Substitution and Supplementation Between Co-Functional Policy Instruments: Evidence from State Budget Stabilization Practices

Governments often use multiple policy instruments for pursuing policy goals with mutually reinforcing effects. These effects include supplementation and substitution. This article examines both effects by studying two instruments of state budget stabilization policy: general fund balances and budget stabilization funds. States normally maintain budget surpluses in the general fund. In recent decades, many also created separate budget stabilization funds to guard against economic downturns. Empirical results show that substitution occurs between these instruments. In other words, the influence of the first instrument is partially offset by the second. The second instrument also produces some independent impacts—called supplementation—that increase the overall influence of both instruments. Such self-reinforcement decreases over time, suggesting that multiple policy instruments are most effective in the initial stage of application.

In the course of pursuing a policy goal, government entities often employ more than one policy instrument. The reasons for doing so are multifarious. Some instruments may better fit different regions of the jurisdiction, different groups of the society, or different sectors of the (national or state) economy. Another scenario, also often seen, fits our intuitive understanding of the policy implementation process: after one instrument has been introduced for some time, it becomes subject to resistance born of the implementation process and thus gradually loses its “teeth.” While this instrument remains in use, but before it becomes completely blunt, a second instrument is often designed and put into use with the purpose of reinforcing, and perhaps even reviving, the first instrument. In such a case, these two instruments are called “co-functional instruments,” with the second instrument designed and employed for supplementation. In due course, a substitution effect may emerge. That is, when the first and second instruments are deployed together, the total effect may not be the sum of the separate effects of the two instruments; some “discount” may appear in which the new instrument subsumes part of the role of the original instrument and displaces part of its effect.

This supplementation-substitution phenomenon occurs frequently in policy processes; but despite the large literature on the technical details of policy implementation (Bardach 1977; Pressman and Wildavsky 1973) and on the concepts of failure, learning, and redirection in implementation (Bennett and Howlett 1992; May 1992), the phenomenon of supplementation-substitution has not been adequately documented and explained. This article attempts to fill this niche. It examines such effects in an emerging and increasingly important policy area in state governments over the past quarter century: does the adoption and use of a budget stabilization fund substitute or supplement the role of the general fund balance in mitigating revenue shortfalls during an economic downturn?

This study makes two important contributions to the literature. First, we provide evidence showing that budget stabilization funds are a reliable policy instrument for states that want to increase fiscal reserves in preparation for economic downturns. The substitution effect, in which states take savings from their general fund and place them into their budget stabilization fund, is marginal; yet the supplementation effect, in which states add new savings to their budget stabilization fund, is substantial. The implication is that state governments can implement budget
stabilization funds (BSFs) to at least partially counteract the effects of an economic recession. This contribution is particularly timely in view of the global economic recession currently under way and the severe financial stress that some states are experiencing. Second, we show that when states enact supplemental policies to fine tune their BSF, these supplemental policies increase the overall effectiveness of the policy mix, but their impact is not additive. Rather, the supplemental policies partly displace or subsume the impact of the original policies. This contribution advances scholarly understanding of how co-functional policy instruments work—which is of considerable importance to researchers who are currently trying to unpack and sort out the impact of multiple policy instruments bundled together in “policy mixes.”

The article is organized as follows. The next section briefly traces the development of the economic stabilization function of government in general, then the countercyclical fiscal policy and policy instruments at the state level. The following section discusses the possibility of substitution and supplementation of the two policy instruments examined in this study, citing previous literature on this topic. The next section begins with a brief statistical analysis of the trends of state savings over the sample period, then elaborates on our empirical methodology and model specifications. We then present and discuss the empirical results, as well as results from sensitivity tests run on stationary dependent and other key variables. The final section concludes by summarizing the implications of this study for state budget stabilization practices and the broader topic of the interaction effects between co-functional policy instruments.

State Policy Instruments for Budget Stabilization

In the public finance theory advocated by John Maynard Keynes (1936) and Richard Musgrave (1959), economic stabilization is one important function of government. This theory was prominent from the mid-1930s through the 1960s. Though controversy over its use and effects has never been settled, central governments all over the world now seem to believe that the stabilization function is necessary and politically convenient to pursue, especially when signs of recession emerge. The policy for the stabilization function is called “countercyclical policy,” which essentially means that government uses monetary and fiscal tools to stimulate economic growth during recessions by countering the contraction phase of the business cycle.

