

STATE BUDGET PERIODICITY AND GENERAL EXPENDITURE VOLATILITY: AN EMPIRICAL ANALYSIS

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ABSTRACT. This article aims to examine empirically the relationship between budget periodicity and expenditure volatility in state governments. Using a large panel dataset for fifty states over the years 1960–2012, after controlling for institutional, economic, and political factors, we find general expenditure of biennial states has been significantly less volatile than that of annual states. The finding suggests that a choice between annual and biennial budget period can emerge as a feasible and effective countercyclical strategy to overcome fiscal difficulties in the short run and promote fiscal stability in the long run.

INTRODUCTION

“Fiscal uncertainty is the enemy of efficient budgeting” (Crain, 2003, p. 96). State finances have been experiencing dramatic changes with growing budget shortfalls and recurring fiscal imbalances since the fiscal crisis took place in 2008, when the macroeconomic environment suddenly became more complex and uncertain. Six years after this crisis, not only has the economic recovery been slow but also uncertain. Facing this difficult situation, state governments are increasingly concerned about their fiscal conditions. Many of them are taking substantial steps to reduce

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deficits and are making great efforts to stabilize government finances by implementing countercyclical devices such as balanced budget requirement (BBR), tax and expenditure limitations (TEL), rainy day funds (RDF), budget stabilization funds (BSF), and pay-as-you-go (PAYGO) financing of capital projects (Burson & Kuipers, 2012; Knight & Levinson, 2000; Wang, Hou, & Duncombe, 2007).

However, the literature has not thoroughly explained the theoretical mechanism of these state-level fiscal institutions. Practically, the effects of these fiscal institutions are either too small to be felt or somewhat questionable when implemented at different stages of the public budgeting process. For this reason, researchers and practitioners alike are eagerly looking for simple, feasible, and effective countercyclical tools to budget more efficiently and enhance long-term fiscal stability. In this context, we propose that the choice between annual and biennial budget periodicity can serve as a viable policy option to smooth expenditure volatility and mitigate the problems caused by excessive year-to-year volatility.

The debate over budget periodicity has been recurring from time to time for nearly seventy years.¹ It appears that whenever the economy is in a downturn, there is a revived interest in exploring budget periodicity as a possible device to curb growing deficits and improve mid- and long-term planning. Previous research has generally focused on the effects of state budget periodicity on the level of state expenditure, which will in turn affect the magnitude of deficit (Caiden, 1982; Crain, 2003; Higgins, 1988; Hou, 2006; Kearns, 1993, 1994; Snell, 2011; Yondorf, 1987). These studies commonly assume the more volatile the state general expenditure is, the less stable the state's budget is. Nevertheless, there has been no consensus to date on which type of budget periodicity works better as a countercyclical device. As Kearns (1993, 1994) claims, neither a common theory is appropriate nor is a single practice static for the impact of state budget periodicity.

This study goes a step further and investigates the two types of budget periodicity by focusing on their impacts on expenditure volatility instead of on static expenditure level. The research question is: "Compared to an annual budget cycle, does a biennial cycle reduce general expenditure volatility and thus stabilize state budget?" The remainder of this paper proceeds as follows.

The opening section begins with a theoretical and historical overview of state budget periodicity, state general expenditure, and its volatility. The next section provides a broad review of the literature on two types of state budget periodicity, with an emphasis on advantages and disadvantages of each. We also summarize prior studies on the relationship between budget periodicity and expenditure in general. The third section establishes a conceptual framework to explain the connection between budget periodicity and general expenditure volatility in state governments. The fourth section describes data and methodology for the empirical analysis. The fifth section presents empirical findings with a brief discussion of the results. The sixth and final section provides conclusion and policy implications.

OVERVIEW OF STATE BUDGET PERIODICITY AND GENERAL EXPENDITURE VOLATILITY

State Budget Periodicity

Budget periodicity refers to a cut-off point for budget recurrence. While a budget cycle in state governments consists of four major overlapping stages—executive preparation, legislative consideration, execution, and audit and evaluation—budget periodicity captures only the length of time whereby the budget document itself is written and therefore draws a sharp dividing line between the current fiscal year and the next fiscal year (Kearns, 1994; Mikesell, 2010). In the United States, such a budget interval is either a one-year (annual periodicity) or a two-year (biennial periodicity) period. Annual budgeting provides policy implementation within 12 months, into which the project period is divided for budgetary and funding purposes.

In contrast, biennial budgeting is typically an elongated version of annual budgeting. It includes biennial enactments of both two 12-month budgets and a 24-month budget at one time (Snell, 2011). At regular intervals, budget periodicity allows state budget makers to set forth their policies with accountability and checks and balances (Kearns, 1993, 1994). State governments have the discretion of deciding their own budget periodicity (annual or biennial). As Table 1 shows, nearly half of the states have changed their budget periodicity in the past forty years, and the situation has been more tumultuous in recent years (Kearns, 1993; Meyers, 1988; Snell, 2011). According to

TABLE 1
Historical Changes of State Budget Period

States		Year of change	
From Biennial to Annual Appropriations			
		From Biennial to Annual	
Alabama		1975	
Arkansas		2010	
Florida		1971	
Georgia		1974	
Idaho		1972	
Illinois		1970	
Iowa		1983	
Kentucky		2001	
Mississippi		1971	
Missouri		1972	
Oklahoma		1968	
Tennessee		1970	
Utah		1969	
Vermont		1978	
From Annual to Biennial Appropriations			
		From Annual to Biennial	
Hawaii		1968	
Nebraska		1987	
From Annual to Biennial to Annual Appropriations			
		From Annual to Biennial	From Biennial to Annual
Arizona		1999	2002
Connecticut		1971	1991
Indiana		1975	1978
Minnesota		1973	1975
Nebraska		1972	1987
North Carolina		1973	1975
From Biennial to Annual to Biennial to Annual Appropriations			
	From Biennial to Annual	From Annual to Biennial	From Biennial to Annual
Iowa	1975	1979	1983

Source: Snell (2011).

Snell's (2011) report, as of April 2011, thirty-one states adopt annual budgets, and the other nineteen states use biennial budgets (Table 2). It is worth noting that Connecticut changed from an annual to a biennial budget period after the 1990-1991 recession, but Arizona and Arkansas changed from a biennial to annual period after the 2001 and 2008 crises, respectively. Other changes in Table 1 seem to be largely unrelated to fiscal crises. These state practices suggest that states change budget periodicity for complex economic, political, and possibly logistic reasons, not simply as a response to fiscal crises.

