What Factors Affect Management Quality?: State Infrastructure Management and the Government Performance Project*

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Abstract

Whether the $131 billion set aside for infrastructure projects under the American Recovery and Reinvestment Act of 2009 can make a lasting contribution to improving the nation's public infrastructure will depend, in part, on the quality of infrastructure management systems and practices in the states. In this article, we examine the factors that influence how well state governments plan for and manage public infrastructures using results from the 2005 and 2008 Government Performance Project. The pooled Tobit regression analysis shows that infrastructure management quality is influenced by political variables such as divided legislatures and legislative term limits, fiscal institutions including tax and expenditure limitations, and environmental demand factors specifically the extent of urbanization. Based on the empirical analysis, we explore possible ways state governments can improve how they manage their fixed assets.

Key words: infrastructure management, determinants of management quality, Government Performance Project

Introduction

The American Recovery and Reinvestment Act of 2009 (PL 111-5) was designed to infuse the national economy with $787 billion in expenditures and tax credits for the purposes of (1) stimulating job creation and retention and promoting economic recovery, (2) assisting those most impacted by the recession, (3) spurring technology in science and health, (4) investing in transportation, environmental protection, and other infrastructure, and (5) stabilizing state and local government budgets. Nearly $131 billion of that amount was set aside for infrastructure projects and the majority of those funds were to support "shovel ready" projects (defined as projects that could be started within 180 days), which meant in most cases repair, replacement and renovation activities. The size and scope of this extraordinary federal investment in infrastructure in such a short period of time reminds of the large public works projects of the 1930s. Massive public capital investment in the nation's basic infrastructure was expected to prepare a broad foundation for the purposes of promoting economic activity and enhancing the quality of life. Economists have long been debating the private capital formation impacts of public investment without reaching any consensus (and, indeed, there is a debate about the direction of the impact arrow). Yet, they do agree that economic activity depends on an adequate level of infrastructure investment (see, e.g., Munnell, 1992), provided principally by the public sector.

While it is widely recognized that the absence of a supportive infrastructure for private economic activity would have a deleterious effect on the nation's economy, it should also be understood that the absence of a sound system of managing such infrastructure can also cause economic disruptions, dislocations and decline. Bridge collapses, transit derailments, the "Big Dig" cost overruns, potholes that snap truck axles, bridges to nowhere, water main breaks that

flood residences and buildings, and other manifestations of poor infrastructure management should encourage us to examine more than just the dollar amount of infrastructure investment. How effectively infrastructure is managed should also be considered. Ineffective, poorly planned, and obsolete infrastructure would potentially harm private economic activity and the quality of life. Infrastructure management that is based on comprehensive capital planning, effective project oversight, and adequate asset preservation can benefit the economy and society.

Clearly, whether the $131 billion set aside for infrastructure projects under the stimulus program will make a lasting contribution to improving the nation's public infrastructure will depend, in part, on the quality of infrastructure management systems and practices in the states. But what factors influence how well state governments plan for and manage their fixed assets? In this article, we test a model that examines the impact of political actors and institutions, fiscal rules, government fiscal condition, and environmental demand factors on the quality of infrastructure management systems. Management quality is measured using the grades from the 2005 and 2008 rounds of the Government Performance Project (GPP). Brudney, O'Toole, and Rainey (2000) point out that one advantage of the GPP grades is that they enable systematic analysis of the effects of public management. The GPP grades have been used to explore the links between pubic management and human resource outcomes (Donahue, Selden, and Ingraham 2000), the policy priorities of state officials (Cogburn and Schneider 2003), and state fiscal condition (Rubin and Willoughby 2009).

This study is organized as follows: In the next section, we briefly describe the GPP methodology, and present and contrast the infrastructure management grades in 2005 and 2008. We then develop and test a model explaining the variation in the quality of infrastructure management across the states. Following the presentation of the results of the pooled Tobit

regression, we present specific recommendations on how state governments can improve their infrastructure management systems.