Because of its obvious benefits that spill across jurisdictions, countercyclical fiscal policy is usually the exclusive domain of central governments. In the United States, state and local governments do not follow this policy orientation of the federal government. Theoretical analysis demonstrates that states and localities should not (Oates 1972). For example, the state and local sector experienced deficits in 1929 but had surpluses in 1934 in the depth of the Great Depression (Brown 1956), which was a “procyclical” and even “perverse” policy outcome (Gramlich 1987; Hansen and Perloff 1944). The bitter experience from the Great Depression, however, was a hard lesson for state and local policy makers: cutting services when citizens acutely need them hurts politicians in elections, frustrates civil servants professionally, and distresses the general public psychologically. That experience was translated into a policy: though states are more limited than the federal government in stabilizing the overall economy, they can at least try to stabilize their budgets to provide smooth, predictable service levels. Since the mid-1930s, Rafuse (1965) observes, it has been a long-standing practice of state governments to maintain sizable general fund balances—surpluses that are used not merely as working capital for managerial convenience, but more importantly for budget stabilization. The surpluses are fiscal reserves for revenue shortfalls and emergencies. As a rule, the general fund balance accumulates in boom years and draws down in lean years. Thus, such balances began to serve as countercyclical savings against revenue shortfalls from recessions (Fisher 1984; Refuse 1965) and made countercyclical fiscal policy accessible to subnational policy makers. Practitioners and the capital market even stipulated some best-practice “standards” regarding the size of the general fund balance (Gold 1984).

However, the maintenance of accumulated general fund balances as a policy instrument relied much more heavily on the prosperity of the economy (revenue side) than on budgetary policy (expenditure side) (Firestone 1960). That is, to more fully adopt a countercyclical budget stabilization policy at the state level, a surplus in the general fund was not an adequate instrument, for two reasons. The first was a political hurdle—spending pressure from politicians who seek reelection and taxpayers who seek utmost immediate benefits. Such pressure is particularly strong in boom years: when revenues exceed current needs, taxpayers demand either more programs (higher levels of services) or tax reductions, or both. Politicians tend to satisfy voters’ wants. The second hurdle was institutional—all states are subject to one or more forms of statutory or constitutional balanced budget requirements. These binding requirements must be implemented without regard for the ups and downs of the economy.

Balanced budget requirements straddle the business cycle: its foot on the recession side kicks away deficits, while the other foot, on the boom side, bounces off big surpluses. Such mechanisms of these requirements are insensitive not only to deficits but also to big surpluses. The antideficit leg of such requirements has been widely known; but their antisurplus leg has evaded most academic attention. It is this second leg of the requirements, in conjunction with political spending pressure under electoral politics, that has made it almost impossible for states to accumulate as much general fund balance in boom years as they need to offset deficits in lean years.

The inadequacy of year-end balances as a policy instrument was recognized in the 1930s; an institutional innovation was made in 1946 when New York State designed and adopted the first budget stabilization fund to overcome the two aforementioned hurdles to implementing a countercyclical budget stabilization policy. Popularly called “rainy day funds,” the budget stabilization fund as a second, reinforcing instrument of countercyclical fiscal policy is often established with enabling legislation that fends off spending pressure during economic expansion. The fund stores extra revenues from booms and protects the savings for exclusive use during economic downturns. The money cannot be used for other purposes (Hou 2003). Budget stabilization funds also circumvent the antisurplus articles of balanced budget requirements by placing the savings outside the jurisdiction of balanced budget requirements. This working mechanism successfully overcomes the political and institutional hurdles states face in trying to implement a countercyclical fiscal policy. Meanwhile, the general fund balance remains intact as a conventional instrument of state budget stabilization policy.

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In the three decades after New York created the nation’s first budget stabilization fund, few states followed suit (Hou 2004). In those 30 years, the overall economy was strong, with robust growth rates; every state was in a construction and expansion mode, with little lasting concern for downturns (Oates 1972). The tide changed in the mid-1970s: two consecutive oil shocks and stagflation altered the states’ mind-set. In 1978, Proposition 13 in California triggered a nationwide wave of tax revolts that cut deep into state coffers. Then, the double-dip recession of the early 1980s led to widespread adoption of the budget stabilization fund among the states as an additional policy instrument to stabilize their budgets. Prodded by multiple factors, states began to take the budget stabilization policy more seriously than ever before.

**Interactions between Co-Functional Policy Instruments**

**The State of Knowledge on Policy Mixes**

Research on policy instruments is founded on the premise that governments have discretion in how they solve society’s problems. Indeed, the range of options is considerable, as Salamon (2002) and others have shown. Of particular importance is the question of how governments should choose between competing policy instruments. Two major streams of thought on how to answer this question have emerged: economic and political approaches. These approaches have evolved independently but along parallel lines (Howlett 2004, 2005).