TABLE 2
State Budget Periodicity (as of April 2011)

Annual Budget	Biennial Budget
Alabama, Arizona, Arkansas, Alaska, California, Colorado, Delaware, Florida, Georgia, Idaho, Illinois, Iowa, Kansas, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Jersey, New Mexico, New York, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Utah, Vermont, West Virginia	Connecticut, Hawaii, Indiana, Kentucky, Maine, Minnesota, Montana, Nebraska, Nevada, New Hampshire, North Carolina, North Dakota, Ohio, Oregon, Texas, Virginia, Washington, Wisconsin, Wyoming

Note: Arizona changed its budget periodicity from annual to biennial budgeting in the 1990s, and enacted the process with a biennial budget in 1999. Later, it shifted to a bifurcated system under which larger agencies receive annual budgets while biennial budgeting continues for smaller agencies. Yet Arizona was recognized as an annual budget state.

Source: Snell (2011).

State General Expenditure and Its Volatility

State general expenditure comprises actual payments of a government and its agencies excluding government-operated enterprises, utilities, and public trust funds (U.S. Census Bureau,

2012). It mainly consists of allocations for elementary and secondary (K-12) education, corrections, public welfare, health, highways, police protection, natural resources, parks and recreation, governmental administration, and interest on general debt (Mikesell, 2010; U.S. Census Bureau, 2011).²

Although state general expenditure is usually divided into a variety of functions as listed above, recently all states have been focusing increasingly on two primary responsibilities—health care and education (Behn & Keating, 2005; Snell, 2011). In this context, state governments tend to act as spenders that have to respond to the demographic and political changes. Consequently, per capita state appropriations have been increasing over time and state general expenditure has become more and more volatile (McGuire & Merriman, 2005; Toikka, Gais, Nikolov, & Billen, 2004).

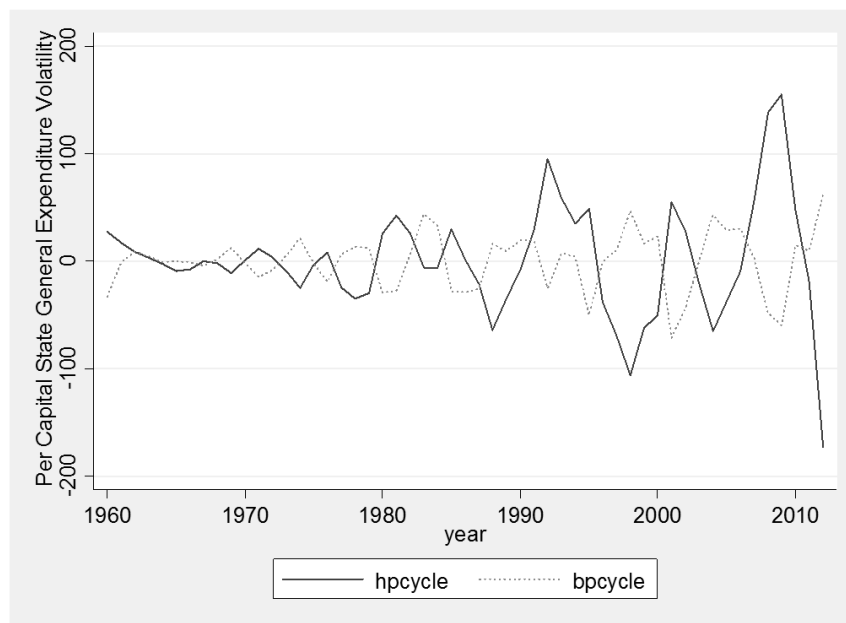
State expenditure data reported by the National Association of State Budget Officers (NASBO, 2000, 2004a, 2008a) show that the share of state spending for Medicaid has grown from less than 11 percent of the spending in 1988 to 19.5 percent in 2000 and then to 20.8 percent in 2008. Specifically, Medicaid surpassed higher education as the second largest state program in 1990 and since 2003 it has grown into a program comparable to state allocations for elementary and secondary education (NASBO, 2004b, 2008b).³

Political pressure for more spending on Medicaid and a rapidly aging population can push the state expenditure up quickly. In addition, unexpected needs for funds can also cause upswings in the state general expenditure. A recent example is the inflow of 50 billion in federal emergency funds related to Hurricane Sandy affected the states of New York, New Jersey, Connecticut, Maryland, Rhode Island and the city of New York (“Obama’s Storm-Aid Bid,” 2012).

Conversely, changing macroeconomic conditions such as severe fiscal crises can at times force states to cut budgets by a large margin. In the last two decades, the U.S. economy has experienced mild fiscal recessions in 1990-91 and 2001-03, as well as a very severe financial crisis in 2007-09. Because of both upward and downward movements caused by various forces, the longitudinal pattern of state expenditure is increasingly volatile. Figure 1 displays the cycle components of average per capita state general expenditure volatility over the period from 1960 to 2012. States have experienced several sharp fluctuations during this period and the expenditure volatility

tends to intensify in recent decades and during fiscal crises (Figure 1). Therefore, it is important to understand what has caused such volatility among states.

FIGURE 1
Average per Capita State General Expenditure Volatility



Note: Data was reported in thousands and then converted into 2012 CPI inflation-adjusted dollars. The trend components of a time series were removed to avoid the impact of the business cycle by using the Hodrick-Prescott (HP) filter and band pass (BP) filter.

Source: The Annual Survey of State Government Finances, U.S. Census Bureau.

LITERATURE REVIEW

A considerable body of studies on annual and biennial budget periodicity has explored the relationship between budget periodicity and expenditure level. Nevertheless, the majority of these studies are

either conducted directly by governmental departments—the U.S. General Accounting Office (GAO) and the Congressional Budget Office (CBO)—or in the context of federal government (Caiden, 1981, 1982; Fisher, 1997; Greenstein & Horney, 2006; Higgins, 1988; Meyers, 1988, 2000; Whalen, 1995). Little scholarly research focuses on state-level budget periodicity. Among the few existing works that primarily compare the advantages and disadvantages of the two types of budget periodicity at state level, none have provided a clear answer or convincing evidence as to which type of budget periodicity can better reduce expenditure volatility and stabilize budgets. This section reviews previous literature on budget periodicity and illustrates the need for further research on this topic.

