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Cheol Liu
City University of Hong Kong, China
John L. Mikesell
Indiana University, Bloomington

The Impact of Public Officials' Corruption on the Size and Allocation of U.S. State Spending

Cheol Liu is assistant professor in the Department of Public Policy at City University of Hong Kong. His research agenda is to diagnose various risks in the fiscal health of governments and to identify implementable proposals for reform. The impact of public corruption on economic, political, and administrative variables is one of his major research interests. He also is interested in the responsiveness of different revenue instruments to fiscal shocks.
E-mail: cheolliu@cityu.edu.hk

John L. Mikesell is Chancellor's Professor of Public and Environmental Affairs at Indiana University. His research focuses on finances of subnational governments, budget systems and processes, and sales and property taxation. His textbook *Fiscal Administration, Analysis and Applications for the Public Sector* is widely used in graduate public administration programs. He holds a bachelor's degree from Wabash College and a doctorate in economics from the University of Illinois at Urbana-Champaign.
E-mail: mikesell@indiana.edu

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This article demonstrates the impact of public officials' corruption on the size and allocation of U.S. state spending. Extending two theories of "excessive" government expansion, the authors argue that public officials' corruption should cause state spending to be artificially elevated. Corruption increased state spending over the period 1997–2008. During that time, the 10 most corrupt states could have reduced their total annual expenditure by an average of $1,308 per capita—5.2 percent of the mean per capita state expenditure—if corruption had been at the average level of the states. Moreover, at the expense of social sectors, corruption is likely to distort states' public resource allocations in favor of higher-potential "bribe-generating" spending and items directly beneficial to public officials, such as capital, construction, highways, borrowing, and total salaries and wages. The authors use an objective, concrete, and consistent measurement of corruption, the number of convictions.

This article explores the impact of public officials' corruption on the size and allocation of state expenditures. A number of studies identify hazardous impacts of corruption on various real sectors. However, the effect of corruption on government spending, public resource allocation, and budgeting in the United States has not been studied. Realization that international development requires good governance has directed the concern of international organizations such as the World Bank and the International Monetary Fund to corruption in developing countries. But corruption of U.S. government officials is also serious. This article presents the first research on the impact of public officials' corruption on U.S. states' spending and budgets. The comprehensive panel data cover the 50 U.S. states from 1997 to 2008.

Mauro (1995) defines corruption as the "misuse of public office for private gain." According to this perspective, public officials' corruption seems to exist everywhere and all the time. Unsuitable policies are made not only because policy makers do not know what the best policy should be but also because decision makers distort economic policies for their private interests (Jain 2001). The argument presented in this article is twofold: First, public officials' corruption is likely to increase state spending. We adopt two "excessive" government growth theories, the bureaucracy model and the fiscal illusion model, to hypothesize the relationship between corruption and state spending waste. Second, public officials' corruption may distort government's public resource allocations. The empirical results show that states with higher levels of corruption tend to spend more on items on which corrupt officials may levy larger bribes at the expense of others.

Our corruption index is based on the number of public officials who were convicted for violations of federal corruption laws (more than 25,000 convictions are included in our panel). The Public Integrity Section of the U.S. Department of Justice has published the conviction numbers on a consistent basis. In contrast to other subjective, perception-oriented indexes of corruption, our corruption variable is concrete, objective, and consistent.

Research on corruption must address concerns of endogeneity and reverse causality. It is relevant to wonder whether corruption alters the size and distribution of government expenditures or whether the magnitude and allocation of government expenditures cause corruption. A number of instrumental variables for corruption have been used to address potential endogeneity bias. However, scholars have not succeeded in finding both relevant and valid instruments for U.S. public officials' corruption that are applicable for a study covering the 50 states over a long period of time. We solve this problem by using the system generalized method of moments (GMM) estimation. Distinct from other instrumental variable regression

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methods using external instruments, this method creates instruments internally by using the unique characteristics of panel data.

The article is composed of five sections. The first section provides a theoretical and empirical background for understanding the consequences of corruption in various areas. Second, we explain the research model, methodology, and data. Third, we present empirical estimates of the impact of corruption on the size and allocation of state spending. Fourth, we interpret the regression results. Our conclusion provides some policy implications.

Literature Review: Economic Consequences of Corruption

Most theoretical and empirical evidence shows that public officials' corruption has a negative impact on national economic variables. First, corruption reduces the amount of capital investment (Brunetti and Weder 1998; Brunetti, Kisunko, and Weder 1998; Elliott 1997; Knack and Keefer 1995; Mauro 1995, 1997). Decisions regarding public procurement and projects managed under corrupt officials are also likely to be inefficient and waste public resources (Celentani and Ganuza 2000; Hellman et al. 2000a; Rose-Ackerman 1997). Those corrupt officials can award projects to firms that are not the best quality in exchange for a bribe. Second, corruption damages economic productivity by infringing on private firms' economic activities and reducing output per worker (Hall and Jones 1999; Johnson, Kaufmann, and Shleifer 1997; Kaufmann, Kraay, and Zoido-Lobaton 1999). Moreover, some scholars have investigated the harmful impact of corruption on both the growth and the level of national gross domestic product (GDP) (Leite and Weidmann 2002; Mauro 1995). Third, the literature provides evidence that the unofficial and underground economy make up a higher share of overall national economic activities in a country with more corruption (Friedman et al. 2000). Fourth, sizable studies explain that public corruption exacerbates income inequality and poverty (Gupta, Davoodi, and Alonso-Terme 1998; Jain 2001; Mauro 1995; Rose-Ackerman 1999; Tanzi and Davoodi 1997).

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Public officials' corruption also has a significant effect on international macroeconomic variables. First, countries with higher levels of corruption have difficulty attracting foreign direct investment (FDI) (Wei 1997a, 1997b). Second, the degree of corruption of importing countries affects the trade structure of exporting countries by differentiating "inclination of exporters to offer bribes" (Lambsdorff 1998). Third, corruption tends to drive out international trade. International agents have better outside options to escape from a market contaminated by corruption than do domestic traders and investors (Wei 2000). Corrupt officials favor diverse tariff rates, which give them discretion to extract side payments from customers. Because tariff rates may work as trade barriers, corruption is likely to reduce international trade in the end (Gatti 1999). Fourth, corruption is one reason that some countries fall into a currency crisis. Countries with higher levels of corruption are likely to have loan-to-FDI ratios that are too high and may face difficulty borrowing from international financial markets (Wei 2000).

Some researchers underline the seriousness of budgetary corruption. Motza (1983) points out that the most serious corruption is related to budgeting and financial management in the budget processes. The most specific consequence of budgetary corruption is closely linked to inefficiency and ineffectiveness in government resource allocations. In regard to inefficiency, Tanzi (1998) suggests three major ways in which budgetary corruption makes public spending wasteful. First, budgetary corruption tends to increase total government expenditure by launching unnecessary and unproductive public projects. Second, budgetary corruption contributes to overpayment for some services or goods that the government purchases. Third, budgetary corruption often results in payments to individuals who are not entitled to payment. Given these situations, it is desirable to reduce public funds spent wastefully as a result of corruption. Finally, public resources may be used for the private interests of the few instead of the needs of the many (Isaksen 2005). Mauro (1998) argues that corrupt public officials are less likely to spend public resources on items such as education, for which it is more difficult to demand large bribes.

Conceptual Framework and Hypotheses

The impact of public corruption on U.S. state spending and resource allocation has not been scrutinized theoretically and empirically. We contribute to the literature by adopting the excessive government explanations and rent-seeking theory to explain how public corruption affects U.S. state spending and resource allocation.

Impact of Corruption on the Size of State Spending

Previous literature on the growth of government sheds light on the impact of public officials' corruption on state spending. The numerous explanations of government growth are divided into two groups: responsive government explanations and excessive government explanations.[1] The excessive government explanations assume that government institutions play a crucial role in determining the scope of government spending. They argue that public officials such as bureaucrats, legislators, and politicians determine both the demand and the supply of government goods and services. In these explanations, the selfish interests of public officials are the main cause of public sector expansion beyond the optimal level (Berry and Lowery 1987). The bureaucracy model and the fiscal illusion model are representative of these excessive government explanations.

In the bureaucracy model, espoused by William Niskanen (1971), bureaucrats are likely to expand the government budget and to control information in their relationships with legislators. According to this model, bureaucrats always desire a larger budget because budgets yield "power, pay, and prestige." Bureaucrats, who are believed to be active participants in voting, have their desires realized by the coercive voting power in determining policies that are directly related to their interests, such as their wages and benefits. Note that the voters who determine the level of government expenditure are the beneficiaries of increased spending (Courant, Gramlich, and Rubinfield 1979). With monopolistic information on the true costs of publicly provided goods and services, bureaucrats are able to overstate these costs in order to receive a larger budget. The bureaucracy model argues that bureaucrats' budget-maximizing desire and monopolistic control of information may push budgets

beyond the competitive level that would have been the median voter's preference. Many scholars find evidence of these "wastes," or costs beyond the level that would be needed to meet the demands of the public. One source of waste is excessive wages for public workers (Gunderson 1979). Deacon (1979) provides evidence that the competitive supply of public goods will reduce costs as a result of more efficient production processes and increased competition. Borcherding (1985) understands these wastes as "transfers" to the politically advantaged.

According to fiscal illusion theory, espoused by Buchanan and Wagner (1977), politicians, as vote maximizers, tend to propose new government programs as much as possible to attract new voters, which makes government bigger. They are motivated to "fool" citizens so that they may attract individuals' votes without being blamed for the increase in government spending (Rogers and Rogers 1995). By designing and manipulating the fiscal system, politicians try to make the public underestimate the costs of public sector goods and services. The greater the extent of these "illusion-inducing" characteristics of a fiscal system, the greater the size of the government (Borcherding 1977; Garand 1988). A number of illusion-inducing characteristics of the fiscal system have been noted: withholding illusion (Enrick 1964; Van Wagstaff 1965), debt financing (Berry and Lowery 1987; Buchanan and Wagner 1977; Vickrey 1961), high revenue elasticity (Craig and Heins 1980; Hansen and Cooper 1980), complex tax structure (Garand 1988; Wagner 1976), indirect taxes (Borcherding 1977; Cameron 1978; Garand 1988), intergovernmental grants (Rogers and Rogers 1995), and user fees and charges (McKenzie and Staaf 1978).