The first generation of research was characterized by long-running normative debates over the merits of government versus business as the preferred provider of goods and services in society. Empirical research largely consisted of simplistic portrayals of single policy instruments exerting (or failing to exert) direct impacts on well-defined policy problems. The resulting advice for policy makers was often framed in rather blunt and dichotomous terms, which Howlett (2004) describes as “good versus evil,” “market versus state,” or “carrot versus stick” (e.g., see Grabosky 1994; Howlett 2004; Woodside 1986). The second generation of research has tended to see the world as a much more complex place. These researchers have recognized that, in reality, policy makers often use multiple tools and adopt policy–instrument mixes to solve society’s problems, which can be quite complex and multidimensional in nature. Some recent portrayals of the policy process have documented how policy makers layer policies onto problems (Hacker 2004; Kay 2007; Orren and Skowronek 2004; Thelen 2004) and resort to multiple policy instruments aimed at treating various aspects or dimensions of the problem (see, e.g., Gunningham, Grabosky, and Sinclair 1998; Gunningham and Sinclair 1999). Accordingly, these researchers have sought to assess the influence of more broadly conceived “governance strategies” on policy problems. These strategies are more sensitive to policy context, and they consist of strategic choices by policy makers on administrative structures, implementation processes, and the nature and composition of the policy mix.2

Of particular interest to us, second-generation researchers have sought to unpack and understand the dynamics of these policy mixes, which probably account for the lion’s share of public policy enacted in the real world. Yet so far, most of the research output has been somewhat strategic in nature and has not yet pried into specific policy settings and policy mixes at the operational level (Howlett 1991). The need for nuance and precision in the analysis of policy instruments is of foremost importance for advancing the state of knowledge (Howlett 2004, 14). This, of course, represents the natural progression of research, as early researchers establish the broad parameters of a research domain and later researchers fill in the details. Some interesting questions that need to be answered include the following: Is a policy instrument’s impact constrained when it is implemented in a dense policy mix with many other instruments? Does it matter whether the instruments contained in a policy mix are complementary or contradictory? Do these instruments interact with each other and produce differential impacts on the policy problem? If so, what are their respective impacts? Here we focus on some of these questions.

**Supplementation and Substitution between Instruments**

The adoption of countercyclical budget stabilization policies by the states and the reinforcing way in which they employ the two policy instruments provides a golden opportunity to observe the policy implementation process and to test the interaction effects between these two co-functional policy instruments. Because the budget stabilization fund is designed to protect savings, its adoption reinforces the countercyclical feature of the policy by increasing the amount of savings. Thus, a supplementation effect is expected. However, the trigger for the design and adoption of the second instrument (the stabilization fund) was the inadequacy of the first instrument: the general fund balance was vulnerable to spending pressure and limitations from balanced budget requirements. In this sense, introducing the second instrument was a state’s choice—the more vulnerable a state’s general fund balance, the stronger the incentive for the state to adopt the stabilization fund.

Therefore, the two instruments are endogenous: states that have vulnerable general fund balances may be more inclined to adopt the stabilization fund; furthermore, these states may find it worthwhile to shift at least part of their year-end balances into the stabilization fund, which produces a substitution effect. Increases in the stabilization fund are accompanied by decreases in the general fund balance. In other words, the effect of the stabilization fund on total savings may be inflated because it includes part of the effect from the general fund balance that has been moved into the legally protected savings haven. This is the interaction between the two instruments, where we expect to observe both the supplementation and substitution effects.

Our research question is, does adopting the budget stabilization fund as a second saving device increase state net savings dollar for dollar? Or does the stabilization fund add some new net savings, but at the same time substitute for some of the original general fund balances as a mechanism to reduce spending pressure and circumvent the balanced budget requirements? Put another way, do states shift some original general fund balances into the stabilization fund to ward off spending pressure and to avoid balanced budget requirements? To provide an answer, we examine state saving levels before and after adoption of the stabilization fund. A basic assumption is that general fund balances and budget stabilization funds are the two major instruments for states to reserve fiscal resources from boom years for use in lean years.

The literature in this specific policy area is not large. Studies of individual retirement savings have examined the issue of substitution...
between alternative saving devices. For example, Poterba, Venti, and Wise (1995) examine the interaction between 401(k) and other personal saving devices, and Englehardt (2002) looks into the relation between spending distributions and pension accumulation.