Annual Budget Periodicity

For an annual budgeting cycle, GAO (1987: 13–14) lists five major advantages. Annual budget periodicity (1) allows development of shorter-range revenue estimates and a revenue or spending plan more accurately reflecting the needs of the state; (2) provides an opportunity to adjust expenditures and revenues more frequently as economic and other factors change; (3) allows more opportunity for involvement of individual legislators as well as the elimination of a 20-month period of relatively inactive appropriations; (4) requires fewer adjustments or supplements to meet state obligations; and (5) avoids the legislature's need to delegate authority to the governor to make changes in the off-year of the biennial. In addition, the CBO (1987: 22) notes annual budgeting is more likely to allow quick responses to the rapidly changing economic cycles, shifts in public opinion, or balanced budget limits.

However, the CBO (1987) and GAO (1987) cite several problems arising from annual budgeting. It (1) hinders the development of a long-range fiscal plan; (2) extends the length of legislative sessions; and (3) requires the executive and legislative branches to use extensive resources to prepare and approve budgets. Moreover, Caiden (1981, 1982) argues that annual budget theories and practices lag behind operational requirements since the time frame is too rigid to allow for prompt governmental action to deal with seasonal economic trends and unexpected events requiring sudden shifts in public spending patterns. Therefore, in a turbulent environment, the predictions of an annual budget cannot keep pace in a timely manner. Caiden reports that an annual budget leaves

more than three-quarters of annual expenditures “uncontrolled” (1982: 519). Likewise, by examining the actual state general expenditure gap and trends ranging from 1979 through 1999, Hou (2006) finds that recent cyclical deficits indicate a failure of the annual perspective of the budgetary system.

Biennial Budget Periodicity

Biennial budgeting is part of a group of innovations (e.g., TEL, BBR, RDF, and line-item veto⁴) currently touted as a partial solution to the spiraling governmental debt (Kearns, 1994: 356). According to the GAO (1984: 3; 1987: 21), biennial budgeting requires departments and programs to consider the long-range implications of their budget requests and program operations. Thus, it can lend itself to a more planned approach to the development of the budget as a policy-making and programming process. Similarly, Meyers (2000) emphasizes that a biennial period may be more realistic since it helps connect decisions of budget allocation to more future-oriented program goals and administrative agency performance based on a longer commitment of policy direction and funding. In addition, it can provide even greater political realism than a many-year period as it coincides with the two-year electoral cycle for the House. As a result, the biennial budget not only helps to reduce political transaction costs but also to promote accuracy, clarity, and publicity (Musso, Graddy, & Grizard, 2006).

However, biennial budgeting is often criticized because spending and revenue forecasts are less reliable (CBO, 1987; GAO, 1987). Under biennial budgeting, larger unpredicted shortfalls in revenues and unpredicted increases in outlays for uncontrollable benefit programs have often led to more state deficits (GAO, 1984; Meyers, 1988). Fisher (1997) points out that biennial budgeting may create costly burdens on members of Congress. The budget workload for Congress in the second year can be substantial in terms of the increased legislative oversight of executive agencies and programs. Arguably, such a disadvantage may accord with the so-called Parkinson’s Law Corollary, defined as the temptation to defer difficult and complicated decisions as long as possible (CBO, 1987; Higgins, 1988; Whalen, 1995). Meyers (2000) insists that biennial budgeting threatens to worsen the problem of a missed deadline, since a two-year budget would require more decisions than a one-year budget does. When the economic situation weakens, the government may

have difficulty making efficient fiscal policies to stabilize its economy unless significant policy changes occur during the second year of a biennial budget cycle (Greenstein & Horney, 2006).

The Relationship between Budget Periodicity and Expenditure in States

Not until recently has the literature given much attention to the problem of single-year or a two-year budget (Kearns, 1993, 1994). The role of budget periodicity, compared to other fiscal devices of states (e.g., BBR, TEL, RDF, or BSF), has been viewed largely as arbitrary and of little importance. In addition, researchers have studied expenditure volatility much less than revenue volatility, and very few existing research papers have examined general expenditure volatility and its determinants (Crain, 2003). This sub-section will review the literature on the relationship between budget periodicity and expenditure in general.

Prior studies show budget periodicity and state expenditure level are related (Caiden, 1982; Crain, 2003; GAO, 1987; Higgins, 1988; Kearns, 1993, 1994; Meyers, 1988; Warnick, 2004; Wiggins & Hamm, 1984; Yondorf, 1987), but there is no consensus on which particular type of budget periodicity causes some states to spend more or less than others. Some researchers find that biennial budget states spend relatively more than annual budget states (Kearns, 1994; Warnick, 2004; Yondorf, 1987).

For instance, by conducting an ordinary least squares (OLS) regression analysis, Warnick (2004) advocates that biennial budgeting leads to more spending due to voter myopia and risk aversion by legislators. He argues that in the political reality of the United States, legislators must provide more visible projects to meet voters' so-called "what have you done for me lately" attitude during a two-year budget than they would for two one-year budgets. In comparison, other studies maintain a common normative argument in favor of the biennial budget, stating that biennial budget periodicity is associated with lower state spending level than an annual budget (Crain, 2003; GAO, 1987; Kearns, 1993; Meyers, 1988; Wiggins & Hamm, 1984). In particular, Caiden (1982) and Hou (2006) argue an annual budget leaves more than three-quarters of expenditures uncontrolled and such budgeting cannot guarantee a balanced budget in the long term; it can cause cyclical deficits.

A CONCEPTUAL FRAMEWORK

Volatility in expenditure does not just refer to any changes in expenditure; it particularly implies sudden swings that may do harm. Typically, state expenditure, in tandem with state revenue, is expected to follow a gentle long-term upward trend; but from time to time it can fluctuate violently in response to economic upturns and downturns or other reasons. Some states follow the long-term linear trend more closely than others (less volatile), while others much less so (more volatile).

The conflicting theories and evidences about the relationship of state budget periodicity and expenditure level, as reviewed in the previous literature, leads to yet another possible explanation: what if the budget periodicity affects the expenditure volatility instead of the level of spending itself? Turning attention to a broader context of budget-making processes, we believe that the overall impact of budget periodicity on general expenditure volatility should be present, through both direct and indirect forces.

