(1/T)\sum_t (X_{it} - \bar{X}_i)^2\right]^{1/2}$ where $\bar{X}_i$ is the time average of X_{it} for state i, and T is the number of years in the sample.

Table 2: AR(1) Estimation

	log(tax/covered wages)	log(benefits/covered wages)
State by state Unit Root Tests		
Number of rejections:	12	24
Panel AR(1) estimation	0.94***	0.87***
	(0.01)	(0.01)
Panel Unit Root test	–0.07	–0.12
	(-7.05)	(–8.52)
R-squared	0.88	0.77
N. of obs	1536	1536

Notes. The first row reports number of rejections of unit roots in augmented Dickey-Fuller tests. The second row reports the point estimates of the respective lagged variable in a standard panel AR(1) estimation with state fixed effects with standard errows in parenthesis. The last rows reports ??? *, ** and *** refer to the 10%, 5% and 1% significance level respectively

Table 3: AR(1) Estimation

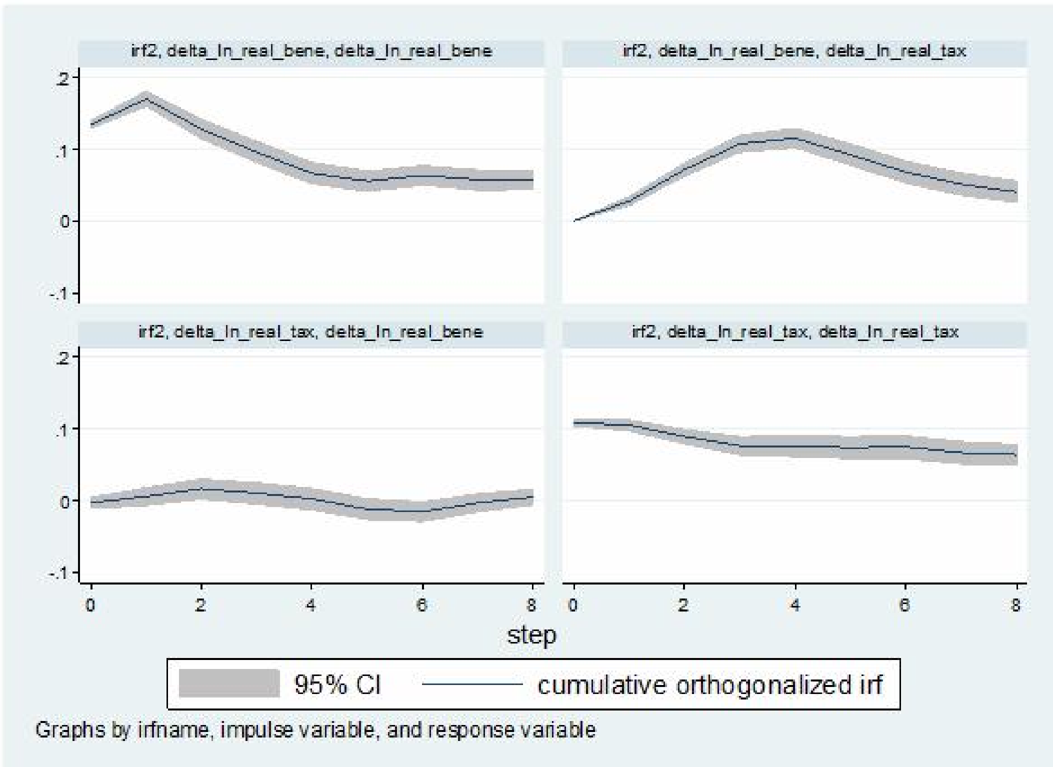
	log(tax/covered wages)	log(benefits/covered wages)
lagged taxes:		
$(t-1)$	-0.03	0.09*
	(0.03)	(0.04)
$(t-2)$	-0.16***	0.07
	(0.03)	(0.03)
$(t-3)$	-0.16***	-0.04
	(0.03)	(0.03)
$(t-4)$	-0.07**	-0.00
	(0.03)	(0.03)
$(t-5)$	-0.07**	-0.10**
	(0.03)	(0.03)
$(t-6)$	0.01	-0.00
	(0.03)	(0.03)
$(t-7)$	-0.04	0.04
	(0.02)	(0.03)
lagged benefits:		
$(t-1)$	0.21***	0.27***
	(0.02)	(0.03)
$(t-2)$	0.27***	-0.41***
	(0.02)	(0.03)
$(t-3)$	0.30***	-0.08**
	(0.02)	(0.03)
$(t-4)$	0.20***	-0.31***
	(0.02)	(0.03)
$(t-5)$	0.09***	-0.07*
	(0.02)	(0.03)
$(t-6)$	0.09***	-0.06*
	(0.02)	(0.03)
$(t-7)$	0.02	-0.13***
	(0.02)	(0.03)
N. of obs	1175	1175

Notes: VAR estimation.