On government saving practices, as far as we can determine, there are only two previous studies with very different findings. Knight and Levinson (1999) analyze data from 47 states in the 1980s and 1990s and find that states with stabilization funds have higher total savings than states without the fund; states with such funds also have higher savings after adoption than before adoption, they conclude. These are expected results confirming the supplementation effect of the second policy instrument. They conclude that deposits into the budget stabilization fund increased total savings dollar for dollar, meaning that there was no substitution between the two instruments. In fact, the authors report coefficients of 1.14 from the fixed-effects model and 1.37 from the ordinary least squares model. That is, the second instrument not only does not trigger any substitution from the first instrument, but also multiplies the original effect of the first instrument.

In the second study on this topic, Wagner (2003) uses survey data for 42 states from 1974 to 1997. With separate tests on two subsets of these states that have stationary (18 states) and nonstationary (10 states) total savings and stabilization funds, he obtains coefficients of 0.44 for stationary states and 0.49 for nonstationary states. The supplementation effect is small, while the substitution effect is very large, according to his study. The budget stabilization fund is verbatim substitutable with general fund balances.

Vastly different findings from these two studies beg further exploration. This is an important issue from the perspective of policy design. If adopting a new saving device increases savings more than the amount deposited into the new device, as Knight and Levinson (1999) found, we are doubly blessed and policy design becomes much easier. But we intuitively know that this does not comport with reality. If there is substitution, as Wagner (2003) found, we need to know the extent. Substitution of the original instrument by the second one is understandable and acceptable to a certain degree. However, if substitution is substantial, policy makers may need to reevaluate the problem and explore alternative policy instruments.

This article expands on previous research and contributes to the literature in several ways. First, because widespread adoption of budget stabilization funds occurred after the 1980–82 recessions and state general fund balances underwent drastic changes in the 1980s as a result of the tax and expenditure limitation movement spurred by Proposition 13, the sample period of this study is fiscal year 1978 through fiscal year 2003. Thus, the article covers the three most recent business cycles that are relevant to the states. Second, unlike the previous two studies, this article excludes only one state (Alaska), so the results are more representative and generalizable. Third, to provide more evidence on possible differences across adoption years, this study also tests differential effects from three adoption periods and effects of budget stabilization funds in two full business cycles. Finally, to render more convincing results, this study controls for institutional causes of substitution, design features of the stabilization fund, budgetary institutions, state politics, socioeconomic factors, and the time trend.

Researchers are confronted with many problems when trying to sort out and isolate the impact of a specific policy instrument bundled in a policy mix. As Howlett, Kim, and Weaver explain, “Empirically assessing the nature of instrument mixes is quite a complex affair, involving considerable methodological difficulties and conceptual ambiguities related to the definition and measurement of instruments and their interrelationships and the nature of the data that must be collected in order to assess the components of an instrument mix” (2006, 130; see also Braathen 2005; Briassouls 2005). Here we try to overcome these problems and document the impact of two co-functional policy instruments employed by state governments for budget stabilization. The results may not be fully generalizable to other policy settings; this will have to be determined by future research. However, we believe this study represents a major advance in thinking and empirical research on policy mixes.

Data, Methodology, and Model Specification
State Savings: A Statistical Analysis
Before going further, some summary statistics are provided on state savings, which refer to the sum of the general fund balance (GFB) and budget stabilization fund (BSF). These are two main instruments of budget stabilization policy. State average per capita savings from 1978 to 2003 (in year-2000 dollars) present a wide range. Among high-saving states, Alaska is an extreme outlier, with its total savings about 20 times the 50-state average of $150 and about eight times of the next highest state, Wyoming. Another three states, Delaware, Hawaii, and North Dakota, have savings above $200 per person, and another nine states between $100 and $200. Among states with low savings, Arkansas and Vermont have less than $10 per person, and seven other states have savings below $50.

The sample period spans three business cycles: the partial pre-1982 cycle and two full cycles of 1983–92 and 1993–2001. The 49-state (excluding Alaska) average per capita savings before the 1980 recession reached a peak in 1979 at $128; it went down to $40 after the early 1980s recessions, rebounded to $109 in 1989, and was drawn down to $44 at the end of 1991. After the long expansion of the 1990s, savings peaked in 2000 at $163 before the most recent downturn. The average shows an over-time increase of 27.5 percent from the first to the third cycle ($163 over $128), indicating substantial increase of net savings, as shown in figure 1.