Kearns (1993) views budget complexity and revenue variability (or volatility) as two main factors in determining budget periodicity. To begin, complex business cycles make states regularly alter their tax structure; consequently, the growth rate and volatility in both revenue and expenditure can also change (Cornia & Nelson, 2010). It is commonly agreed that state tax revenue, particularly sales tax, is quite vulnerable to cyclical economic situations and the resulting volatility necessarily leads to subsequent changes in state general expenditure (Crain, 2003).⁵

For instance, two major sources of state revenue—sales tax and income tax—tend to fluctuate greatly according to different economic conditions (McNichol, 2013). Additionally, lack of accurate revenue forecasting can amplify the state general expenditure volatility to some degree. A state budget cycle, from a request to auditing and evaluation, typically spans more than one year (or two years if states adopt biennial budgets). Thus, it is important for finance officers to have an accurate prediction of revenue and expenditure for the next two or more years. There is some evidence showing states with biennial budgets are less capable of adjusting upcoming budgets in response to revenue changes (CBO, 1987; GAO, 1984, 1987; Meyers, 1988). According to Snell (2011), the average error of estimate for biennial states is 2.18 percent, while the average error for annual

budgeting states is only 1.04 percent⁵. The main reason for such a big miscalculation is the volatility of the state revenue source. Kearns (1993) argues that accuracy of revenue forecasts works as a motivation for some budget players who prefer annual to biennial budget periods.

Afonso and Furceri (2008) contend that government expenditure volatility is a combination of both output volatility and policy measure. From this point of view, lengthening state budget period from one year to two years—or longer—can push state policymakers to be more prudent both when deciding budget resource allocation and redistribution for the next two years. Fiscal illusion theory holds that a fiscal illusion emerges when revenue is overestimated and the cost of providing a public service is perceived to be lower than it actually is (Peng, 2008; Puviani, 1903). Therefore, state governments have a tendency to spend more money and provide a higher level of public service than they should (Peng, 2008, p. 143). As a result, annual budget is more likely to be uncontrollable and unbalanced because of the mismatch between ever-growing demand for spending and the “illusion” of increased revenue (Caiden, 1982; Higgins, 1988; Hou, 2006; Kearns, 1993).

In contrast, biennial budgets enable state budget actors, including public managers, governors, and legislators now faced with increased revenue uncertainty to pay more attention to long-term policy decisions and allocate resources using a more planned and meticulous approach than they would have to do with annual budgets (GAO, 1984; Meyers, 2000). This accords with Kearns’s (1993) finding that biennial budgets yield more opportunities for oversight and program evaluation despite the cost of accurate revenue forecasts (GAO, 1987; Meyers, 1988).

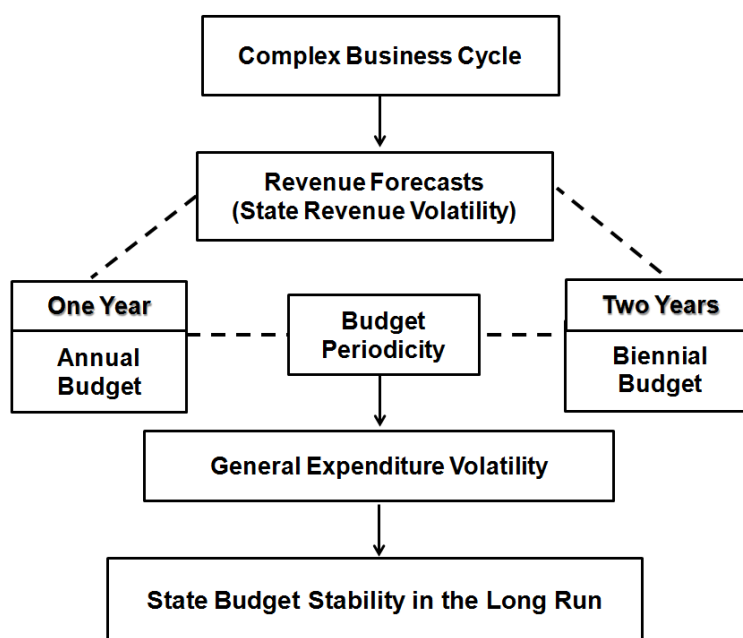
More recently, Hart (2011) highlights the possibility of scrutiny about budget resources for biennial budgets, citing that Oregon’s biennial legislative schedule stimulates interim study committees to undertake major state projects, even in the absence of a legislative session. Similarly, since Connecticut adopted a biennial budget in 1991, it has experienced increasingly longer-range budget forecasting and greater fiscal performance evaluation (Snell, 2011).⁶

Taking account of all these considerations, we believe there is a complex relationship pattern among state revenue forecasts, budget periodicity, and the volatility of state revenue and expenditure. Figure

2 is a conceptual map that presents our proposed relationship between these major factors in the state budgeting cycle.

Similar to Crain (2003: 115), we propose a longer budget period with visible and invisible constraints on spending in response to revenue forecasts. This will lead to smaller expenditure volatility. Thus, we narrow down the research question to the following two sub-questions: “Does biennial budgeting reduce state general expenditure volatility?” and “If so, by how much?” The null hypothesis for this paper is: *Per capita general expenditure of biennial states is more or equally volatile than that of annual states, ceteris paribus*. We expect to reject this null hypothesis in favor of the alternative hypothesis: *Per capita general expenditure of biennial states is less volatile than that of annual states*.

FIGURE 2
Conceptual Map for State Budget Periodicity and
General Expenditure Volatility



DATA AND METHODOLOGY

Data

The data used for this study cover all fifty U.S. state governments, excluding the U.S. territories and the District of Columbia, for 53 consecutive years (from 1960 to 2012). Following the example set forth in previous studies (Crain, 2003; Snell, 2011; The Pew Center on the States & the Nelson A. Rockefeller Institute of Government, 2011), this study utilizes per capita general expenditure volatility of states and budget periodicity as the dependent and the main independent variable, respectively.

The main independent variable, budget periodicity (annual versus biennial) of each state, is coded as a dummy variable (= 1 if biennial period, = 0 if annual period), the same as in Snell's (2011). In reality, biennial budget states have two different processes: some states enact a consolidated two-year budget, whereas others enact two annual budgets at one time (Snell, 2011). Both cases are considered biennial periods in this paper. Thus, if a state adopted an annual budget at the time of the observation, we recorded zero; if a state adopted a biennial budget or was operating under a biennial budget at the time of observation, we recorded one. The mean of budget periodicity is 0.437 (about 43.7% of all observations were biennial) and its standard deviation is 0.496 with 2,649 observations (Table 4).

For the dependent variable, we follow Besley and Case's (2003) study and use per capita general expenditure (denoted as Y_{it}) instead of absolute general expenditure to control for the effect of state size.⁸ The data of state population and general expenditure are from the file compiled by the Annual Survey of State Government Finances, U.S. Census Bureau. We then borrow from standard economic literature and construct three different measures of per capita general expenditure volatility: (1) absolute value of Hodrick-Prescott (HP) filter cyclical components of per capita general expenditure volatility in log, (2) absolute value of band-pass (BP) filter cyclical components of per capita general expenditure volatility in log, and (3) absolute value of OLS regression residuals of per capita general expenditure volatility in log (see Table 3).