First hypothesis. The bureaucracy model and the fiscal illusion model predict that "self-interested" public officials are likely to design and manipulate government institutions to maximize budgets for their own private gain. Note that the definition of corruption is "misuse of public office and authority for private gain." This implies that public officials' "selfishness" is the common denominator in both the excessive government explanations and the corruption literature analyzing public officials' behavior. The difference is that corruption takes place when officials' selfishness is pursued to the extreme, which results in so-called predatory behaviors. They violate laws and regulations in pursuit of their private interests. The present argument is that corrupt officials are likely to pursue their personal gains not only through legitimate behaviors but also through predatory (illegal) behaviors. Budget-maximizing behaviors by self-interested bureaucrats will be intensified by corrupt bureaucrats. Corrupt public officials also have stronger incentives to create fiscal illusion. They have to hide their malfeasance so as not to be detected and punished. The bureaucracy model and the fiscal illusion model both hold that public officials' self-interested behavior may cause government spending to be larger than optimal, or "excessive." Because of this, it is relevant to contend that budgets of states with a higher degree of corruption will become larger.

Our hypothesis regarding the impact of public officials' corruption on the size of state spending is as follows:

> **Hypothesis 1:** All other things being equal, states with higher levels of public officials' corruption are likely to have larger total expenditures.

Impact of Corruption on the Allocation of State Spending

Corruption may distort public resource allocation because of rent-seeking behavior among related agents. When allocating public resources, corrupt officials favor sectors with greater rent, higher secrecy, and less competitiveness.

Table 1 Public Officials' Corruption in U.S. States: 1976–2008, Average Ranking

Index with Population				Index with Employment			
Rank	State	Rank	State	Rank	State	Rank	State
1	Oregon	26	New Mexico	1	Oregon	26	Hawaii
2	Washington	27	Maryland	2	Washington	27	Rhode Island
3	Minnesota	28	Hawaii	3	Minnesota	28	Maryland
4	New Hampshire	29	Delaware	4	Nebraska	29	Delaware
5	Utah	30	West Virginia	5	Iowa	30	New Jersey
6	Iowa	31	New Jersey	6	Vermont	31	Georgia
7	Nebraska	32	Florida	7	Utah	32	West Virginia
8	Colorado	33	Georgia	8	New Hampshire	33	Montana
9	Vermont	34	South Carolina	9	Colorado	34	Virginia
10	Wisconsin	35	Missouri	10	Kansas	35	Missouri
11	Kansas	36	Ohio	11	Wisconsin	36	South Carolina
12	Michigan	37	Virginia	12	Wyoming	37	North Dakota
13	Nevada	38	Pennsylvania	13	Idaho	38	Ohio
14	Arizona	39	Kentucky	14	Michigan	39	New York
15	Idaho	40	Oklahoma	15	North Carolina	40	Oklahoma
16	North Carolina	41	New York	16	Indiana	41	Florida
17	Indiana	42	Montana	17	Arizona	42	Kentucky
18	Texas	43	Illinois	18	Maine	43	South Dakota
19	Arkansas	44	Alabama	19	Texas	44	Alaska
20	California	45	Tennessee	20	Nevada	45	Alabama
21	Maine	46	South Dakota	21	Arkansas	46	Pennsylvania
22	Connecticut	47	North Dakota	22	California	47	Illinois
23	Massachusetts	48	Louisiana	23	New Mexico	48	Tennessee
24	Rhode Island	49	Mississippi	24	Connecticut	49	Louisiana
25	Wyoming	50	Alaska	25	Massachusetts	50	Mississippi

Source: U.S. Department of Justice, *Reports to Congress on the Activities and Operations of the Public Integrity Section*, 1976–2008.

Corrupt public officials are likely to spend public resources on items for which it is easier to levy larger bribes. Mauro (1998) finds evidence that the share of expenditures on education is lower in more corrupt countries. Expenditures on education do not provide as many "lucrative" opportunities for corrupt officials as other components of spending (Baraldi 2008; Mauro 1998). Shleifer and Vishny (1993) argue that the illegal nature of corruption demands secrecy. The nature of secrecy shifts a country's investments away from projects in health and education into those in defense and infrastructure if these offer better opportunities for corruption. Gupta, Davoodi, and Alonso-Terme (1998) show empirically that corruption is associated with higher military spending as a share of GDP and total government expenditure. Delavallade (2006) shows that corruption reduces the share of social expenditures, such as education, health, and social protection, in total spending. In contrast, public officials' corruption tends to increase the share of government spending on public services and order, energy, culture, housing, and defense. Hessami (2010) shows mathematically that corruption is less likely to prevail when transaction costs associated with concealing corruption and/or the degree of competitiveness among bribe givers is high.

Second, third, and fourth hypotheses. The literature on the relationship between corruption and public resource allocation motivates the following hypotheses on the impact of public officials' corruption on state's resource allocations:

> **Hypothesis 2:** All other things being equal, states with higher levels of public officials' corruption are likely to spend more on items that may provide a larger rent to corrupt officials, such as capital, construction, and highways (Kenny 2007; Mauro 2004; Shleifer and Vishny 1993).
>
> **Hypothesis 3:** All other things being equal, states with higher levels of public officials' corruption are likely to spend more on items that may provide larger benefits to corrupt officials. This predicts that debt financing[2] and expenditures on total wages and salaries[3] will become larger in a more corrupt state.
>
> **Hypothesis 4:** All other things being equal, states with higher levels of public officials' corruption are likely to spend less on items that provide fewer opportunities for corrupt officials to collect bribes, such as education, welfare, health, and hospitals.

Data: U.S. State Public Officials' Corruption

This study uses data on corruption from the U.S. Department of Justice publication *Reports to Congress on the Activities and Operations of the Public Integrity Section* (PIS). The report provides the number of federal, state, and local public officials convicted of a corruption-related crime across the states. We collected the number of convictions by state for the period from 1976 to 2008. More than 25,000 public officials were convicted of corruption charges during this time period. The Department of Justice defines public corruption as "crimes involving abuses of the public trust by government officials" (2002, 1). The report records the misconduct of public officials such as federal and state legislators, governors, judges, and other federal, state, and local public employees while in public office (DOJ 2010).[4]

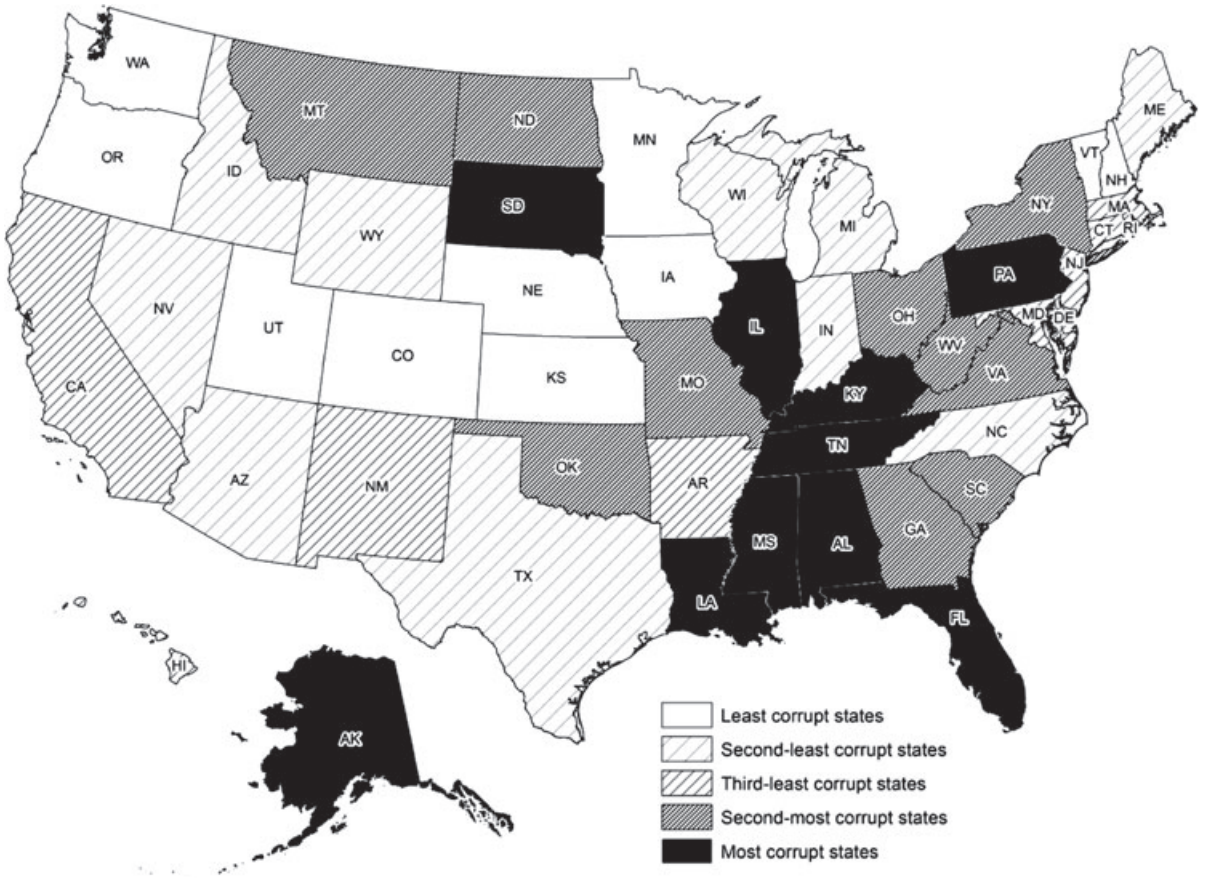

Figure 1 Public Officials' Corruption in U.S. States: Average, 1976–2008

Table 2 Judicial Resources and Corruption Convictions, Panel Data Fixed Effect Model, 1976–2008

	Dependent Variable	
Variables	Corruption (Population)	Corruption (Employees)
Caseloads (per judge)	0.0000886 (1.24)	0.000144 (1.40)
Pending rates (per judge)	–0.000103 (–0.99)	–0.000162 (–1.16)
Attorneys' work hours (per citizen)	0.0129 (0.37)	
Judges (per citizen)	–1.014 (–1.20)	
Attorneys' work hours (per employee)		0.00499 (0.15)
Judges (per employee)		–0.0794 (–1.68)
Constant	0.578* (2.55)	0.787*** (3.97)
Observations	843	843

t-statistics in parentheses.
*$p < .05$; **$p < .01$; ***$p < .001$.