Decomposing total savings into the two saving instruments shows the BSF was below $1 in 1978 and was only about $5 in 1983, inadequate to be a major factor in combating the recessions of the early 1980s. Then the BSF increased to more than $27 by 1990 and it played a role in mitigating the 1990–91 recession—states drew down their BSF balances by 39 percent in 1990–92. With more states adopting this instrument, the average BSF rose to more than $71 by the end of fiscal year 2001, and the BSF became an important device in stabilizing state budgets during the most recent recession. As a percentage of total savings, the BSF rose from only 1 percent in 1979 to 25 percent by 1989, and further to 43 percent in 2000. With the increase of BSF balances, however, the GFB level went down, discounting some of the increases in total savings. With the pre-1980 peak at $127, the GFB fell to $82 before the start of fiscal year 1990, the decrease being more than the absolute increases in the BSF. The GFB returned to $93 in 2000, at only 73 percent of the 1979 peak level. This decrease, however, was less...
higher. As for difference nonstationarity, because the total BSF balance is capped in most states at a certain percentage point (2, 5, or 7) of their general fund revenue or expenditure and the BSF balance fluctuates a lot from year to year (even in boom years), difference nonstationarity does not seem to be a major concern.

As is common with most panel data sets, serial correlation of the first or higher order in the disturbance may be a potential problem. This study applies the Durbin-Watson test, Durbin’s alternative test, and the Breusch-Godfrey test; the authors find first-order but not higher-order serial correlation. For treatment, we use the Prais-Winsten model with state- and year-fixed effects to correct for serial correlation. As shown in the empirical results, the problem is corrected to a satisfactory level.

The GFB and BSF data are taken from the Fiscal Survey of the States series (FSS) published by the National Association of State Budget Officers (NASBO). The FSS series reports the BSF only since 1984. For 1978 to 1983, this study uses state audited financial reports as the data source. Some previous research notices two problems with the FSS data: one is nonreporting of general fund deficits, and the other is double-counting of the BSF (Hou 2005). There is nothing we can do about the first problem except use a different data source, which is not readily available. To solve the second problem, we checked each data entry by state and year and cleaned up all double-counting of the BSF in the series that we identified as problematic; thus, our data are reliable to the utmost extent we can control.

It has been a convention in state studies to exclude both Alaska and Hawaii as offshore states. This study excludes only Alaska because it is an outlier in terms of its extremely large BSF balance and its huge general fund “loans” from the BSF. In fact, the source of its BSF is unique, and the operation of its general fund has been different from

**Empirical Methodology**

As discussed in the previous section, although the budget stabilization fund was created in 1946 (New York), its widespread adoption occurred after the early 1980s double-dip recessions. (For details of state adoption years, see Hou 2004.) It is reasonable to assume that, among other reasons, the BSF was adopted by state governments to protect the GFB from spending pressures. The extent of BSF balances increasing state total savings depends on the extent of the BSF substituting the GFB. That is, the adoption of the BSF as a second saving instrument may cause the GFB level to fall, remain flat, or rise. These are the three possible scenarios. (An accounting framework for these three scenarios is available upon request from the authors.)

Advances in econometrics have identified nonstationarity as a common feature in all financial variables (Granger and Watson 1984). Nonstationarity means that the data points tend to rise over the sample period with no inclination to return to the mean value, thus causing distortion to the results of estimation and to the error term, making them unreliable. Nonstationarity comes in two types: trend non-stationarity and difference nonstationarity. This study takes several steps to handle these problems. First, all monetary figures are transformed into year-2000 per capita dollars. To treat potential trend nonstationarity in state savings, a time trend variable is created with 1978 as the start (1) and each following year as one number.
other states since the creation of the BSF. Thus, the exclusion of Alaska is reasonable and necessary. We choose to retain Hawaii because we believe this state presents no extremism in its saving behavior. Its distance from the continent or location offshore does not make the case for exclusion from the whole. The data include all the 48 other states because they are not outliers, and wider inclusion makes the sample more representative for generalizability of the results.

Model Specifications

The empirical model is specified as the following form:

\[
S_{it} = \alpha + \delta_i \text{BSF}_i + \delta_n \text{X}_n + \beta_j \text{Z}_j + \lambda_t + \gamma_i + \mu_{it},
\]

where \( \lambda \) = state-effects, \( \gamma \) = year-effects, \( i = 1–49 \), and \( t = 1–26 \).

The dependent variable is per capita total savings, \( S_{it} \), which is the sum of per capita BSF and GFB. This construct will generate coefficients that will reveal the effects of BSF adoption on total savings. The key variable in the model is BSF real per capita BSF balance level. Because total savings in the sample period show a trend of net increase (except during recession years when it is drawn down), the expected sign for coefficients of \( \delta \) is positive. A coefficient of 1 indicates a dollar-for-dollar increase of total savings by the BSF—a supplementation effect with no substitution. A coefficient smaller than 1 indicates substitution of the GFB by the BSF; the difference between 1 and the coefficient \( (1 - \delta) \) is the extent of substitution. A coefficient of larger than 1 would point to multiplication of the GFB by the BSF, that is, one more dollar of BSF not only increases total savings by one dollar but also raises the GFB by the difference between the coefficient and 1, which is the scenario in which a state increases not only its BSF but also the GFB at the same time; the causal relation, however, is not clear.