Grading Infrastructure Management in the States

GPP was initiated in 1997 to evaluate state governments' performance in managing money, people, infrastructure, and information, and to inform state governments' future management decisions (Ingraham, Joyce, and Donahue 2003). For infrastructure management, five major criteria were used to assess the quality of state management systems: capital planning, project monitoring, maintenance, internal cooperation, and intergovernmental coordination. These criteria were selected based on the standards employed by GPP in earlier years, further refinement to those standards, and advice from scholars and state governments (Pagano 2008; Ingraham 2007). Box 1 provides the details for each criterion.

[Box 1 here]

GPP Methodology

GPP employs a multi-method data gathering effort to evaluate the management systems and practices in the states (Donahue, Selden, and Ingraham 2000; Ingraham, Joyce, and Donahue 2003). Data were collected from a survey of all states, interviews with state officials, and documents and reports on infrastructure management. A survey, filled out by state government officials, and carefully analyzed by the GPP's academic teams, provided a great deal of basic data upon which states' infrastructure management could be assessed. Many documents were also analyzed, including state websites, budgets and capital plans. These were utilized in two ways: as direct sources of additional information to survey responses and, in some cases, as elements of management that deserved to be evaluated themselves. In addition, journalists from

Governing magazine conducted an estimated 1,400 interviews to add information to the pool and, importantly, to provide context in which the survey and document data could best be understood. Among those interviewed were legislators, legislative staffers, legislative fiscal analysts, controllers, treasurers, budget officers, human resource officials, transportation officials, chief information officers, officials in charge of non-transportation infrastructure, auditors, representatives of civic organizations, academics, and representatives of agencies, notably the states' environmental and transportation departments.

Each state's infrastructure management capabilities were evaluated on the basis of the extent to which they met the conditions established in each criterion. The evaluation scheme employed by GPP ranked states' performance for each criterion by a rating scheme that included "weakness", "mid-level", and "strength." Each state's ranking was based on an assessment of the document analysis performed by the academic team members, a review of the responses to the survey by the academic team members, and an examination of the journalists' reports from each of the interviews. Both academic team members (five members) and journalists (six members) met collectively for three days in person in Washington, D.C. during the course of the project as well as several times on conference calls. The rankings were based on the collective assessment of all members of the GPP. In the end, these criterion evaluations were aggregated in order to determine, for each state and for each criterion, whether it was an area of strength or weakness. We determined the overall infrastructure management grade by differentially weighting the criteria scores, ensuring that grade differences represented real distinctions among the states, and ensuring that like cases were treated in a like manner—that is, that two states with the same criteria scores got the same overall grades. The weighting scheme, which was only a guideline and not a rigid algorithm, was heavily influenced by the maintenance criterion. Maintenance of

existing infrastructure is indeed the primus inter pares among the five criteria and weighted approximately 30% of the final grade. Capital planning and project monitoring are each weighted approximately 25% of the final grade, and internal coordination and intergovernmental coordination are each weighted approximately 10% of the final grade. Based on the performance of the states in the five inter-related areas of infrastructure management, GPP assigned letter grades to each state. Possible grades ranged from A to F.

Comparing the Results of the 2005 and 2008 Rounds

Because of the changes implemented in the assessment criteria in 2004, only the GPP grades in the last two rounds are directly comparable (Barett and Greene 2005). In the 2005 and 2008 GPP rounds, a majority of the states received letter grades in the B range, or B+, B and B-, for infrastructure management. States which received grades within the A range increased from only 2 in 2005 (Utah and Florida) to 4 in 2008 (Florida, Kentucky, Michigan, and Utah). In 2005, Alabama received the lowest grade of D followed by New Mexico with a D+. In 2008, states which had the lowest grade of D+ included New Hampshire and Massachusetts. The discussion below focuses on the evaluation of states' performance in each of the five infrastructure management criteria.