Relevance and Validity of the Corruption Variable

There exist several doubts regarding the relevance and validity of our measure of corruption using the number of convictions. First, the number of convictions may not be sufficient to capture the level of state corruption completely. Second, some may suspect that the number of convictions may imply prosecutors' capacities and the degree of law enforcement or slackness, not the amount of corruption actually taking place.

Regarding the first suspicion, the number of convictions should be highly associated with the degree of corruption. Meier and Holbrook (1992) and Glaeser and Saks (2006) explain that the state conviction rankings match Americans' general perceptions on state corruption. Table 1 ranks the states according to our indexes of corruption by averaging them over the period 1976–2008.[5] The lower the ranking, the less corruption there is in the state. According to

Table 3 Determinants of Total State Expenditure

Variables	Measurement and Expected Sign	Data Source
ln(Previous expenditure)	Previous year's expenditures in each category, a measure of incrementalism of government finance	U.S. Census Bureau
Interparty rivalry	The degree of political competition may be associated with higher government spending because representatives are likely to increase spending to ensure their incumbency. Clingermayer and Wood (1995) suggest that "1 minus the absolute value of the average annual proportionate partisan majority in the chambers of the state legislature." A higher value means a split legislature.	National Conference of State Legislatures (NCSL)
Fiscal centralization	Greater fiscal centralization in states is likely to be related to higher state-level expenditures. It is the ratio of state expenditures to the sum of state and local government expenditures.	U.S. Census Bureau
ln(Intergovernmental grant)	Intergovernmental grants may increase state spending by providing additional income to the state. The effect is referred to as the "flypaper effect." Measures the annual total amount of intergovernmental grants, not just from the federal government.	U.S. Census Bureau
Line-item veto	The presence of the line-item veto would reduce government spending by allowing a selective power to eliminate specific expenditures or tax proposals.	NCSL
Tax and expenditure limits (TELs)	A dummy variable that measures the presence of tax and expenditure limits. According to the policy objective, the introduction of TELs should cause state spending to decrease.	NCSL
Governor's party	A dichotomous dummy variable indicating whether a state has a Democratic governor. Liberal governments are generally believed to spend more on welfare than conservative governments.	Vital Statistics on American Politics
Election year	Politicians increase spending and other reflationary policies in the periods immediately before and after an election. A categorical variable equals 1 if it is a governor's election year.	*The Book of the States* U.S. Census Bureau
Ideology (Government)	Berry et al. (1998) compute a weighted average of the ideology scores to measure state government's political ideology as follows: GOV TIDEOs,t = (.25)[(POW : DEM : LOWS$,t$)(ID : DEM : LOWS$,t$) + (POW : REP : LOWS$,t$)(ID : REP : LOWS$,t$)] + (.25)[(POW: DEM : UPPS$,t$)(ID : DEM : UPPS$,t$) + (POW : REP : UPPS$,t$)(ID : REP : UPPS$,t$)] + (.50)[ID : GOVS$,t$], where GOV TIDEOs,t is the overall ideology of government in state s in year t. (POW : DEM : LOWS$,t$), (POW : REP : LOWS$,t$), (POW : DEM : UPPS$,t$), and (POW : REP : UPPS$,t$) are the Democrats' and Republicans' shares of power within a state's lower and upper chambers, respectively (the shares sum to 1 in each chamber). (ID : DEM : LOWS$,t$), (ID : REP : LOWS$,t$), (ID : DEM : UPPS$,t$), and (ID : REP : UPPS$,t$) are the average ideology scores of Democrats and Republicans in a state's lower and upper chambers, respectively (all of which are assumed to equal the average ideology of the corresponding state Democratic or Republican congressional delegation). (ID : GOVS$,t$) is the governor's ideology, equal to the average ideology score of all members of the state legislature in the governor's party.	Berry et al. (1998) Updated data from Evan Ringquist[a]
Ideology (Citizen)	Berry et al. (1998) measure U.S. states' political ideology, relying on the roll call voting scores of state congressional delegations. The values of citizen and government ideology variables scatter from 0 to 100. A value of zero implies that citizens and governments of the state are extremely conservative; a value of 100 suggests that citizens and governments of the state are extremely liberal. The ideology indicators use interest group ratings of members of Congress, combining information from Americans for Democratic Action (ADA) and Americans for Constitutional Action (ACA). ADA and ACA compute an average ideology score for each state's congressional delegation. Berry et al. (1998) use this equation below to measure the state citizens' ideology: CITIDEOd,t = (INCSUPPd,t)(INCIDEOd,t) + (CHALSUPPd,t)(CHALIDEOd,t), where CITIDEOd,t denotes citizen ideology in district d in year t. INCSUPPd,t is the (estimated) proportion of the electorate in year t preferring district d's incumbent, and CHALSUPP is the (estimated) proportion of the electorate preferring the challenger. INCIDEOd,t is the ideology score for district d's incumbent in year t, and CHALIDEO is the (estimated) ideology score for the challenger.	Berry et al. (1998) Updated data from Evan Ringquist[a]
Age 18–64 (%)	Young residents (younger than 18) and elderly residents (older than 64) demand more publicly provided services such as public education and health care.	U.S. Census Bureau
ln(Urbanization)	Population residing in urban areas. It proxies for the degree of urbanization.	U.S. Census Bureau
ln(Population)	It controls for economies of scale in publicly provided services. I expect a negative relationship.	U.S. Census Bureau
Unemployment (%)	It proxies for potential claims to unemployment insurance and related welfare programs.	U.S. Bureau of Labor Statistics
ln(Personal income)	The size of a state governments' spending is expected to grow as personal income grows.	U.S. Bureau of Economic Analysis

a. Data provided directly to the author.

the indexes, the 10 least corrupt states over this period were Oregon, Washington, Minnesota, Nebraska, Iowa, Vermont, Utah, New Hampshire, Colorado, and Kansas. The 10 most corrupt states were Mississippi, Louisiana, Tennessee, Illinois, Pennsylvania, Alabama, Alaska, South Dakota, Kentucky, and Florida. Figure 1 illustrates the corruption map of the U.S. states.

Regarding the second concern, table 2 shows that these corruption indexes are not statistically related to the degree of federal prosecution, degree of law enforcement/slackness, or court resources. If the numbers of convictions were simply the result of prosecutors' capacities, law enforcement/slackness, or court resources, the corruption indexes should be significantly correlated with at least one of the following variables: work hours of U.S. attorneys divided by state population (or by the number of public employees), number of federal judges per citizen (or per public employee), amount of district courts' caseloads per judge, or the amount of pending rates per judge. However, the table shows that none of these factors has a statistically significant association with our corruption convictions measure. The results imply that judicial resources, U.S. attorneys' workloads, and enforcement/slackness do not determine the corruption conviction measure substantially. This provides confidence in the relevance and validity of our proxy variable for corruption.

Merits of the PIS Data

The PIS data have a significant comparative advantage over other available corruption-related indexes in that they are consistent across time and jurisdictions. The measure of convictions in this report is based on U.S. federal law rather than on local and state laws. State and local laws have distinct legal systems, and the degree of law enforcement is presumably different across states. In contrast, the PIS data are consistent across states because the Public Integrity Section applies federal law to all cases commonly and historically (Depken and LaFountain 2006). In addition, most cross-national research on corruption depends on opinion surveys, which ask individuals about the level of corruption in the nation. However, these perception-oriented corruption indexes are vulnerable to the subjective meaning of corruption and can vary across societies and countries (Glaeser and Saks 2006). Compared to these types of corruption indexes, our corruption index provides a more objective, concrete, and consistent measure of cross-state variations in corruption.

Empirical Model and Methods

Econometric Model

Our econometric model explaining the impact of public officials' corruption on state spending is as follows:

> Real State Total Expenditure per Capita = *f*(Corruption; Previous Year's Expenditure; Interparty Rivalry; Fiscal Centralization; Intergovernmental Grants; Presence of Line-Item Veto Power; Presence of Tax and Expenditure Limits [TELs][6]; Governor's Party; Election Year; Ideology [Government]; Ideology [Citizen]; Population Age 18 to 64; Urbanization; State Population; Unemployment Rate; State Personal Income; Year Dummies).

The dependent variable is real state annual total expenditure per capita. Table 3 provides comprehensive information on all the determinants: how to measure them, expected sign of variables' coefficients, and where we collected the data. Tables 4, 5, and 6 display the descriptive statistics.