The first method uses the HP filter proposed by Hodrick and Prescott (1997). The filter decomposes the series into a cyclical component ($c_{i,t}$) and a trend component ($g_{i,t}$) by minimizing the

following equation with respect to $g_{i,t}$, for $\lambda > 0$, as suggested by the literature the standard value for λ is set to be 100 for annual data in our calculations:

$$(1) \sum_{t=1}^T (y_{i,t} - g_{i,t})^2 + \lambda \sum_{t=2}^{T-1} (g_{i,t+1} - g_{i,t-1})^2$$

The second method uses the band-pass (BP) filter as first suggested by Baxter and King (1999) and later improved by Stock and Watson (1998) and Christiano and Fitzgerald (1999). The low-pass (LP) filter, $\alpha(L)$, which forms the basis for the BP filter, selects a finite number of moving average weights, α_h , to minimize

$$(2) Q = \int_{-\pi}^{\pi} |\delta(\omega)|^2 d\omega,$$

$$\text{where } \alpha(L) = \sum_{h=-K}^K \alpha_h L^h \text{ and } \alpha_k(\omega) = \sum_{h=-K}^K \alpha_h e^{-i\omega h}.$$

We define ω_L and ω_H —the lower and upper frequencies of two LP filters—as 8 and 2 respectively for annual data. By doing so, we remove all fluctuations shorter than two or longer than eight years.

Finally, the per capita government expenditure business-cycle volatility is measured by the absolute deviation of the actual value from the trend (expected) value predicted by the OLS regression. This is a frequently used method to measure revenue or expenditure volatility (e.g., Hou, 2003).

Besides budget periodicity, what other factors determine the variations in per capita general expenditure volatility among the states? Many political, historical, institutional, economic, and other external influences may play a role in the variation in state general expenditure volatility. Based on literature review and our conceptual framework, this paper adopts an empirical model that controls for the factors as listed in Table 3, and these factors can be roughly categorized into three groups: (1) institutional factors including legislative constraints and budgetary devices (e.g., BSF)⁷; (2) economic factors encompassing Gross Domestic Product (GDP), intergovernmental transfers (e.g., federal aid), the revenue diversification index measured by Herfindahl-Hirschman Index (HHI) and per capita general obligation debt (GOBDPC); and (3) political factors including party affiliation of state governor and legislature majority.

In the institutional factor group, we control for per capita budget stabilization fund (BSF), tax and expenditure limits (TEs) and balanced budget requirement (BBRs). With respect to BSF, Navin and Navin (1994) note that such funds can serve as buffers against procyclical budget fluctuations as well as an alternative revenue source to cope with cash flow problems within and between fiscal years. That means, as a countercyclical device, BSF enables states to stabilize their budget from substantial business cycle variability or cope with the “rainy days” (Hou, 2003).

Wagner and Elder (2005) also find that the decrease in spending volatility is empirically related to states with the BSF due to lower spending during high-revenue periods or due to high spending during low-revenue periods. Moreover, Wagner and Sobel (2006) argue that states need the fund as a valuable tool to help the state savings and improve its fiscal health (Knight and Levinson 1999; Wagner 2003, 2004). We collected the data on BSF from the federal survey of states (based on Table A-1, fall fiscal surveys of states each year, National Association of State Budget Officers).

TEs provide certain strictures to restrain the growth of governmental budgets either on the tax side or the spending side, or both. As of April 2010, 23 states operate under spending limits, 4 have tax limits, and 3 have both (NCSL, 2010). Shadbegian (1996) found that TEs have size limitation effects in TEs states with low income growth, but they increase government growth in states with high income growth. In addition, Shadbegian (1998) found that, at a local level, TEs decrease both the level and growth of expenditures and revenues. TEs also decrease the level and growth of property taxes.

Similar to TEs, BBRs are also restrictive institutions that aim to ensure expenditures are within the cash available for that fiscal year. Some states, however, have more explicit and stricter BBRs than others, and according to the National Association of State Budget Officers (NASBO, 2010), BBRs can be categorized into a four-rule framework: “governor must submit balanced budget,” “legislature must pass balanced budget,” “governor must sign balanced budget,” and “may carry over deficit.”

People have different readings and understandings of these BBR provisions (NCSL, 2010; ACIR, 1987), and Hou and Smith (2006) proposed a substantially different framework to model the stringency

of BBR provisions. For the purpose of this study and for simplicity, we adopt the NASBO four-rule summary, and select “legislature must pass balanced budget” as an indicator of BBRs. As of 2008, 41 states operate under this requirement (NASBO, 2008). Both TELs and BBRs data come from multiple years of the NASBO survey.

Since both institutions are restrictive measures in nature, they should restrain government size and deficits, leading to smaller expenditure volatility. Nevertheless, states should adapt to TELs and BBRs quickly, so these two institutions may have little long-term effect on spending variability as long as there is no substantial change in TELs and BBRs provisions. Consequently, the expected signs for TELs and BBRs are unclear.

In the group of economic factors, we chose a range of variables for gauging the volatility of general expenditure in state governments. First, we select per capita Gross Domestic Product (GDP) by state to control for levels of wealth among the states and economic growth over time (Roemer & Gugerty, 1997). Afonso and Furceri (2008) find public spending is a crucial variable that affects the sustainability and volatility of public finances. They suggest that fiscal volatility in both revenue and expenditure measured by one lag value tends to hamper economic growth. They also note that the direction of causality between fiscal volatility and economic growth is not very clear (2008: 22). We anticipate that the level of GDP has a positive influence on state general expenditure volatility, because the larger the state economy is, the more volatile its expenditure tends to be. We collected the data on GDP from the U.S. Bureau of Economic Analysis.

We retrieved the data on per capita intergovernmental transfers from the Annual Survey of State Government Finances, U.S. Census Bureau. States' frequent adjustments of intergovernmental aid have existed in response to a complex federal system (Hedge, 1983; Kearns, 1993, 1994). In particular, the so-called flypaper effect can occur if federal government grants to state governments result in more state spending increases (Gamage, 2010). Therefore, we expect that intergovernmental transfers can affect the state expenditure volatility in a positive direction.