[Table 1 here]

Criterion 1: Capital Planning

In the 2008 round, a majority of the states received favorable assessments for capital planning. Federal highway planning requirements are the primary reasons for the generally higher rating on the capital planning criterion. All states receive federal-aid money for transportation. As a condition of aid, a state must create a Statewide Transportation Improvement

Program (STIP) which lists all federal projects ordered by priority and by funding sources. Federally supported transportation projects in metropolitan areas must be approved by the local Metropolitan Planning Organizations, which also must conform to State Implementation Plans for attaining federal air quality standards. In effect, the federal grant requires a minimum level of transportation planning for every state or what might be thought of as the "floor" for infrastructure planning in any state.

Comparing the ratings in the 2005 and 2008 rounds, there has been a general improvement in states' performance in capital planning. The number of weak states decreased from 14 in 2005 to 13 in 2008. In addition, states which received a mid-level grade jumped from only 23 in 2005 to 28 in 2008, while the number of strong states decreased from 13 to 9. In the online survey, a total of 37 states listed the reasons for failing to undertake a comprehensive assessment of needs and to do a transparent selection of projects during the capital planning process. Competing priorities (15 states) and lack of funding (12) were the most frequently cited obstacles, followed by high cost of the process (5), political processes (3), lack of staff or skilled personnel (2), and high population growth (1).

Criterion 2: Project Monitoring

Improvements were also registered in the project monitoring grades of the states. In the 2005, 7 states were graded as having a "weakness" in project monitoring, 34 were "mid-level", and 9 registered a "strength". In 2008, only 2 states were rated weak, 38 states were mid-level, and 10 states were rated strong in project monitoring.

The monitoring criterion assesses the extent to which states regularly collect data on project construction, the means by which data are collected, and the response or correction time once a deficiency or problem has been detected. Specifically, the problem areas for which data

and information on reporting and correction time were collected include project efficiency, quality of work, cost overruns, project delays, and safety compliance. For non-transportation projects, a majority of the states with usable responses to the online survey reported being able to implement action to address project inefficiencies (28 out of 39 responding states), control costs (29 states), ensure timeliness of project completion (28) and quality (33), and meet safety standards (33) in 2-3 weeks or less. But for transportation projects, more states reported a longer time period (1-2 months) before being able to respond to problems of cost overruns and project delays (29 out of 40 responding states).

Criterion 3: Maintenance

Maintenance presents the most difficult challenge to most states. In 2005, 54 percent or 27 states received the lowest grade for poor maintenance of their existing capital stock. Some 36 percent or 18 states were mid-level, and only 1 percent or 5 states were considered strong performers. The 2008 assessment finds that most states made some headway in improving their maintenance systems and policies. Low performers decreased from 27 to 23 states, states receiving satisfactory scores increased from 18 to 21, and strong performers rose from 5 to 6 states. Still, the fact that some 23 states, or almost half of the states, performed poorly on maintenance is a worrisome trend.

A majority of the states have developed asset management systems designed to assess the condition and to estimate the intensity and timing of maintenance and repair investments for facilities in transportation, corrections, office buildings, the state capitol, libraries and parks and recreation. Despite this accomplishment, however, a number of states continue to under-fund maintenance activities. Among the 34 states which provided information on maintenance under-funding in the online survey, more than half or 19 states reported that maintenance was under-

funded by more than 26 percent in 2006. Of these states, 7 reported that maintenance was under-funded by 26-50 percent, and 13 states reported more than 50 percent under-funding.

One reason for the continuing neglect of maintenance activities is that they can be postponed without immediate backlash. Usually, a fixed asset will not deteriorate if it is not maintained properly for a year, but after several years of neglect, the facility deteriorates rapidly.

Criterion 4: Inter-Agency Coordination

Inter-agency coordination is a controversial area because it could be read as favoring a "centralist" orientation, meaning that only states with hierarchical and centralized bureaucracies score well. This, however, is not the case. The issue here is whether, and how, all state infrastructure agencies cooperate in the planning, design, and construction of facilities. The focus is on encouraging the state to look at all its fixed assets holistically, as part of a state-wide system of investment.