Because BSF balances trend up in the sample period, as shown in figure 1, and because one possible cause for the striking difference between the findings of the two previous studies lies in their different sample periods, this study incorporates eight more key variables with the BSF to capture the potential “period” effects in three separate specifications: three for the different adoption periods of the BSF, three indicators for the three groups that were adopted in different periods, and two for effects of the BSF during the two full business cycles. To create the first three, we divide the 46 states that have BSF into three adoption-period groups: 10 states that adopted the BSF prior to 1982 (inclusive) are in the first group (Alaska excluded). Twenty-seven states that adopted the BSF between 1983 and 1992 (inclusive) are in the second group. Nine states that adopted the BSF after 1993 (inclusive) are in the third group. An indicator of 1 is created for these states with a BSF from the year of BSF adoption to the end of their period group (1982, 1992, and 2001, respectively); these indicators then are multiplied by the per capita BSF balance to create three interaction terms to use in regression. The three interaction terms will capture the effects of the BSF on total savings in years of the first business cycle immediately after their creation. More specifically, the “BSF adoption 1978–82” variable captures the effects of those BSF created before 1982 in the half cycle from 1978 to 1982; “BSF adoption 1983–92” catches the impact of those created between 1983 and 1992 in the 1983–92 cycle; “BSF adoption 1993–01” identifies effects of those created between 1993 and 2001 in the 1993–2001 cycle, respectively. Sources for the BSF adoption years are NASBO’s Fiscal Survey of the States series and Hou (2003).

Once created, the BSF will continue to function in all subsequent years. So far, none of the states that have adopted a BSF has repealed this fund. To capture the cumulative effects of the funds in each BSF adoption group throughout the sample period since their adoption, three more binary variables are created: one for each of the three groups. The “group” binaries differ from the “adoption” binaries in that the group binaries are designed to capture the distinct effects of each group on total savings throughout the sample years, whereas the adoption binaries capture the effects only in the few years immediately after adoption. These group indicators are also interacted with real per capita BSF balance; these group–BSF interaction terms will test whether funds adopted in different periods show lasting differences in their effects on total savings.

Further, to capture the mean cumulative effects of all BSF funds during the two complete business cycles in the sample period, this study created two extra indicators. The first full cycle went from the trough in the fourth quarter of 1982 (fiscal year 1983) to the peak in the third quarter of 1990. For this, we have all BSFs that were set up before and during this period. Those created before are coded as 1 for all years in this cycle; those created during the cycle are coded 1 only after their creation. The second full cycle went from the trough in the first quarter of 1991 (fiscal year 1991) to the peak in March 2001 (fiscal year 2001). Coding was done in the same manner as the first full cycle. Interacting these two indicators with BSF level will reveal the effects of BSF balance during the two full business cycles.

The \( B_t \) matrix includes the major design features of each state’s budget stabilization fund as specified in their enabling legislation. Wagner’s (2003) study includes three deposit rules and three withdrawal rules; Knight and Levinson’s (1999) study includes two deposit rules, three rules on the maximum balance level, and two withdrawal rules. This study controls for four deposit rules, three rules on the maximum balance level, and four withdrawal rules. The deposit rules are, in order of increasing stringency, deposit from general fund surplus whenever surplus is available, deposit by legislative appropriation, deposit by a preset formula, and deposit as a requirement. The withdrawal rules are, also in order of increasing stringency, by executive discretion, by a preset formula, by legislative appropriation, and for revenue shortfall only. The three caps on the balance level are 2 percent, 4 percent to 7 percent, and more than 7 percent of the general fund expenditure. The data source for the design features is Hou’s (2004) comprehensive study of state BSF legislation. These binary variables are interacted with BSF balance. Estimated coefficients on these features will tell how much each design feature, coupled with presence of BSF balance, will increase or decrease total savings.

The \( \text{X} \) matrix stands for state characteristics. This study controls for socioeconomic factors, budgetary institutions, and state policies. Socioeconomics includes five factors: state population (in millions) captures the effects of state size on savings; state general fund expenditure (per capita, in thousands) captures the effect of government size on the need for savings; personal income (per capita, in thousands) captures the marginal propensity to save; poverty rate catches the effects of state social programs on the need for savings; government size on the need for savings; personal income (per capita, in thousands) captures the marginal propensity to save; poverty rate catches the effects of state social programs on the need for savings.
savings; and, finally, annual average unemployment rate captures the business cycle effect on savings. We expect higher personal income to present higher propensity to save (+), higher poverty rate to pull up the need for more savings (+), and higher unemployment to reduce savings (−). In contrast, bigger states and bigger governments are expected to be prone to high spending (−).