Operating with the notion that states have more flexibility and discretion over taxation if its economy is more diversified (Hendrick, 2002), we use the Herfindahl-Hirschman Index (HHI) in our model to control for state revenue diversification. The private sector has widely

used the HHI to measure market concentration (Jordan & Wagner, 2008). Based on Suyderhoud's (1994) and Hendrick's (2002) studies, we calculate the HHI using six different revenue categories: property taxes, sales taxes, income taxes, license taxes, other taxes, and non-tax sources (e.g., user charges, fees, and miscellaneous general revenue) as a percent of total own-source revenue. Cornia and Nelson (2010) and Jordan and Wagner (2008) argue that the change in the composition of state tax portfolios can minimize the effects of the business cycle and lead to a more stable budget. Therefore, a more diversified revenue system in state budgets should lead to smaller expenditure volatility.

We include general obligation bond per capita (GOBDPC) in our model as a control for debt financing. Unlike revenue bonds, general obligation (GO) bonds are of full faith and credit, implying that the power of taxation is unconditionally pledged (U.S. Census Bureau, 2009), so the funds used to repay the principle and interest directly competes with other general spending.⁸ Gamage (2010) notes that, theoretically, states are expected to eliminate most of their fiscal volatility problems simply by running deficits during downturns and surpluses during upturns. However, many states still have such volatile problems and have typically relied more on long-term debts than short-term ones (Regens & Lauth, 1992). Moreover, the nature of borrowing usually is pro-cyclical, meaning that governments borrow more when they encounter fiscal difficulties and borrow less when the economy is in its upturn. Therefore, greater amount of debt, especially GO debt, not only magnifies the size of expenditure but also contributes to larger expenditure volatility. For this reason, GO debt should have a positive relation with expenditure volatility. We took the data on GO debt from the file compiled by the Annual Survey of State Government Finances, U.S. Census Bureau.

Last, to examine the political conflict in the budgetary decision-making process and its impact on state expenditure volatility, our model includes political factors regarding the composition of state governor and state legislatures—the upper house (Senate) and the lower house (House of Representatives or Assembly)—by political party affiliation. We collected this information from the U.S. Census Bureau, the National Governors Association, and the Council of State Governments' *Book of the States*.

Following the original data coding, we divided budgetary conflict into three different variables—party of governor (GOVPARTY) and majority party in each senate (UPCFLICT) and lower house (LWCFLICT). We treated them as dummy variables (= 1 if the governor or majority of each state legislature is affiliated with the Democratic Party, = 0 otherwise; i.e., Republican or tied). In the context of partisan-ideological competition among the states, political parties have different preferred fiscal goals and thus react differently to changes in revenue forecasts (Alt & Lowry, 1994, 2000). The Democratic Party – assumed to be fiscally more liberal than Republicans as a Left-of-Center political party – favors increasing spending that is associated with bigger government, but only when party representation in both the governor’s house and the legislature is strong (Krause, Lewis, & Douglas, 2013; Rogers & Rogers, 2000). By contrast, Republicans – assumed to be more fiscally conservative than Democrats as a Right-of-Center political party – tend to prefer lowering taxes and vote for the stricter form of the budget process, which they believe will result in a smaller budget (Ferejohn & Krehbiel, 1987; Krause, Lewis, & Douglas, 2013). Based on this viewpoint, we expect all three political variables to have a negative impact on expenditure volatility.

Table 3 summarizes the explanation and expected signs of all variables in our model.

TABLE 3
Definition and Description of Variables

Variables	Abbreviation	Sign	Description
Volatility of Per Capita General Expenditure	<i>LNHPCYAB</i>		Absolute value of HP filter cyclical components of per capita general expenditure volatility (in log)
	<i>LNBPCYAB</i>		Absolute value of BP filter cyclical components of per capita general expenditure volatility (in log)
	<i>LNGEPCRES AB</i>		Absolute value of OLS regression residuals of per capita general expenditure volatility (in log)
Budget Periodicity	<i>PERIOD</i>	–	1 if the state budgeted biennially, 0 if the state budgeted annually

TABLE 3 (Continued)

Variables	Abbreviation	Sign	Description
Institutional Factor	<i>BSFUNDPC</i>	-	Per capita budget stabilization fund in the year of the observation by the state (in thousands)
	<i>TEL</i>	-	1 if there is some form of tax and expenditure limits in place, 0 if none
	<i>BBR</i>	-	1 if legislature must pass balanced budget, 0 if otherwise
Economic Factors	<i>GDPPC</i>	+	Per capita GDP in the year of the observation (in thousands)
	<i>IGREVPC</i>	+	Per capita intergovernmental transfers to the state government (in thousands)
	<i>HHI</i>	-	Herfindahl-Hirschman Index of revenue diversification
	<i>GOBDPC</i>	+	Per capita general obligation debt in the year of the observation by the state (in thousands)
Political Factors	<i>GOVPARTY</i>	-	1 if the governor is affiliated with Democratic Party, 0 otherwise
	<i>UPCFLICT</i>	-	1 if the proportion of state's senate majority made up by members of the Democratic Party, 0 otherwise
	<i>LWCFLICT</i>	-	1 if the proportion of state's lower house majority made up by members of the Democratic Party, 0 otherwise

TABLE 4
Descriptive Statistics of Variables

Variable	Observations (N)	Mean (SD)	Min	Max
LNHPCYAB	2,650	3.369 (1.433)	-3.837	8.027
LNBPCYAB	2,650	3.018 (1.392)	-4.168	7.825
LNGEPCRESAB	2,650	5.665 (0.994)	-0.108	7.885
PERIOD	2,650	0.437 (0.496)	0	1
BSFUNDPC	2,650	0.080 (0.748)	-0.164	21.724
GDPPC	2,500	21.435 (15.394)	1.972	72.895
IGREVPC	2,650	0.659 (0.662)	0.022	4.356

TABLE 4 (Continued)

Variable	Observations (N)	Mean (SD)	Min	Max
HHI	2,643	0.793 (0.072)	0.102	0.937
GOBDPC	2,650	0.223 (0.413)	-0.019	3.391
GOVPARTY	2,650	0.546 (0.498)	0	1
UPCFLICT	2,601	0.590 (0.492)	0	1
LWCFLICT	2,601	0.623 (0.484)	0	1
TEL	2,650	0.298(0.458)	0	1
BBR	2,650	0.671(0.470)	0	1

Note: Standard deviations in parentheses.