In 2005, 6 states performed poorly in internal coordination, 29 were mid-level, and 15 got the highest rating. In the 2008 round, the number of weak states declined to only 3, states which received a satisfactory rating increased to 37, while strong performers decreased to 10.

In terms of capital planning coordination, 17 of the 40 states which provided useable answers to the survey question on inter-agency coordination reported that their central budget or finance office is primarily responsible for developing capital plans. In another 10 states, individual agencies play a more active role in developing capital plans and formally consult other agencies before submitting their requests to the state budget or finance office. Agencies in 19 states informally consult other relevant agencies in the capital plan development process. In general, there is a certain degree of internal coordination across states but the capital plan is not

always prepared in a state-wide manner. Most states create a state plan and a transportation plan separately but how those two plans inform each other is often unknown.

Criterion 5: Inter-Governmental Coordination

This criterion speaks to a form of cooperation and coordination that is similar to the previous criterion, but from the intergovernmental perspective. Local governments, as creatures of the states, often receive infrastructure construction and operating support from the state. The mechanisms for inter-governmental cooperation varies from simple communication channels such as newsletters, websites, and other information distribution systems, to more formal arrangements such as state advisory commissions on intergovernmental relations which are institutions that are designed to promote intergovernmental coordination. Of the 40 states which provided information on interstate coordination, half reported that they relied on ad-hoc task forces, 15 used regular meetings, and 8 coordinated infrastructure-related issues across state lines through one central state agency or office. Some 5 states reported that they employed no interstate coordination mechanism.

A majority of the states performed well in terms of the extent to which they have created effective intergovernmental and interstate infrastructure management networks. Comparing the grades for intergovernmental coordination in the last two GPP rounds, weak performers declined from 1 in 2005 to none in 2008, strong states increased from 23 to 26, and consequently, states which were mid-level declined from 26 to 24.

Model and Hypothesis

Both the 2005 and 2008 GPP rounds show that the quality of infrastructure management in the states is uneven. What factors explain the variation in the quality of infrastructure

management systems and processes in the states? We test the following model to answer this question:

GPP = f { P, FI, FC, E }

where infrastructure management quality (GPP) is hypothesized to be influenced by political variables (P), fiscal institutions (FI), state fiscal condition (FC), and environmental demand factors (E).

Political Factors

Interest group activities, divided government, term limits, and legislative professionalization can have an impact on public management systems. Historical evidence suggests that business interest groups are likely to demand more efficient government management to facilitate economic expansion. For instance, the local government institutional and management reforms implemented during the early 20th century Progressive Movement – such as non-partisan ballots, recall elections, council-manager government, and merit systems, among others – were largely a result of the demands of local business groups to curtail city corruption and improve government efficiency in support of local economic growth (Judd and Swanstrom 2002). Adopting the strategy of Gray and Lowery (1988), we measure the size of business interest groups as the percentage of state's labor force employed in manufacturing and transportation-related industries. It is hypothesized that:

H_1-H_2: A higher percentage of state's labor force employed in manufacturing and transportation is associated with stronger infrastructure management systems

Other mechanisms link politics with management quality. The impact of divided government, for one, has been extensively studied in the literature. Divided government refers to a situation where the governor and the majority in the both legislative chambers come from

different political parties, while divided legislature occurs when majorities in both the upper and lower houses of the legislature are held by different parties. Poterba (1994) and Alt and Lowery (1994) point out that a divided government complicates government decision-making. For instance, divided government may lead to pork-barrel type politics as candidates for office distribute benefits in order to attract more voters. This means that selection of projects in the capital budget are not be based on capital planning priorities, but on decisions of legislators to deliver public works projects and contracts to their supporters and constituencies. Reform gridlock is another possible result of divided government (Poterba 1994; Alt and Lowry 1994). If different parties control majorities in both legislative chambers and the governorship, it might be more difficult to achieve agreement on implementing reforms targeted at improving infrastructure management practices, such as implementation of a capital planning process. On the other hand, a unified government can reduce decision-making costs (Horn 1995) increasing possibility of administrative reforms. Thus:

H_3-H_4: A divided government and legislature have a negative effect on the quality of infrastructure management systems and practices in the states.