This study controls for four state budgetary institutions that we believe may contribute to the effects of the BSF on savings: tax limits, expenditure limits, biennial budget cycles, and strict balanced budget requirements. Twenty-eight states now have a tax and expenditure limit clause either in their statute or constitution; three-quarters of these were adopted in the late 1970s and early 1980s in the aftermath of the tax revolt movements initiated by Proposition 13 in California. The literature on the consequences of Proposition 13 (and its counterparts in other states) on state finance generally agrees that taxpayers were angered by the high levels of GFB accumulated in the 1970s; they initiated the revolts to restrict state taxing and spending power, which caused drastic decline of state GFB; consequently, state officials (elected as well as appointed) sought ways to manage their shambled finances. Therefore, we have reason to argue that states might have opted to adopt a BSF as a second instrument of the budget stabilization policy to protect savings from citizen pressure (Gold 1984; Knight and Levinson 1999). In general, we expect revenue and expenditure limitations to present a positive sign. The data for these two variables are taken from Mullins and Wallin (2004). The biennial budget is a historical remnant from periods of part-time legislators; it has maintained some of its advantages as well as disadvantages in terms of financial operations. Of the 50 states, 21 still practice biennial cycles. We expect the biennial nature may require higher saving levels than do annual budgets. Though states are all under some legal requirement to balance their budgets, the requirements vary significantly in form and stringency. Among the requirements reported in The Book of the States series, the most stringent, according to Bohn and Inman (1996), is that the state may not carry over deficits into the next fiscal year. The expected sign is negative because the strict rule not only presses down the possibility of annual deficits, it also works against high saving levels.

The controls for state politics include gubernatorial election year, democratic majority in the state legislature (this dummy is set as 0 for Nebraska’s nonpartisan unicameral legislature), and divided government. In most states, the governor plays a key role in making fiscal policy, in the budgeting process in particular, and in budget implementation; however, the political business cycle literature (Nordhaus 1975) has produced evidence that election years almost always see big spending increases. Thus, the expected sign for election year is negative. Choice of the Democratic legislature is based on the assumption that the two major political parties adopt different ideologies, and that Democrats are prone to spend on social welfare. Therefore, the expected sign is negative. In contrast, divided party between the governor and the legislative majority may create tension in passing spending bills and would result in more year-end savings (+). Table 1 offers descriptions of these variables and data sources; table 2 provides their summary statistics.

Empirical Results and Discussion

Empirical results are shown in table 3. The Prais-Winsten model generates satisfactory transformed Durbin-Watson statistics.

Results of the F-test show the models to be reliable, and the explanatory powers of the specifications are reasonable. The coefficients of all key variables are positive, as expected, and statistically significant at the 1 percent level. Column 1 shows the mean effect: on average, if a state had a BSF in place during the sample period and kept a balance in the fund, this state had a total savings level higher by 85 cents for each dollar of BSF than a state without a BSF; a state that adopted a BSF during the sample period raised its total savings by 85 cents in contrast to before adoption of the fund. The net effect of the BSF on total savings is less than one showing that substitution of the GFB by the BSF is a fact. While BSFs do increase total savings substantially, the increase is smaller than a dollar-for-dollar scale.

It is of course only natural that the net effect of the BSF on total savings is less than 1 because the BSF is created to shelter savings from popular spending pressure. By design, policy makers would have shifted some GFB into the BSF for legal protection. On the other hand, the substitution of 15 cents per dollar of BSF (1 - 0.85) is by no means very large.

Results in the next three columns provide evidence on decomposition of the funds that were created in different periods and their performance in different business cycles. When we break the funds into three groups by time order of their adoption and look at their effects during the period of their adoption (column 2), the point estimates tell a story of varying impacts. Those funds created before 1982 raised total savings by 85 cents for each dollar of BSF in the 1978–82 period. Funds created between 1983 and 1992 did better: each dollar of BSF raised savings by almost 98 cents in the 1983–92 period. The funds created between 1993 and 2001 fared the worst: each dollar of BSF raised total savings by only 63 cents.