Research Method

To test the hypothesis that per capita general expenditure of biennial states are more volatile than that of annual states, this paper conducts a panel data analysis with a large and updated data set consisted of 50 state governments for over 53-year period spanning from 1960 to 2012.⁹ A concise version of the panel model to be estimated with above data can be written as follows:

$$\ln(Y_{it}) = \alpha_i + \beta_1(PERIOD_{it}) + \beta_2(I_{it}) + \beta_3(E_{it}) + \beta_4(P_{it}) + u_{it}$$

where Y_{it} represents per capita general expenditure volatility at time t for state i . $PERIOD_{it}$ is a dummy variable for state budget periodicity, coded as 0 for annual budgets and 1 for biennial budgets. Variables I_{it} , E_{it} , and P_{it} are vectors of control variables indicating institutional, economic, and political factors to affect the dependent variable, respectively. i represents i^{th} state government from 1 to 50; t refers to time period 1, . . ., 53 (from 1960 to 2012); α_i is the state-specific intercept; and u_{it} is the error term in the equation. A Hausman test shows that the random effect model should be rejected in favor of a fixed effect model.¹⁰ We also ran a modified Wald test and Wooldridge test for each model and found that all models suffer from heteroskedasticity, and model (1) and (3) also suffer from first-order autocorrelation(AR1).¹¹ Therefore, a fixed-effect model with AR(1) corrected robust standard errors should be the best estimation method for our data.

RESULTS

Table 5 reports three sets of regression results estimated using three different measures of per capita general expenditure volatility as dependent variable. The three models yield adjusted *R*-squared values ranging from .18 to .37, indicating a moderate fit over the time dimension, as well as the cross-unit dimension of the panel. The *F*-statistics indicate the model fit is sufficient to rule out the possibility that no variable has a significant effect on the per capita general expenditure volatility. First, the negative and significant coefficients of the main independent variable (PERIOD) are remarkably consistent across different models. The estimated coefficients on PERIOD range from -0.355 to -0.252 and all are statistically significant at 5% level. Thus, it strongly rejects the null hypothesis that per capita general expenditure of biennial states is more or equally volatile than that of annual states, in favor of the alternative.

In particular, we can interpret this result as follows: if a state adopts biennial budget periodicity, its per capita general expenditure volatility will approximately be reduced by about 26.5 percent (as measured by HP filter), 35.5 percent (as measured by BF filter), and 25.2 percent (as measured by regression residuals), respectively, all other things being equal.¹² Due to the different methods we used to measure volatility, it is not easy to decide which of these percentages reflects the real impact level of biennial budgeting on per capita general expenditure volatility. Nevertheless, it is clear such impact is not pure chance and its magnitude is significant.

Previous studies (Hou, 2003; Navin & Navin, 1994; Wagner & Elder, 2005; Wagner & Sobel, 2006) advocate that the budget stabilization fund (BSFUNDPC) should be effective in reducing general expenditure volatility. Our model provides some empirical support for this theory, because the BSF bear negative signs in all three models and are statistically significant at 10% for model (1) and at 5% for (3). As per capita BSF increases by 1,000 dollars, general expenditure volatility as measured by regression residuals will decrease by about 3-6 percent, holding other things constant. Because BSF is only significant at 10% for model (1) and very insignificant for model (2), model (3) offers no strong empirical evidence for the effectiveness of budget stabilization. The idea of using a rainy day fund may be correct in theory, but its effect may have been quite small in practice.

TABLE 5
Estimation Results of Three Fixed Effects Panel Data Models

Independent Variables	Dependent Variable (General Expenditure Volatility)		
	(1) HP Filter(Log)	(2) BP Filter(Log)	(3) Residual(Log)
PERIOD	-0.265** (0.035)	-0.355*** (0.001)	-0.252** (0.044)
BSFUNDPC	-0.055* (0.068)	-0.014 (0.701)	-0.029** (0.047)
GDPPC	0.044*** (0.000)	0.034*** (0.000)	0.015*** (0.005)
IGREVPC	-0.013 (0.907)	0.127 (0.179)	0.052* (0.646)
HHI	-0.290 (0.547)	0.107 (0.818)	-0.521* (0.054)
GOBDPC	0.286*** (0.002)	0.182** (0.020)	-0.353*** (0.000)
GOVPARTY	-0.083 (0.154)	0.043 (0.401)	0.049 (0.282)
UPCFLICT	0.078 (0.357)	0.061 (0.418)	0.090 (0.141)
LWCFLICT	0.097 (0.236)	-0.037 (0.614)	0.067 (0.226)
TEL	0.241** (0.017)	0.252*** (0.003)	0.023 (0.828)
BBR	0.072 (0.385)	-0.053 (0.450)	0.074 (0.349)
Constant	2.600*** (0.000)	2.200*** (0.000)	5.596*** (0.000)
<i>N</i>	2,397	2,447	2,397
<i>R</i> ²	0.366	0.296	0.178
<i>F</i>	59.24***	67.97***	6.84***

Note: Robust *P*-values are in parentheses. **p* < 0.10, ***p* < 0.05, ****p* < 0.01.

TELS seem to have some positive effect on expenditure volatility. This is probably because TELS, especially revenue limits, prevent states from raising more revenue during recessions and therefore force them to cut spending more deeply than those states without TELS. The Bell Policy Center (2003) holds a similar view and points out that, while TELS sound reasonable, they actually impair “ability to respond effectively to ... changing circumstance.” Similarly, BBRs show positive effect in model (1) and (3), but are not significant in all three models. It is hard to make conclusions about the effect of TELS and BBRs, but the overall impression is they might have significant impact on spending level but not on volatility.

GDPPC is positively associated with all three measures of the dependent variable and it is statistically significant at 1% level for all three models. In specific, as per capita GDP increases by 1,000 dollars, general expenditure volatility will increase by about 4.4 percent (HP filter), 3.4 percent (BF filter), and 1.5 percent (regression residuals), respectively. This result indicates that the larger the state economy, the more volatile the expenditure.

Other explanatory variables in our model are generally insignificant or bear contradictory signs. Holding other factors constant, intergovernmental revenue (IGREVPC) is not significant for all three models. The coefficients of GO debt (GOBDPC) are all statistically significant at 5% but having conflicting signs. In both the HP and BP models, per capita GO debt appears to increase expenditure volatility by a large margin, but its coefficient turns negative when the volatility is measured by residuals.

This seemingly contradictory result probably arises from the observation that GO debt only accounts for a small portion of the states’ total borrowings and currently states issue more and more revenue debt in place of GO debt. A more accurate control of debt should distinguish the portion of total debt used to increase general expenditure from the portion of debt used for other dedicated purposes, but there is no way to do at this time. Another possible reason is that we assume a linear relationship when calculating residuals in model (3) and have to rely on only 53 years of data. Therefore, this OLS measure may not be as good as HP and BP filters, which utilize a non-linear time-series method. Previous studies (Cornia & Nelson, 2010; Jordan & Wagner, 2008) show HHI is negatively associated with the general expenditure volatility. Our

result in model (3) provides further empirical evidence for this theory. The more diversified a state's economy, the less volatile its general expenditure volatility. The effect, however, seem to be not very strong and not robust to different measures of expenditure volatility.