Legislative term limits and professionalization are also likely to affect the quality of infrastructure management in the states. Legislators play a crucial role in terms of the quality of state infrastructure management since they not only select capital projects and control budget authorizations, but can also enact policies requiring a comprehensive long-term capital planning process, dictate the regularity of infrastructure condition assessment, and identify regular sources of financing for maintenance of fixed assets.

Legislative term limits facilitate greater legislative focus on improving state management systems in order to enhance public service delivery. Will (1992) argues that term limits control

legislators' preoccupation with reelection and encourage them to consider broader interests rather than those of their districts alone. Carey, Niemi, and Powell (1998) provide evidence that legislators in term-limited states are less likely to spend time seeking out district pork and more likely to focus on state-level needs relative to district interests. Legislative professionalization, on the other hand, has also been associated with innovative management initiatives in the states. Professionalization of legislatures refer to the degree to which state legislative assemblies have access to resources to undertake informed deliberation of issues, and to formulate sound policy initiatives. Tolbert, Mossberger, and McNeal (2008) find that legislative professionalization is a strong predictor of the implementation of digital government in the states. Similarly, Kellough and Selden (2003) find a strong positive relationship between professional legislatures and the implementation of public personnel reform in state governments. A measure of professionalization of state legislatures is that of Squire (2008) which uses the U.S. Congress as a standard against which to assess salaries, staff support, and time in session in state legislatures. It is hypothesized that:

> H_5-H_6: Legislative professionalization and term limits contribute positively to infrastructure management quality.

Fiscal Institutions

Institutions play an important role in determining governmental policies. They refer to both the formal and informal rules of the game that constrain or facilitate behavior. Many state decisions are governed by a plethora of fiscal rules designed to control government profligacy by constraining public revenues, debt, and expenditures. Three fiscal rules are included in the analysis – balanced budget requirements, debt limitations, and tax and expenditure limitations.

A number of studies provide evidence of the effectiveness of fiscal institutions in instilling greater fiscal discipline in state governments. For example, Bohn and Inman (1996) find that tight end-of the-year anti-deficit rules lead to effective control of state general fund deficits. Kiewiet and Szakaly's (1996) study concludes that states that required referendum approval before debt could be issued and those that actually prohibited guaranteed debt had less debt compared to states which required a supermajority of the legislature to issue debt or those with revenue-based limitations. Finally, Rueben (1995) provides some evidence that TELs do indeed reduce the growth of state governments.

We measure the strictness of anti-deficit rules using ACIR's (1995) balanced budget stringency index which ranges from 0 to 10, with 10 being the most stringent. With regard to debt limits, we only include the most stringent types – referendum-based debt limits and rules that prohibit guaranteed debt – which are coded as simple dummy variables. Finally, a TEL stringency index is constructed with 0 indicating that state-level TELs are not in effect for state *i* in year *t*, 1 if TELS are in effect but are not codified in state constitutions and do not limit increases in revenues or spending to two or more growth factors (such as population, inflation, and income growth), 2 if they are codified in state constitutions or limit increases in revenues or spending to two or more growth factors, and 3 if TELs are both codified in state constitutions and limit increases in revenues or spending to two or more growth factors.

Fiscal institutions force governments to manage resources more efficiently and judiciously. With limited flexibility to run deficits, incur debt, and raise taxes, state governments have no choice but to improve management structures and systems to ensure stability and continuity of service delivery given limited resources. It is expected that:

H_7-H_9: Strict anti-deficit rules, state-level tax and expenditure limitations, and debt limits are associated with stronger infrastructure management systems

State Fiscal Condition

The literature on public financial management indicates that fiscal stress may inhibit implementation of reforms to improve management in the public sector precisely because state governments do not have the time or resources. As Schick (1980) points out, periods when governments have sufficient resources to support new programs represent the best time to implement rational management and budgeting techniques such as for instance, capital planning and asset condition assessment systems. Kellough and Selden (2003) also provides evidence that states suffering from a poor economic condition as measured by higher unemployment rates are significantly less likely to adopt public personnel reforms. They argue that states with greater financial assets may have greater capacity to adopt and experiment with innovative practices.