The dynamic panel regression equation is as follows:

$$[\ln(TOTEXPPOP]_{i,t}) = \alpha_0 + \alpha_1 CORRUPTION_{i,t} + \alpha_2[\mathrm{IN}(TOTEXPPOP]_{i,t-1}) + \beta^1 X^1_{i,t} + \mu_i + \nu_{i,t} \quad (1)$$

where $\ln(TOTEXPPOP_{i,t})$ is the natural log of state *i*'s real total expenditure per capita in year *t,* and *CORRUPTION* is the level of public officials' corruption.[7] In addition, $\ln(TOTEXPPOP_{i,t-1})$ is the natural log of the previous year's real total expenditures in state *i*. *CORRUPTION,* $\ln(TOTEXPPOP_{i,t-1})$ are endogenous in the sense that they are correlated with the error terms. X^1 is a column vector of exogenous explanatory variables other than *CORRUPTION* and $\ln(TOTEXPPOP_{i,t-1})$. β^1 is a vector of coefficients. The unobserved

Table 4 Descriptive Statistics: Determinants of Total State Expenditure, 1997–2008

Variable	Mean		SD	Min.	Max.	Observations
Corruption	overall	0.503	0.410	0.000	2.732	*N* = 597
	between		0.259	0.123	1.094	*n* = 50
	within		0.320	–0.433	2.314	*T*-bar = 11.94
Interparty rivalry	overall	0.340	0.117	0.000	0.500	N = 600
	between		0.034	0.266	0.380	*n* = 50
	within		0.112	–0.039	0.561	*T* = 12
Fiscal centralization	overall	0.659	0.079	0.468	0.862	*N* = 500
	between		0.078	0.503	0.808	*n* = 50
	within		0.017	0.545	0.713	*T* = 10
ln(Intergovernmental grant)	overall	23.214	0.948	21.368	25.756	*N* = 600
	between		0.922	21.734	25.522	*n* = 50
	within		0.257	22.643	23.986	*T* = 12
Line-item veto	overall	0.860	0.347	0.000	1.000	*N* = 600
	between		0.351	0.000	1.000	*n* = 50
	within		0.000	0.860	0.860	*T* = 12
TELs	overall	0.587	0.493	0.000	1.000	*N* = 600
	between		0.471	0.000	1.000	*n* = 50
	within		0.158	–0.163	1.337	*T* = 12
Governor's party	overall	0.467	0.499	0.000	1.000	*N* = 600
	between		0.297	0.000	1.000	*n* = 50
	within		0.403	–0.450	1.383	*T* = 12
Election year	overall	0.257	0.437	0.000	1.000	*N* = 600
	between		0.053	0.167	0.500	*n* = 50
	within		0.434	–0.243	1.090	*T* = 12
Ideology (Government)	overall	48.662	27.336	0.000	98.125	*N* = 600
	between		20.818	8.652	85.870	*n* = 50
	within		17.940	5.686	101.723	*T* = 12
Ideology (Citizen)	overall	51.297	15.992	8.450	95.972	*N* = 600
	between		14.634	25.688	82.790	*n* = 50
	within		6.746	27.524	75.710	*T* = 12
Age 18–64 (%)	overall	0.622	0.014	0.576	0.664	*N* = 600
	between		0.013	0.594	0.647	*n* = 50
	within		0.007	0.600	0.639	*T* = 12
ln(Urbanization)	overall	14.715	1.138	12.167	17.359	*N* = 600
	between		1.146	12.322	17.303	*n* = 50
	within		0.065	14.467	15.045	*T* = 12
ln(Population)	overall	15.084	1.011	13.101	17.416	*N* = 600
	between		1.020	13.137	17.365	*n* = 50
	within		0.041	14.863	15.271	*T* = 12
Unemployment (%)	overall	4.683	1.141	2.300	8.300	*N* = 600
	between		0.825	3.167	6.658	*n* = 50
	within		0.796	2.508	7.249	*T* = 12
ln(Personal income)	overall	25.482	1.055	23.345	28.025	*N* = 600
	between		1.060	23.621	27.892	*n* = 50
	within		0.103	25.167	25.793	*T* = 12

Table 5 Classification of State Categorical Expenditures

Category	Definition
Capital	Direct expenditure for purchase of construction, by contract or government employee, construction of buildings and other improvements; for purchase of land, equipment, and existing structures; and for payments on capital leases. Capital outlay comprises four subcategories: construction, purchase of land and existing structures, purchase of equipment, and other than construction.
Construction	Production, additions, replacements, or major structural alterations to fixed works, undertaken either on a contractual basis by private contractors or through a government's own staff.
Highways	Maintenance, operation, repair, and construction of highways, streets, roads, alleys, sidewalks, bridges, tunnels, ferry boats, viaducts, and related non-toll and toll structures.
Total wages and salaries	Total expenditure during fiscal year for salaries and wages, covering all functions and activities of the government and its dependent agencies. Includes the general government, liquor stores, and utilities sectors.
Borrowing	Borrowing is an estimate of the net amount of new money that a government has borrowed during the fiscal year, including short and long term debt. It consists of the par value of long-term debt issued during the year (other than for refunding purposes) plus any net increase in short-term debt between the beginning and end of the fiscal year.
Correction	Residential institutions or facilities for the confinement, correction, and rehabilitation of convicted adults, or juveniles adjusted, delinquent or in need of supervision, and for the detention of adults and juveniles charged with a crime and awaiting trial.
Police	Expenditures for general police, sheriff, state police, and other governmental departments that preserve law and order, protect persons and property from illegal acts, and work to prevent, control, investigate, and reduce crime.
Elementary and secondary education	The operation, maintenance, and construction of public schools and facilities for elementary and secondary education (kindergarten through high school), vocational-technical education, and other educational institutions except those for higher education. Covers operations by independent governments (school districts) as well as those operated as integral agencies of state, county, municipal, or township governments. Also covers financial support of public elementary and secondary schools.
Higher education	Degree-granting institutions (associate, bachelor, master, or doctorate) operated by state or local governments that provide academic training beyond the high school (grade 12) level, other than for auxiliary enterprises of the state or local institution. Higher education activities and facilities that provide supplementary services to students, faculty or staff, and which are self-supported (wholly or largely through charges for services) and operated on a commercial basis.
Public welfare	This category includes cash assistance programs, vendor payments for medical care, vendor payments for other purposes, and institutions related to public welfare.
Health	Provision of services for the conservation and improvement of public health, other than hospital care, and financial support of other governments' health programs.
Hospitals	Expenditures related to a government's own hospitals as well as expenditures for the provision of care in other hospitals (public or private). Own hospitals are facilities directly administered by the government, including those operated by public universities. Other expenditures cover the provision of care in other hospitals and support of other public and private hospitals. This function also covers direct payments for acquisition or construction of hospitals (whether or not the government will operate the completed facility) and payments to private corporations that lease and operate government-owned hospitals.

Source: U.S. Census Bureau, *Government Finance and Employment Classification Manual*.

state fixed effects are represented by μ_i. Subscripts i and t index state and time, respectively.[8]

The Benchmark Model: System GMM[9]

The benchmark model of this study is the system generalized method of moments using the most recent data from 1997 to 2008, which is the most appropriate method to investigate the impact of public officials' corruption on U.S. state spending. The key independent variable of this study, the number of convictions of public officials, is not strictly exogenous. To our knowledge, however, scholars have not succeeded in finding a valid instrument that is correlated with corruption but orthogonal to state spending. A potential instrument should be consistently valid over the 50 states and multiple years. This makes it difficult to find a relevant and valid instrument for corruption when the dependent variable is state expenditure. A difference GMM and a system GMM can be used in a situation in which it is difficult to find proper "external" instruments for various reasons and the only available instruments are "internal." Because of the characteristics of the panel data, instrumenting the corruption variable based on lags of the corruption variable itself is available.

Blundell and Bond (1998) suggest situations in which the system GMM works better than the difference GMM. First, when variables are persistent, which implies that the current value of those variables is determined mostly by the previous value of themselves,[10] the precision of the difference GMM estimator is compromised.[11] Second, when measurement errors in variables are large, first-differencing of difference GMM will worsen the errors (Swaleheen 2011). To consider these issues, we tested the persistence of our variables using the Levin-Lin-Chu (2002) method. We find that some variables are persistent, which implies that the system GMM estimation will provide more precise analysis than the difference GMM for this study.

Empirical Findings

Impact of Corruption on State Spending: Size

Model I in table 7 displays the system GMM estimation results. Roodman (2009) notes that a researcher should run certain tests before interpreting the coefficients of a GMM estimation. The first is the Arellano-Bond test for autocorrelation. For a valid GMM estimator, the error terms could be AR(1) but should not follow AR(2) process because the GMM estimation assumes no autocorrelation in the idiosyncratic errors before being differenced. Model I in table 7 has no second-order autocorrelation under the conventional significance levels. The second test is that of overidentification. It checks joint validity of GMM instruments. The null hypotheses of no overidentified instruments are not rejected under the conventional significance levels. The rule of thumb is that the number of instruments should not exceed the number of states, or 50. Model I also satisfies this requirement. Third, a GMM estimation tests the exogeneity of examined instruments. Model I in table 7 does not reject the null of exogeneity of instruments. In sum, model I in table 7 satisfies all the requirements for valid GMM estimators in terms of autocorrelation, overidentification, and exogeneity of instruments. The benchmark model is specified.