Another way of looking at the funds adopted in the three different periods is to examine their effects throughout the sample period. In other words, though the 1983–92 group fared the best and the 1993–2001 group the worst in the first few years of their creation, their average policy outcomes over all the sample years may be different from those of the first few years. These results are reported in column 3. The pre-1982 group on average raised state savings by 95 cents for each dollar of BSF in comparison with the other two fund groups and states that did not have a BSF. The 1983–92 group raised savings by 84 cents for each dollar of BSF in contrast to the other two fund groups and states that did not have a BSF; funds in the 1993–2001 group raised savings by 83 cents, all things being equal. These three coefficients reveal an increasing rate of substitution from the earliest adoptions to the latest adoptions. Thus, it is probably reasonable to guess that the earliest funds were created more for increasing savings, while the later funds were created more to shelter savings than to increase them.

Finally, we look at the collective, average policy outcome of all of the funds in the two complete business cycles in the sample period (column 4), one from the end of the 1982 recession to the end of the 1980s boom, the other from fiscal year 1992 to 2001. In the first full cycle, states that had a BSF increased their savings by 85 cents for every dollar of BSF compared to states that did not or did not yet have BSF. In the second full cycle, each dollar of BSF raised the respective state’s savings by 72 cents. The observation of
Results of the design features of BSF legislation are presented in column 5. Of the 11 features examined, three generate statistically significant results. The requirement that a deposit must be made into the BSF if the general fund is in surplus increased savings by almost 70 cents for each dollar of BSF. The provision for a required balance in the BSF increased savings by 56 cents for each dollar of BSF. And the medium cap on BSF balances also raises total savings, but by only 42 cents for each dollar of BSF. Other features are not significantly different from zero.

Among the socioeconomic factors, coefficients of population size and poverty rate are not significantly different from zero. The other three factors do generate reliable results. A state with larger expenditures keeps less savings; for each thousand-dollar increase in per capita general fund expenditures, the state's total savings drop between $45 and $56. Rich states tend to save more: for each thousand-dollar increase in per capita personal income, the state's savings may be higher by $12 to $17. The business cycle casts an obvious impact on savings: for each percentage-point increase in the annual average unemployment rate, a state's savings will drop increasing substitution “first obtained in column 3 is confirmed here. Thus, we have reason to speculate that as time goes on, the saving effect of a BSF can be subject to more substitution. In fact, the time trend variable captures the decreasing trend over time in state total savings, which is in conformity with the results from the “three groups” specification (column 3) and the “two full cycles” specification (column 4).
between $10.5 and $11.5. The budgetary institutions do not show significant results, except the biennial budget in one case. Among the political variables, a gubernatorial election year will cost on average around $6.5 per capita from savings, while divided government may push up the savings between $7.8 and $10.6. The results of these two variables are consistent throughout all five specifications. Results for democratic legislative majority are significant in two specifications—when it is significant, it shows the expected negative sign, with a magnitude of about $13.5.

### Sensitivity Tests

As sensitivity tests, we conducted the augmentedDickey-Fuller test (Fuller 1976) of the dependent variable, per capital total savings, and the key variable, per capita BSF balance. From the tests, we found 15 states that have stationary saving levels. We reran the model with these 15 states, as a contrast to the results presented in column 1 of table 3. The results from the 15 stationary states are very similar to those in the all-state panel: There are no sign flips, and almost all major variables remain statistically significant at high levels. The BSF coefficient is 0.97—that is, the BSF substantially increases total savings, with minimal substitution. From the augmented Dickey-Fuller test, six states have stationary BSF balance levels, five of them coinciding with the 15 states with stationary savings. We also reran the model on these six states and again obtained similar results, with key variables keeping their original signs and high significant levels. The BSF coefficient is 0.75; the substitution rate is a little higher, but the net effect of the BSF on total savings remains substantial.

### Conclusion

This article has explored the interaction between co-functional public policy instruments through an empirical examination of the supplementation and substitution effects of two instruments of countercyclical budget stabilization policy used by state
This article . . . [explores] the interaction between co-functional public policy instruments through an empirical examination of the supplementation and substitution effects of two instruments of countercyclical budget stabilization policy used by state governments.

[. . . ] Two policy instruments employed together for state budget stabilization purposes have interactive effects: when the original policy is supplemented by a second policy, the overall impact increases, but the effect of the original policy is partly subsumed or displaced by the supplemental policy over time.

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Notes
1. Every government keeps a “general fund,” which is the largest among all governmental funds and responsible for receiving the largest amount of revenues and paying most of the outlays. “General fund balance” refers to the amount in this fund that is available at the end of each fiscal year for use in the next fiscal year.
2. For a finer-grained explanation of the two schools of thought and the two generations of research, see Howlett (2004; 2005, 31–33), on whom we have relied heavily.

References