Political variables—GOVPART, UPCFLICT, and LWCFLICT—generally have a positive relationship with general expenditure volatility, which is consistent with the majority of previous studies reviewed earlier (Ferejohn & Krehbiel, 1987; Rogers & Rogers, 2000). However, they are not significant or consistent across different models. Overall, our models reveal that political factors have small and questionable impact on expenditure volatility. This probably indicates that reducing expenditure volatility is not one of the mayor fiscal targets of either party.

DISCUSSION

The empirical results reported above suggest important implications for scholars and practitioners concerned with the issue of budget periodicity, in particular, and budget stabilization, in general. In this paper, we have built three linear models. After controlling for state-specific institutional, economic, and political characteristics, we proved general expenditure in biennial states is significantly less volatile than that of annual states. For nearly seventy years, scholars have been discussing the pros and cons of the two types of budget periodicity. Now at least one clear conclusion emerges: biennial budgeting is better than annual budgeting at stabilizing state general expenditure.

If used appropriately and coupled with other necessary fiscal policies, a biennial budget can serve as an effective tool to promote longer-term planning and more stability. Consequently, a biennial budget helps reduce non-structural budget deficits. As the nation is heatedly debating possible ways to balance the budget and curb fast-growing deficits (Korte, 2011), our research provides yet another easy-to-implement policy choice among existing fiscal policies such as spending caps, raising taxes, and line-item veto authority. The main finding of this paper shows that by simply switching from annual budget to biennial budget, the government can reduce a significant portion of budget variability not caused by economic cycles. Applying this knowledge to budgetary practices, states can improve budget stability and reduce deficits.

This research contributes to the existing literature (Crain, 2003; GAO, 1984; Hou, 2006; Kearns, 1993, 1994; Meyers, 1988, 2000; Snell, 2011; Warnick, 2004; Wiggins & Hamm, 1984; Yondorf, 1987) by confirming that budget periodicity is not only correlated with expenditure level but also with expenditure volatility. Policymakers and practitioners concerned about the reform of budget periodicity should be aware that biennial budgeting has a stabilizing effect on expenditure volatility. The observation that many frequently cited socio-economic, political, and institutional determinants show no effect on expenditure volatility provides an illustration of the complex nature of state finances. In essence, expenditure volatility may be driven by the same set of forces that have driven the economy to fluctuate. We will probably never be able to fully explain and predict these forces.

Since this is one of the first academic works that attempt to explain expenditure volatility, we offer some caveats. Due to lack of theories, method constraints, measures of variables, and certain data, the explanatory power of this research, as indicated by the *R*-squares, was not very high and some variables were not consistent across different models. Future research should find more and better independent variables to improve our understanding of expenditure volatility and the role that budget periodicity plays in this process. These variables should include better measures of TELs and BBRs, and take account of the power of the speaker and president *pro tempore*, which branch creates the budget or formulate it, and how each state structures the tax system. If we could better understand and model the interactions of all these political and fiscal factors with expenditure volatility, we would be in a better position to provide policy recommendations that could help states overcome short-term fiscal difficulties and promote long-term fiscal stability.

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NOTES

1. Sundelson (1935) initially addresses the periodicity problem as the budgetary principles of “Annularity” or “Annuality.” It refers to a one-year period of budget procedure, which includes estimates, decisions, and accounts (Caiden, 1982).
2. Total state expenditure includes payments from all sources of funds, including not only current revenues but also proceeds from borrowing and prior year fund balances, whereas state general expenditure contains “actual payments” of a government and its agencies (net of correcting transactions and recoveries or refunds) of the present year. By function, state general expenditure typically includes education, public welfare, hospitals, health, highways, police protection, correction, natural resources, parks and recreation, governmental administration, interest on general debt, and others, but excludes utilities, liquor stores, and social insurance trust expenditure.
3. While elementary and secondary education accounted for 22 percent of state spending, Medicaid and higher education accounted for 21 percent and 11 percent, respectively, in 2003. Such variations of state expenditure are attributable to states’ policies to control Medicaid costs implemented from 2002 through 2004 and the new rule regarding Medicaid eligibility passed in 2006. As a result, all 50 states have reduced or frozen provider payments and implemented policies to control prescription drug costs, 34 states have reduced or restricted Medicaid eligibility, 35 states have reduced benefits, and 32 states have increased co-payments.
4. Although the proposition that line-item veto can reduce spending has been inconclusive in public finance literature, proponents have argued that the line-item veto can give the governor much needed power to cut wasteful spending items from the budget (so-called to lower pork-barrel spending in districts of powerful legislators) and to control general fund deficits (Bohn & Inman, 1996; Holtz-Eakin, 1988).
5. Such a relationship does not imply that the states with biennial budget always have a less accurate forecasting record than annual states. However, it is true that those states with biennial

budget periodicity have greater difficulty in forecasting revenues accurately (Snell, 2011).

6. While planning an annual budget generally requires an 18-month revenue forecast, one with a biennial budget takes 30 months (Snell, 2011).
7. Budget periodicity itself is also one institution of state governments but we use it as a main independent variable in this paper. As one of the possible control variables, region can be included, but it will be automatically dropped in a panel-data model since region does not change over time.
8. As a long-term debt of state government, full faith and credit debt includes debt payable initially from specific taxes or nontax sources, but it is a liability payable from any other available resources if the pledged sources are insufficient.
9. The data set is an unbalanced panel data ranging from 2,500 to 2,650 observations in total due to missing values for GDP, political variables, and so on. For example, in Nebraska, there is no state senate and lower house majority data.
10. For all three models, the result of the Hausman test confirms that it is better to use the fixed-effect than the random-effect model for the panel data analysis because it shows significant p -value (Prob > chi2 = 0.0000).
11. For all three models, the Chi-squared and P-values (in parentheses) of modified Wald test are 338.65 (0.00), 258.90(0.00) and 524.81(0.00). The F scores and P-values of Wooldridge test for autocorrelation are 31.51 (0.00), 0.00 (0.99), and 109.24 (0.00).
12. Since the dependent variable in the regression model is a logarithmic functional form (not an independent variable), the result can be interpreted by the estimated coefficient x 100 (percent).

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