Table 6 Descriptive Statistics of Dependent Variables: Natural Log of Categorical State Expenditure, 1997–2008

Expenditure Category		Mean	SD	Min.	Max.	Observations
Total expenditure	overall	10.135	0.283	9.541	11.327	*N* = 599
	between		0.222	9.803	11.074	*n* = 50
	within		0.183	9.653	10.668	*T*-bar = 11.98
Capital	overall	6.129	0.482	5.042	8.450	*N* = 597
	between		0.440	5.550	7.996	*n* = 50
	within		0.204	5.461	6.820	*T*-bar = 11.94
Construction	overall	5.918	0.492	4.786	8.255	*N* = 596
	between		0.444	5.305	7.765	*n* = 50
	within		0.231	5.138	6.714	*T*-bar = 11.92
Highways	overall	6.130	0.453	5.149	8.531	*N* = 597
	between		0.438	5.399	8.089	*n* = 50
	within		0.170	5.615	6.998	*T*-bar = 11.94
Total wages and salaries	overall	6.864	0.487	5.651	9.109	*N* = 600
	between		0.449	6.146	8.442	*n* = 50
	within		0.198	5.804	8.857	*T* = 12
Borrowing	overall	6.112	0.853	–1.642	8.544	*N* = 596
	between		0.621	4.627	7.936	*n* = 50
	within		0.597	–1.434	7.614	*T*-bar = 11.92
Correction	overall	5.146	0.483	3.648	6.846	*N* = 600
	between		0.456	4.309	6.622	*n* = 50
	within		0.172	4.327	5.874	*T* = 12
Police	overall	3.912	0.580	1.958	5.838	*N* = 600
	between		0.541	2.615	5.641	*n* = 50
	within		0.222	2.832	4.531	*T* = 12
Total education	overall	7.586	0.405	6.488	9.029	*N* = 594
	between		0.367	7.028	8.752	*n* = 50
	within		0.187	6.870	8.033	*T*-bar = 11.88
Elementary/ secondary education	overall	6.989	0.446	5.277	8.593	*N* = 594
	between		0.406	6.365	8.327	*n* = 50
	within		0.202	5.815	7.525	*T*-bar = 11.88
Higher education	overall	6.592	0.410	5.693	7.926	*N* = 595
	between		0.369	5.980	7.514	*n* = 50
	within		0.192	6.097	7.045	*T*-bar = 11.9
Public welfare	overall	7.190	0.469	5.718	8.685	*N* = 594
	between		0.403	6.405	8.438	*n* = 50
	within		0.247	6.115	7.720	*T*-bar = 11.88
Health	overall	5.291	0.590	3.741	6.980	*N* = 598
	between		0.547	4.243	6.545	*n* = 50
	within		0.231	4.568	5.983	*T*-bar = 11.96
Hospitals	overall	4.872	0.904	0.292	6.985	*N* = 598
	between		0.853	2.502	6.635	*n* = 50
	within		0.325	2.662	6.351	*T*-bar = 11.96

Model I, presented in table 7, shows that public officials' corruption is one of the statistically significant determinants of total state expenditure. As expected in hypothesis 1, total state expenditure is likely to be larger in states with higher levels of corruption. Public officials' corruption is likely to increase total state expenditure, as argued in the bureaucracy model and the fiscal illusion model. The statistically significant determinants of total state expenditure are public officials' corruption, previous year's expenditures, interparty rivalry, fiscal centralization, governor's party, political ideology of citizens, percentage of the population ages 18–64, urbanization, population, unemployment rates, and personal income. After controlling for the state fixed effects and endogeneity, the evidence from these models supports previous findings in the literature on state spending growth.

Impact of Corruption on State Spending: Allocations[12]

Summary of results. Tables 7–10 present the system GMM estimates of all state categorical expenditures.[13] States with higher levels of corruption are likely to favor capital, construction, highways, total salaries and wages, borrowing, correction, and police protection, at the expense of social sectors such as total education, elementary and secondary education, health, and hospitals.

Capital, construction, and highways. In cross-national analyses, the construction industry is consistently ranked as one of the most corrupt industries. Kenny (2007) explains why corruption prevails in this industry. First, construction involves large, complex, nonstandard activities, so the quality of construction can be very hard to assess. Second, domestic and international construction industries are dominated by a few monopolistic firms. Third, the industry is closely linked to the government. Governments have major roles as "clients, regulators, and owners" of construction companies. It is very common to bribe government officials to gain or alter contracts and to circumvent regulations related to construction (Kenny 2007).

The results presented in model III in table 7 show that real per capita state construction expenditures tend to be larger in states with higher levels of corruption, and the impact is statistically significant. This finding is consistent with the view that corrupt public officials increase expenditures on construction, expecting bribes from construction companies.

Likewise, public officials' corruption is positively related to state expenditures on capital (model II in table 7) and highways (model IV in table 7). According to U.S. Census Bureau data, expenditures on construction ($92 billion) amounted to 81 percent of the total capital outlay ($113 billion) in 2008.[14] Thus, given that state expenditures on construction are substantially affected by corruption, it is natural that state expenditures on capital should be higher in states with higher levels of corruption. Expenditure on highways is one of the major categories of state infrastructure spending. Similar to the cases of capital outlay and construction, states with higher levels of corruption tend to spend more on highways. This result is consistent with findings by Mauro (2004) and Shleifer and Vishny (1993).[15]

Total wages and salaries and borrowing. The regression results of total wages and salaries (model I in table 8) are consistent with the bureaucracy model, which implies that real per capita total salaries and wages of public employees are likely to be higher in states with higher levels of corruption.

The results in model II in table 8 show that states with higher degrees of corruption tend to borrow larger amounts annually. The results correspond with the fiscal illusion theory of government expansion. Corrupt public officials may have stronger incentives to create fiscal illusions to make citizens estimate their fiscal burdens less than the actual by debt financing. An alternative explanation of this finding is related to the regression results of models II–IV in table 7. To undertake projects related to capital, construction, and highways, most states tend to rely on debt financing. Another interpretation of the significance of expenditures on these items is that corrupt officials are willing to increase expenditures on capital, construction, and highways because these projects offer better opportunities for them to receive rents. To finance these projects, states borrow more.

Correction and police protection. Regression results from models III and IV in table 8 reveal that states with a higher extent of corruption

Table 7 Impact of Corruption on State Spending Dependent Variables: Natural Log of Each Categorical State Expenditure, 1997–2008, System GMM

	I	II	III	IV
	Total Expenditure	Capital	Construction	Highways
ln(Previous expenditure)	0.779***	0.961***	0.999***	0.920***
	(36.71)	(27.82)	(25.44)	(–30.07)
Corruption	0.017*	0.063*	0.055*	0.033*
	(2.39)	(2.13)	(2.07)	(2.12)
Interparty rivalry	0.020***	–0.029	–0.048	–0.091*
	(3.13)	(–0.83)	(–1.41)	(–2.41)
Fiscal centralization	0.445***	0.188	–0.004	0.226**
	(9.25)	(1.66)	(–0.04)	(2.84)
ln(Intergovernmental grant)	0.104***	0.102***	0.105**	0.077**
	(13.63)	(4.31)	(3.44)	(3.06)
Line-item veto	0.007	–0.027	–0.037	0.013
	(1.04)	(–1.73)	(1.59)	(1.13)
TELs	–0.002	–0.017	–0.017	–0.0003
	(–0.72)	(–1.73)	(–1.64)	(–0.05)
Governor's party	0.006*	0.016	0.027*	–0.009
	(2.32)	(1.45)	(2.27)	(–1.10)
Election year	–0.006*	–0.036*	–0.035*	–0.003
	(–2.25)	(–2.33)	(–2.11)	(–0.24)
Ideology (Government)	–0.00008	–0.0003	–0.0004	0.0001
	(–1.29)	(–1.16)	(–1.22)	(0.30)
Ideology (Citizen)	–0.0003*	–0.001*	–0.0004	–0.001*
	(–2.68)	(–2.17)	(–0.71)	(–2.51)
Age 18–64 (%)	0.373**	0.122	–0.116	0.094
	(2.83)	(0.27)	(–0.28)	(0.31)
ln(Urbanization)	0.063***	0.059*	0.038	0.025
	(4.57)	(2.25)	(1.03)	(91.47)
ln(Population)	–0.298***	–0.13	–0.082	–0.110*
	(–11.98)	(–1.81)	(–0.91)	(–2.50)
Unemployment (%)	–0.003*	–0.014*	–0.012*	–0.015**
	(–2.09)	(–2.56)	(–2.19)	(–3.21)
ln(Personal income)	0.135***	–0.013	–0.048	0.018
	(8.76)	(–0.26)	(–0.79)	(0.47)
Constants	–0.493**	–0.753	–0.34	–0.518
	(–3.40)	(–1.91)	(–0.63)	(–1.30)
Overidentification (*p*-value)	.414	.618	.866	.254
H_0: AR(1) (*p*-value)	.000	.001	.002	.013
H_0: AR(2) (*p*-value)	.830	.571	.525	.218
Number of instruments	49	49	49	49
Number of groups	50	50	50	50
Number of observations	448	443	442	444
H_0: Exogeneity of instruments	Not Rejected	Not Rejected	Not Rejected	Not Rejected

t-statistics in parentheses. Year dummies are included but not reported.

*$p < .05$; **$p < .01$; ***$p < .001$.

tend to spend more on correction and police protection. The overall extent of corruption will be higher in states with higher numbers of convictions of public officials. In a corrupt state, not just public officials but also citizens are likely to be exposed to corruption. Thus, in states with higher levels of corruption, the demand for correctional services such as prisons and police services will be greater. In addition, government officials have substantial discretionary power and economic rents related to government expenditures on correctional services. It is possible for corrupt officials to take advantage of these opportunities for their personal interests by maximizing state budgets for correctional facilities and services.

Education: Total, elementary and secondary, and higher. Model I in table 9 shows that total expenditures on education are likely to decrease in states with higher levels of public officials' corruption. The harmful impact of corruption on education persists even after expenditures on education is divided into subcategories: elementary and secondary education and higher education.[16] Models II and III in table 9 support this conclusion. These results imply that public officials' corruption reduces states' investment in education overall. These cross-state results are consistent with the findings from cross-national studies on education by Mauro (1997) and Delavallade (2006). Government spending on education is negatively and significantly associated with higher levels of corruption. Expenditures on education do not provide as many "lucrative" opportunities for corrupt officials as other components of spending such as construction.