There is no widely accepted indicator of government fiscal condition (Alm, McKee, and Skidmore 1993; Jimenez 2009). The first measure of state fiscal condition is one which has been frequently used in the literature – general fund balance and budget stabilization fund (BSF) as a percentage of general fund expenditures (Poterba 1994; Rubin and Willoughby 2009). General fund balances are the residual equity or the difference between all assets and liabilities in the general fund account. BSFs, often referred to as rainy day funds, represent a specific mechanism for states to save during boom years. Also included in the model is per capita revenue (from own sources) which measure slack resources that can be invested to improve management systems and processes (Tolbert, Mossberger, and McNeal 2008). Following Alm, McKee, and Skidmore (1993), the final measure of state fiscal condition is the growth rate in intergovernmental revenue. Intergovernmental revenues are one of the most important sources of revenues for

states. Any significant change in intergovernmental funds has far-reaching consequences for the fiscal health of state governments. To control for inflation, all monetary data are converted into 2000 dollars using the implicit price deflator published by the Bureau of Economic Analysis. It is expected that:

H_{10}-H_{12}: Higher fund balances, revenue per capita, and intergovernmental revenues contribute positively to infrastructure management quality

Organizational Environment

There is a rich literature in organization theory which argues that organizational structure, reform, and innovation can be explained by attempts of organizations to respond to changes, demands, and threats from the external environment. Gaus' (1947) organizational ecology model argues that public administration, its development and its activities, are influenced by its setting or ecology. For instance, migration from rural to urban areas required government to finance transportation sanitation services, and to look for new ways of raising taxes and revenues to support such services. Langton's (1985) ecological theory of bureaucracy is more specific and argues that bureaucratic forms of organizations arise and are retained because they help organizations achieve better fit with their environment allowing them to compete more effectively with other organizational forms for vital resources, whether these be market share and profits, status and political support, or personnel. Finally, Burns and Stalker (1961) aver that management innovation is driven by conditions in the environment.

We examine the effects of two environmental factors on infrastructure management quality in the states. Urbanization could be a major impetus for the development of more developed and integrated infrastructure management systems and processes. Rondinelli (1971), for example, avers that urbanization and its negative consequences, such as congestion and

physical deterioration, influenced policymakers at the federal, state, and local levels to create new structures to coordinate development issues and implement rational-comprehensive planning methods and techniques. Thus, urbanization serves as a catalyst for the development and integration of infrastructure management systems and processes. The variable percentage of population living in urban areas is included in the analysis to test the urbanization hypothesis. Age of infrastructure is another environmental factor that can influence infrastructure management quality. Some regions of the country are hit harder by physical infrastructure problems than others, specifically older cities in the Frostbelt states. The aging of so many facilities and the need for careful maintenance and replacement of worn facilities create opportunities to apply newly developed infrastructure-related management technologies in the hope of obtaining more efficient strategies for maintenance and modernization (ACIR 1984). It is expected that:

H_{13}-H_{14}: Highly urbanized states and those states in the Frostbelt will have sound infrastructure management systems and practices.

Data and Estimation Methodology

We test the hypotheses using the GPP infrastructure management grades. To simplify the analysis, letter grades are transformed into numeric values ranging from F=1 to A=12.We use the grades from the 2005 and 2008 GPP rounds. Also, note that grades for 2008 actually reflect assessment of infrastructure management quality in the states in 2007, and 2005 grades represent 2004 assessments. Documents were collected from state websites and elsewhere beginning in January 2007 and ending December 2007. Interviews with state policy officials and others began in June 2007 and extended through January 2008. The survey was administered from May to October 2007. The data for the 2008 report, therefore, refer to events and activities in 2007. The

2005 report followed a similar timeline (Pagano 2008). Consequently, the data for the independent variables are from 2004 and 2007.