Table 4: Ad hoc Regressions of Benefits and Taxes

	Benefits	Taxes
	Coef./Std. err.	Coef./Std. err.
urates	0.03***	0.01
	(0.01)	(0.01)
log(GSP/Pop)	0.26**	0.16
	(0.08)	(0.09)
Δ log(GSP/Pop)	-2.57***	-0.19
	(0.27)	(0.22)
log(trust fund bal at t-1)	0.47***	-0.80***
	(0.10)	(0.12)
Δ (log Trust fund bal)	-0.28	-0.76*
	(0.19)	(0.35)
Recession dummy	0.02*	0.04**
	(0.01)	(0.02)
lagged Benefits	0.68***	
	(0.03)	
lagged Taxes		0.80***
		(0.02)
R-squared	0.95	0.93
N. of obs	1536	1536

Notes: *, ** and *** refer to the 10%, 5% and 1% significance level respectively.



Notes: Figure 1 displays the estimated impulse responses following a one stanadard deviation shock to benefits (upper panels) or taxes (lower panles).

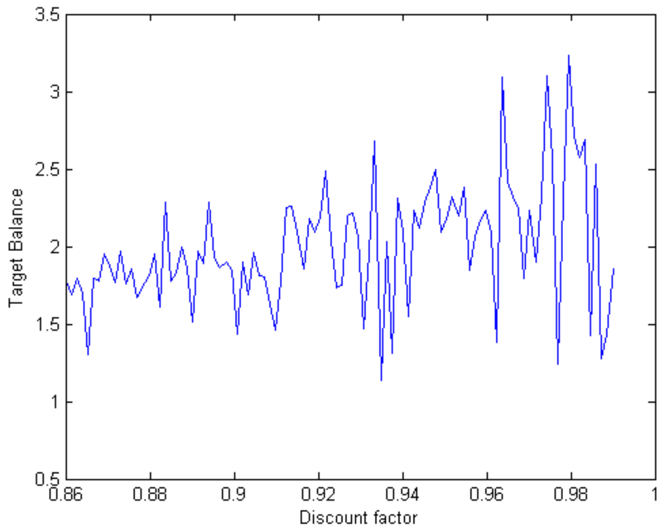


Figure 2: Simulated Target Balance

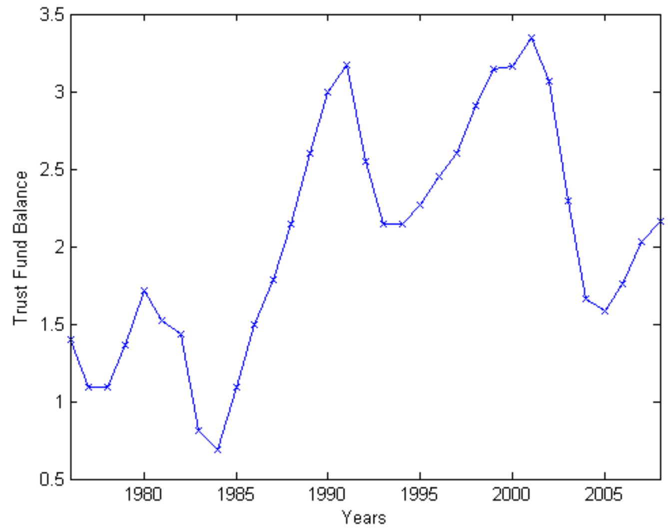


Figure 3: Average Trust Fund Balance

Notes: Figure 2 displays the simulated amount of cash at hand relative to income for a buffer stock model with an agent having income growth of 4 percent, interest rate of 3 percent, risk aversion 2, and standard deviation of transitory and permanent shocks of 0.5 and 0.1, respectively. Figure 3 displays the year-by-year average over the U.S. states of (trust fund balance plus interest income plus tax) relative to income plus tax.