Public welfare, health, and hospitals. Table 10 illustrates that state government expenditures on public welfare, health, and hospitals tend to be lower in states with higher degrees of corruption. As can be seen in models I, II, and III, public officials' corruption is negatively and significantly associated with per capita state expenditures on public welfare, health, and hospitals. The results correspond with cross-national study results from Mauro (1997)

Table 8 Impact of Corruption on State Spending Dependent Variables: Natural Log of Each Categorical State Expenditure, 1997–2008, System GMM

	I	II	III	IV
	Wages/Salaries	Borrowing	Correction	Police
ln(Previous expenditure)	0.889***	–0.260*	0.843***	0.867***
	(24.89)	(–2.64)	(46.35)	(20.74)
Corruption	0.082**	0.207*	0.046*	0.144***
	(3.19)	(2.08)	(2.70)	(4.24)
Interparty rivalry	–0.094***	0.31	–0.060**	0.085
	(–5.43)	(1.70)	(–3.71)	(1.56)
Fiscal centralization	0.345*	3.093***	0.436**	–0.045
	(2.32)	(3.83)	(3.06)	(–0.18)
ln(Intergovernmental grant)	0.02	0.324	0.013	–0.007
	(0.66)	(1.66)	(0.64)	(–0.13)
Line-item veto	0.015	–0.048	0.019	0.156
	(0.65)	(–0.32)	(1.27)	(1.18)
TELs	–0.009	0.112	0.006	0.041
	(–0.77)	(1.28)	(0.58)	(0.62)
Governor's party	–0.019	–0.089	0.005	0.013
	(–1.59)	(–1.37)	(0.64)	(0.19)
Election year	–0.013	–0.011	0.002	0.020
	(–1.61)	(–0.24)	(0.29)	(0.32)
Ideology (Government)	0.001***	0.002	0.0002	0.0007
	(3.74)	(1.45)	(0.72)	(0.82)
Ideology (Citizen)	–0.002**	0.002	–0.002***	–0.00003
	(–3.69)	(0.69)	(–4.80)	(–0.02)
Age 18–64 (%)	–0.695	–5.012	0.561	1.362
	(–1.08)	(–1.34)	(1.03)	(0.98)
ln(Urbanization)	0.07	0.357	0.149***	0.033
	(1.59)	(1.18)	(4.61)	(0.28)
ln(Population)	–0.329***	–3.591***	–0.328	–0.148
	(–3.82)	(–5.58)	(–5.97)	(–1.02)
Unemployment (%)	0.004	0.150***	0.007	–0.019
	(0.78)	(4.79)	(1.24)	(–1.65)
ln(Personal income)	0.223**	2.732***	0.156*	0.096
	(2.82)	(4.66)	(2.20)	(0.48)
Constants	–1.194	–20.680**	–1.255	–0.986
	(–1.48)	(–3.14)	(–1.75)	(–0.57)
Overidentification (*p*-value)	.947	.227	.82	.848
H_0: AR(1) (*p*-value)	.046	.187	.06	.008
H_0: AR(2) (*p*-value)	.684	.535	.33	.51
Number of instruments	49	49	49	49
Number of groups	50	50	50	50
Number of observations	448	442	448	448
H_0: Exogeneity of instruments	Not Rejected	Not Rejected	Not Rejected	Not Rejected

t-statistics in parentheses. Year dummies are included but not reported.
*$p < .05$; **$p < .01$; ***$p < .001$.

and Delavallade (2006). Corruption may tempt public officials to choose public expenditures less on the basis of public welfare than on the opportunity they offer for extorting bribes.

Conclusion and Policy Implications

We hypothesized that state public officials' corruption will cause state total expenditure to expand. Two public finance theories support this hypothesis: the bureaucracy model and the fiscal illusion theory. Both theories explain that public officials' "self-interested" motivation to maximize their personal gain may expand government budgets. The amount of increased budget is greater than the level of expenditure necessary to meet the needs of the public. This "excessive" government expenditure will be exacerbated by corrupt officials' "predatory" behavior. They commit even illegal activities to maximize their personal interests and to pursue selfish goals.

To suggest policy implications related to public officials' corruption, we compare observed expenditures with the "estimated" expenditures of the 10 most corrupt states. The estimated expenditures are fitted values with the regression coefficients gained from the benchmark model, model I in table 7. To fit the estimated expenditure of each state, we displace the average level of corruption across 50 states with each state's observed level of corruption. We expect that the observed expenditures of the 10 most corrupt states should be greater than the estimated expenditures, as the levels of corruption of these states are higher than average. Nine out of the 10 most corrupt states correspond to this expectation.[17] The comparison shows that their estimated (average corruption) expenditure is dramatically smaller than the observed. The average gap is $1,308 per capita annually. This implies that the nine most corrupt states could have spent $1,308 less annually per capita, on average, if they

This implies that the nine most corrupt states could have spent $1,308 less annually per capita if they had succeeded in maintaining only an average corruption level.

Table 9 Impact of Corruption on State Spending Dependent Variables: Natural Log of Each Categorical State Expenditure, 1997–2008, System GMM

	I	II	III
	Total Education	Elementary/ Secondary Education	Higher Education
ln(Previous expenditure)	0.979***	0.865***	0.998***
	(63.77)	(25.97)	(48.28)
Corruption	–0.022*	–0.031*	–0.002
	(–2.06)	(–2.05)	(–0.21)
Interparty rivalry	0.045***	0.051*	0.038**
	(3.34)	(2.61)	(2.78)
Fiscal centralization	0.189***	0.594***	0.060
	(5.45)	(5.12)	(1.21)
ln(Intergovernmental grant)	0.016*	–0.001	0.010
	(2.47)	(–0.04)	(1.27)
Line-item veto	–0.009	–0.01	0.010
	(–1.31)	(–0.75)	(1.94)
TELs	–0.006	–0.004	–0.008**
	(–1.62)	(–0.54)	(–3.13)
Governor's party	–0.004	–0.015*	–0.001
	(–0.96)	(–2.25)	(–0.32)
Election year	–0.004	0.005	–0.004
	(–1.14)	(1.06)	(–0.9)
Ideology (Government)	0.0001	0.0002	–0.00003
	(0.75)	(1.39)	(–0.27)
Ideology (Citizen)	–0.0005**	–0.001**	–0.00001
	(–2.74)	(–3.73)	(–0.05)
Age 18–64 (%)	–0.122	–0.169	0.001
	(–0.98)	(–0.36)	(0.01)
ln(Urbanization)	–0.008	0.034	0.008
	(–0.65)	(1.10)	(0.70)
ln(Population)	–0.069***	–0.210***	–0.039*
	(–3.75)	(–5.12)	(–2.69)
Unemployment (%)	–0.006**	–0.0001	–0.001
	(–3.26)	(–0.03)	(–0.56)
ln(Personal income)	0.067***	0.188***	0.024
	(4.16)	(5.46)	(1.61)
Constants	–0.718***	–1.30***	–0.322
	(–4.12)	(–3.80)	(–1.66)
Overidentification (*p*-value)	.445	.056	.370
H_0: AR(1) (*p*-value)	.002	.002	.000
H_0: AR(2) (*p*-value)	.065	.051	.931
Number of instruments	49	49	49
Number of groups	50	50	50
Number of observations	440	438	437
H_0: Exogeneity of instruments	Not Rejected	Not Rejected	Not Rejected

t-statistics in parentheses. Year dummies are included but not reported.

*$p < .05$; **$p < .01$; ***$p < .001$.

Table 10 Impact of Corruption on State Spending Dependent Variables: Natural Log of Each Categorical State Expenditure, 1997–2008, System GMM

	I	II	III
	Public Welfare	Health	Hospitals
ln(Previous expenditure)	0.995***	0.854***	0.998***
	(33.07)	(34.91)	(12.42)
Corruption	–0.024*	–0.059*	–0.404*
	(–2.14)	(–2.6)	(–2.3)
Interparty rivalry	0.006	–0.093*	–0.113
	(0.29)	(–2.27)	(–0.91)
Fiscal centralization	0.182**	0.055	1.216
	(3.09)	(0.44)	(1.98)
ln(Intergovernmental grant)	0.019	0.123***	0.072
	(1.13)	(4.55)	(0.48)
Line-item veto	–0.016	0.090**	–0.705**
	(–1.59)	(2.94)	(–3.06)
TELs	–0.002	0.003	0.128
	(–0.33)	(0.19)	(0.59)
Governor's party	0.028**	–0.005	0.324*
	(3.43)	(–0.44)	(2.37)
Election year	0.003	0.015*	0.276**
	(0.59)	(2.02)	(3.18)
Ideology (Government)	–0.0001	0.0003	–0.006**
	(–0.71)	(0.86)	(–3.04)
Ideology (Citizen)	0.0002	0.0001	0.001
	(0.60)	(0.25)	(0.63)
Age 18–64 (%)	–0.790***	0.499	–5.323*
	(–3.75)	(0.73)	(–1.73)
ln(Urbanization)	0.050*	0.134*	–0.192
	(2.69)	(2.11)	(–0.68)
ln(Population)	–0.051	–0.307**	0.004
	(–1.31)	(–3.40)	(0.01)
Unemployment (%)	–0.005	–0.003	–0.003
	(–1.44)	(–0.52)	(–0.07)
ln(Personal income)	–0.012	0.048	0.253
	(–0.31)	(0.44)	(0.68)
Constants	0.394	–0.979	–1.92
	(1.14)	(–0.94)	(–0.59)
Overidentification (p-value)	.512	.392	.552
H_0: AR(1) (*p*-value)	.000	.003	.095
H_0: AR(2) (*p*-value)	.016	.963	.977
Number of instruments	49	49	49
Number of groups	50	50	50
Number of observations	435	448	444
H_0: Exogeneity of instruments	Not Rejected	Not Rejected	Not Rejected

t-statistics in parentheses. Year dummies are included but not reported.

*$p < .05$; **$p < .01$; ***$p < .001$.

had succeeded in maintaining only an average corruption level. This amounts to 5.2 percent of the mean per capita expenditure, $25,210, in the states over the period 1997–2008.

Despite various efforts of state governments to balance budgets, state budget deficits have been increasing. Researchers have scrutinized economic, political, and institutional determinants of government expansion under the Great Recession. The results of this article suggest that preventing public officials' corruption and restraining spending induced by public corruption should accompany other efforts at fiscal constraint. Increases in states' expenditures on capital, construction, highways, and borrowing are not problematic in themselves. Those investments are crucial for the state's economic growth and development. However, policy makers should pay close attention that public resources are not used for private gains of the few but rather distributed effectively and fairly for various purposes.

Notes

1. The responsive government explanations view government as a "passive reactor to outside pressures." That is, government changes its activities and level of expenditure only in response to external changes in technical, social, and/or economic conditions (Berry and Lowery 1987).
2. According to the fiscal illusion model, debt financing makes it possible for public officials to increase state spending while making voters underestimate the actual fiscal burden of the expenditure growth, which benefits public officials by maximizing votes for them (Berry and Lowery 1987).
3. The bureaucracy model argues that bureaucrats want to maximize budgets to increase their benefits. Total wages and salaries of public employees are directly connected to their benefits.
4. Henceforth, the data are called PIS data. The PIS data include a wide array of crimes: accepting bribes, awarding government contracts to vendors without competitive bidding, accepting kickbacks from private entities engaged in or pursuing business with the government, overstating travel expenses or hours

worked, selling information on criminal histories and law enforcement information to private companies, mail fraud, using government credit cards for personal purchases, sexual misconduct, falsifying official documents, theft of government computer equipment for an international computer piracy group, extortion, robbery, and soliciting bribes by police officers, possession with intent to distribute narcotics, and smuggling illegal aliens (DOJ 2002).

5. Table 1 provides two indexes estimating the degree of U.S. public officials' corruption. *CORRUPTPOP* is the number of convictions per 100,000 population; *CORRUPTEMP* measures the number of convictions per 10,000 public employees. Both indexes provide similar regression results and coherent corruption rankings of states. In this article, we choose *CORRUPTEMP* as our key corruption variable, for two reasons. First, conceptually, the variable should measure the level of public officials' corruption. It is argued that the number of public employees in some states is relatively larger than others even though their population is relatively smaller. Second, statistically, it is suspected that there will be some potential spurious relationship between the dependent variable, per capita total expenditure, and CORRUPTPOP because both variables are divided by population (Cameron and Trivedi 2010).
6. Kioko and Martell (2012) suggest that the general fund TELs and the procedural limits have different fiscal impacts on state government finances. Our model includes just the presence of TELs because we found that the separation did not make any substantial differences and the TEL information of several states was missing.
7. The corruption variable measures the number of convictions per 10,000 public employees.
8. We take a natural log on the dependent variable because we suspect that the levels of state total expenditures and other categorical expenditures are not stationary. The ordinary least squares (OLS) estimation and other specifications with a nonstationary variable are considered to be spurious (Rapach 2002). After taking a natural log on each dependent variable, we checked their stationarity through the Levin-Lin-Chu (2002) and the Harris-Tzavalis (1999) unit-root tests. As expected, the levels of total expenditures and other categorical expenditures are nonstationary. However, the levels of various expenditures with a natural log are stationary under the conventional significance levels (5 percent, 1 percent, and 0.1 percent). We use only those stationary dependent variables in this article. They are total expenditures, capital, construction, highways, total wages and salaries, borrowing, correction, police protection, total education, elementary and secondary education, higher education, public welfare, health, and hospitals. To handle the potential nonstationarity problem, we also use the faction of each categorical spending to total expenditures as dependent variables. Regression results of capital, construction, highways, total wages and salaries, borrowing, correction, police, higher education, health, and hospitals are consistent with those of our original regression analyses displayed in Tables 7–10.
9. We checked our model's robustness by comparing it with other methods. Alternatively, we ran a pooled OLS estimation with cluster-robust errors, a fixed-effects model with cluster-robust errors, and a two-step difference GMM estimation. Moreover, benchmarking Islam (1995) and Swaleheen (2011), we checked the overall impact of corruption on state spending in the long run by making averages of values over five-year spans. They provide consistent results that support our model's robustness. Among them, we chose the system GMM as the benchmark model of this study. We suspect that the pooled OLS estimators and the fixed-effects estimators are biased because of state's fixed effects and the endogeneity of corruption. The difference GMM model can give weak instruments if the dependent and the explanatory variables are persistent. Finally, averaging variables is likely to lose precision in general.
10. Blundell and Bond (1998) use an AR(1) model with unobserved fixed effects:

$$y_{it} = \alpha\, y_{i,t-1} + \eta_i + \upsilon_{it};$$
$$E[\eta_i] = E[\upsilon_{it}] = E[\eta_i\, \upsilon_{it}] = 0;\ E[\upsilon_{it}\, \upsilon_{is}] = 0, t \neq s;\ E[y_{i1}\, \upsilon_{it}] = 0,\ t \geq 2$$

A persistent variable would have a sufficiently large α. Blundell and Bond (1998) show two cases in which the instruments used in the first-differenced GMM estimator would become less informative: first, as α is close to unity, and second, as the relative variance of the fixed effect increases.

11. For the sake of simplicity, they examine the case with $T = 3$ (see the AR[1] model in note 10). Blundell and Bond (1998) show that the corresponding difference GMM estimator, $\widehat{\alpha_{dif}}$, reduces to a simple instrumental variable estimator with the reduced-form equation

$$\Delta y_{i2} = \tau y_{i1} + r_i.$$

For sufficiently high α or variance of η_i, the least squares estimate of the reduced-form coefficient π can be close to zero, which implies that the instrument y_{i1} is only weakly correlated with Δy_{i2}. By assuming stationarity and letting $\sigma^2_{\eta} = \text{var}(\eta_i)$ and $\sigma^2_{\upsilon} = \text{var}(\upsilon_{it})$, they show,

$$\text{plim}\ \hat{\pi} = (\alpha - 1)\frac{k}{\left(\frac{\sigma^2_{\eta}}{\sigma^2_{\upsilon}}\right) + k} \text{ with } k = \frac{(1-\alpha)^2}{(1-\alpha^2)}.$$

12. Table 5 classifies state categorical expenditures based on the definitions found in the U.S. Census Bureau's *Government Finance and Employment Classification Manual.* Table 6 displays detailed descriptive statistics of the variables.
13. Again, we take a natural log on all the categorical expenditures and do the unit-root tests to find that all the dependent variables are stationary. All regressions of state categorical expenditures satisfy all the requirements for valid GMM estimators in terms of autocorrelation, overidentification, and exogeneity of instruments, except the AR(2) test on public welfare. Overall, the model is specified.
14. The U.S. Census Bureau's *Government Finance and Employment Classification Manual* defines all state government outlays including capital and construction. Table 5 summarizes the definitions that we follow in this article. Note that capital outlays include expenditures for purchase of construction.
15. Mauro (2004) explains that some cement that should be used for public highways may be stolen and used by corrupt officials for their personal construction. Shleifer and Vishny (1993) suspect that poor countries are likely to spend their public resources on infrastructure projects because this allows for many corruption opportunities.
16. However, the negative impact of corruption on higher education expenditure is not statistically significant under conventional significance levels.
17. The nine states are Alabama, Alaska, Florida, Illinois, Kentucky, Louisiana, Mississippi, Pennsylvania, and Tennessee.

References

Arellano, Manuel, and Stephen Bond. 1991. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies* 58(2): 277–97.

Baraldi, Laura. 2008. Effects of Electoral Rules, Political Competition and Corruption on the Size and Composition of Government Consumption Spending: An Italian Regional Analysis. *B.E. Journal of Economic Analysis and Policy* 8(1): 1–37.

Berry, William D., and David Lowery. 1987. *Understanding United States Government Growth: An Empirical Analysis of the Postwar Era.* New York: Praeger.

Berry, William D., Evan J. Ringquist, Richard C. Fording, and Russell L. Hanson. 1998. Measuring Citizen and Government Ideology in the American States, 1960–93. *American Journal of Political Science* 42(1): 327–48.

Blundell, Richard, and Stephen Bond. 1998. Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometrics* 87(1): 115–43.

Borcherding, Thomas E. 1977. *Budgets and Bureaucrats: The Sources of Government Growth.* Durham, NC: Duke University Press.

———. 1985. The Causes of Government Expenditure Growth: A Survey of the U.S. Evidence. *Journal of Public Economics* 28(3): 359–82.

Brunetti, Aymo, Gregory Kisunko, and Beatrice Weder. 1998. Credibility of Rules and Economic Growth: Evidence from a Worldwide Survey of the Private Sector. *World Bank Economic Review* 12(3): 353–84.

Brunetti, Aymo, and Beatrice Weder. 1998. Investment and Institutional Uncertainty: A Comparative Study of Different Uncertainty Measures. *Review of World Economics* 134(3): 513–33.

Buchanan, James M., and Richard E. Wagner. 1977. *Democracy in Deficit: The Political Legacy of Lord Keynes.* New York: Academic Press.

Cameron, Colin A., and Pravin K. Trivedi. 2010. *Microeconometrics Using Stata.* Rev. ed. College Station, TX: Stata Press.

Cameron, David R. 1978. The Expansion of the Public Economy: A Comparative Analysis. *American Political Science Review* 72(4): 1243–61.

Celentani, Marco, and Juan-José Ganuza. 2000. Corruption and Competition in Procurement. Technical report, Department of Economics, Universitat Pompeu Fabra. http://www.econ.upf.edu/docs/papers/downloads/464.pdf [accessed March 18, 2014].

Clingermayer, James C., and B. Dan Wood. 1995. Disentangling Patterns of State Debt Financing. *American Political Science Review* 89(1): 108–20.

Courant, Paul N., Edward Gramlich, and Daniel L. Rubinfield. 1979. Tax Limitation and the Demand for Public Services in Michigan. *National Tax Journal* 32: 147–58.

Craig, Eleanor D., and James A. Heins. 1980. The Effect of Tax Elasticity on Government Spending. *Public Choice* 35(3): 267–75.

Deacon, Robert T. 1979. The Expenditure Effects of Alternative Public Supply Institutions. *Public Choice* 34(3–4): 381–97.

Delavallade, Clara. 2006. Corruption and Distribution of Public Spending in Developing Countries. *Journal of Economics and Finance* 30(2): 222–39.

Depken, Craig A., II, and Courtney LaFountain. 2006. Fiscal Consequences of Public Corruption: Empirical Evidence from State Bond Ratings. *Public Choice* 126(1–2): 75–85.

Elliott, Kimberly Ann. 1997. Corruption as an International Policy Problem: Overview and Recommendations. In *Corruption and the Global Economy*, edited by Kimberly Ann Elliott, 175–233. Washington, DC: Institute for International Economics.

Enrick, Norbert Lloyd. 1964. A Further Study of Income Tax Consciousness. *National Tax Journal* 17(3): 169–73.

Friedman, Eric, Simon Johnson, Daniel Kaufmann, and Pablo Zoido-Lobaton. 2000. Dodging the Grabbing Hand: The Determinants of Unofficial Activity in 69 Countries. *Journal of Public Economics* 76(3): 459–93.

Garand, James C. 1988. Explaining Government Growth in the U.S. States. *American Political Science Review* 82(3): 837–49.

Gatti, Roberta 1999. Corruption and Trade Tariffs, or a Case for Uniform Tariffs. Technical report, World Bank, Development Research Group. http://elibrary.worldbank.org/doi/pdf/10.1596/1813-9450-2216 [accessed March 12, 2014].

Glaeser, Edward L., and Raven Saks. 2006. Corruption in America. *Journal of Public Economics* 90(6–7): 1053–72.

Gunderson, Morley. 1979. Earnings Differentials between the Public and Private Sectors. *Canadian Journal of Economics/Revue canadienne d'Economique* 12(2): 228–42.

Gupta, Sanjeev, Hamid Davoodi, and Rosa Alonso-Terme. 1998. Does Corruption Affect Income Inequality and Poverty? Working Paper no. 98/76, International Monetary Fund. http://www.imf.org/external/pubs/ft/wp/wp9876.pdf [accessed March 12, 2014].

Hall, Robert E., and Charles I. Jones. 1999. Why Do Some Countries Produce So Much More Output per Worker than Others? *Quarterly Journal of Economics* 114(1): 83–116.

Hansen, Susan B., and Patrick Cooper. 1980. State Revenue Elasticity and Expenditure Growth. *Policy Studies Journal* 9(1): 26–33.

Harris, Richard D. F., and Elias Tzavalis. 1999. Inference for Unit Roots in Dynamic Panels Where the Time Dimension Is Fixed. *Journal of Econometrics* 91(2): 201–26.

Hellman, Joel S., Geraint Jones, Daniel Kaufmann, and Mark Schankerman. 2000. Measuring Governance, Corruption and State Capture. Policy Research Working Paper no. 2312, World Bank. http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2000/04/24/000094946_00040705412171/Rendered/PDF/multi_page.pdf [accessed March 12, 2014].

Hessami, Zohal. 2010. Corruption and the Composition of Public Expenditures: Evidence from the OECD Countries. http://mpra.ub.uni-muenchen.de/25945/ [accessed March 12, 2014].

Isaksen, Jan 2005. The Budget Process and Corruption. Technical report, Chr. Michelsen Institute. http://www.u4.no/publications/the-budget-process-and-corruption/ [accessed March 12, 2014].

Islam, Nazrul. 1995. Growth Empirics: A Panel Data Approach. *Quarterly Journal of Economics* 110(4): 1127–70.

Jain, Arvind K. 2001. Corruption: A Review. *Journal of Economics Surveys* 15(1): 71–121.

Johnson, Simon, Daniel Kaufmann, and Andrei Shleifer. 1997. The Unofficial Economy in Transition. *Brookings Papers on Economic Activity* 28(2): 159–240.

Kaufmann, Daniel, Aart Kraay, and Pablo Zoido-Lobaton. 1999. Governance Matters. Policy Research Working Paper no. 2196, World Bank. http://elibrary.worldbank.org/doi/book/10.1596/1813-9450-2196 [accessed March 12, 2014].

Kenny, Charles. 2007. Construction, Corruption, and Developing Countries. Policy Research Working Paper no. 4271, World Bank. https://openknowledge.worldbank.org/bitstream/handle/10986/7451/wps4271.pdf?sequence=1 [accessed March 12, 2014].

Kioko, Sharon, and Christine R. Martell. 2012. Impacts of TEL Structure on Government Spending. *Public Finance Review* 40(6): 736–66.

Knack, Stephen, and Philip Keefer. 1995. Institutions and Economic Performance: Cross-Country Tests Using Alternative Institutional Measures. *Economics and Politics* 7(3): 207–27.

Lambsdorff, Johann Graf. 1998. An Empirical Investigation of Bribery in International Trade. *European Journal of Development Research* 10(1): 40–59.

Leite, Carlos, and Jens Weidmann. 2002. *Does Mother Nature Corrupt? Natural Resources, Corruption, and Economic Growth.* Washington, DC: International Monetary Fund.

Levin, Andrew, Chien-Fu Lin, and Chia-Shang James Chu. 2002. Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties. *Journal of Econometrics* 108(1): 1–24.

Mauro, Paolo. 1995. Corruption and Growth. *Quarterly Journal of Economics* 110(3): 681–712.

———. 1997. Why Worry about Corruption? Economic Issues no. 6, International Monetary Fund. https://www.imf.org/EXTERNAL/PUBS/FT/ISSUES6/issue6.pdf [accessed March 12, 2014].

———. 1998. Corruption and the Composition of Government Expenditure. *Journal of Public Economics* 69(2): 263–79.

———. 2004. The Persistence of Corruption and Slow Economic Growth. *IMF Staff Papers* 51(1): 1–18.

McKenzie, Richard B., and Robert J. Staaf. 1978. Revenue Sharing and Monopoly Government. *Public Choice* 33(3): 93–97.

Meier, Kenneth J., and Thomas M. Holbrook. 1992. "I Seen My Opportunities and I Took 'Em": Political Corruption in the American States. *Journal of Politics* 54(1): 135–55.

Motza, Maryann. 1983. Corruption and Budgeting. In *Handbook on Public Budgeting and Financial Management,* edited by Jack Rabin and Thomas Dexter Lynch, 509–37. New York: Marcel Dekker.

Niskanen, William A., Jr. 1971. *Bureaucracy and Representative Government.* Chicago: Aldine, Atherton.

Rapach, David E. 2002. Are Real GDP Levels Nonstationary? Evidence from Panel Data Tests. *Southern Economic Journal* 68(3): 473–95.

Rogers, Diane L., and John H. Rogers. 1995. Political Competition, Fiscal Illusion, and U.S. State Government Size: Do Tighter Election Produce Tighter Budgets?

Working Paper no. 4-95-17, Department of Economics, Pennsylvania State University.

Roodman, David. 2009. How to Do xtabond2: An Introduction to Difference and System GMM in Stata. *Stata Journal* 9(1): 86–136.

Rose-Ackerman, Susan. 1997. The Pursuit of Absolute Integrity: How Corruption Control Makes Government Ineffective. *Journal of Policy Analysis and Management* 16(4): 661–64.

———. 1999. *Corruption and Government: Causes, Consequences, and Reform.* Cambridge, UK: Cambridge University Press.

Shleifer, Andrei, and Robert Vishny. 1993. Corruption. *Quarterly Journal of Economics* 108(3): 599–617.

Swaleheen, Mushfiq. 2011. Economic Growth with Endogenous Corruption: An Empirical Study. *Public Choice* 146(1): 23–41.

Tanzi, Vito. 1998. Corruption and the Budget: Problems and Solutions. In *Economics of Corruption,* edited by Arvind K. Jain, 111–28. Norwell, MA: Kluwer Academic.

Tanzi, Vito, and Hamid R. Davoodi. 1997. Corruption, Public Investment, and Growth. Working Paper no. 97/139, International Monetary Fund. http://www.imf.org/external/pubs/ft/wp/wp97139.pdf [accessed March 12, 2014].

U.S. Department of Justice. 2002. *Reports to Congress on the Activities and Operations of the Public Integrity Section.* Washington, DC: Public Integrity Section, Criminal Division, U.S. Department of Justice.

———. 2010. *United States Attorneys' Annual Report.* Washington, DC: Executive Office for United States Attorneys.

Van Wagstaff, Joseph. 1965. Income Tax Consciousness under Withholding. *Southern Economic Journal* 32(1): 73–80.

Vickrey, William. 1961. The Burden of the Public Debt: A Comment. *American Economic Review* 51(1): 132–37.

Wagner, Richard E. 1976. Revenue Structure, Fiscal Illusion, and Budgetary Choice. *Public Choice* 25(1): 45–61.

Wei, Shang-Jin. 1997a. How Taxing Is Corruption on International Investors? Working Paper no. 6030, National Bureau of Economic Research. http://www.nber.org/papers/w6030 [accessed March 12, 2014].

———. 1997b. Why Is Corruption So Much More Taxing than Tax? Arbitrariness Kills. Working Paper no. 6255, National Bureau of Economic Research. http://www.nber.org/papers/w6255 [accessed March 12, 2014].

———. 2000. Negative Alchemy? Corruption and Composition of Capital Flows. Working Paper no. 8187, National Bureau of Economic Research. http://www.nber.org/papers/w8187 [accessed March 12, 2014].