Since the outcome variable has a lower limit of 1 and upper limit of 12, we estimate the model using pooled Tobit regression. While the natural lower limit is 1, no state received a score lower than 3. On the other hand, since at least 2 states received the highest score of 12, we use Tobit with upper limit. We cluster the observations by states to handle intra-cluster correlation, and use Huber-White sandwich estimators to produce heteroskedasticity-robust standard errors (Wooldridge 2002).

Three forms of effects will be presented. The first is the Tobit coefficient which cannot be interpreted in the same manner as ordinary least squares (OLS) coefficients. An OLS parameter represents the impact of an independent variable on the actual outcome variable, while a Tobit estimate reflects effects on the latent dependent variable. The Tobit estimate is used to confirm the hypothesized relationship between a regressor and the outcome variable. In order to extract more information from the Tobit coefficient, we present two types of marginal effects. The first marginal effect is the impact on the observed outcome variable of a one-unit change in the independent variable conditional on the observations being below the limit. The second type measures the impact of a one-unit change in the independent variable on the probability of being below the limit. Decomposing the effects gives us more information about the relationship between infrastructure management quality, as measured by the GPP grades, and the independent variables.

Discussion of Results

Because of its high dependence on severance tax revenues, Alaska tends to have extreme values for its year-end balances compared to other states. We run the model with and without

Alaska but this does not alter the results. The findings are also robust to other changes in the specification of the model, such as the inclusion of other fiscal condition measures. The final model includes all the original variables described previously and covers all the states except Nebraska which is the only state with a unicameral legislature. Table 2 presents the maximum likelihood estimates from the pooled Tobit regression. The X^2 value of 70.04 with a p-value of 0 rejects the null hypothesis that the pooled Tobit model did not have greater explanatory power than an intercept-only model.

Looking at the influence of political factors, the analysis shows that the variables percentage employed in manufacturing and transportation, and divided government have no statistically significant effects on the quality of infrastructure management in the states. Interestingly, a divided legislature, contrary to the hypothesis, is associated with higher GPP grades, and this relationship is highly significant at the .01 level. To more fully understand the relationship between infrastructure management grades and divided legislature, it is necessary to examine the marginal effects. Marginal effects are calculated at the means of continuous covariates, and at zero for binary independent variables, and only for observations below the upper limit (or the states which did not receive the highest grade of A). Table 2 shows that states which have a divided legislature received 1.31 or one-and-a-third letter grade higher compared to states where a single party controls both legislative chambers, holding other variables constant. Moreover, a divided legislature reduces the probability that states will receive a grade lower than A by at least 2.9 percent. It is possible that control by different parties of the majorities in both legislative houses produces a check-and-balance effect limiting success of legislators in seeking out district pork. In this case, political party competition helps control legislators' propensity to

engage in pork-barrel politics, and may instead encourage legislators to base capital budget decisions on planning priorities.

With regard to the impact of other political variables, the results support the hypotheses that legislative term limits are associated with higher GPP grades. Holding other variables fixed, the calculated marginal effects indicate that among states which did not receive the highest GPP grade, those states with legislative term limits have infrastructure management systems and processes that are 0.97 or almost a full letter grade better than states without term limits. In addition, states with rules that limit the number of terms legislators can serve in office have a 1.6 percent lower probability of receiving a letter grade lower than A.

[Table 2 here]

Among the fiscal institutions, it is only the coefficient of the tax and expenditure limitation stringency index which is significant at the .05 level, and quite unexpectedly, the negative sign indicates that stringent TELs are associated with lower infrastructure management grades. A 1-unit increase in the TEL stringency index is associated with a 0.6 percent rise in the probability of receiving a grade lower than A, and 0.51 unit or a half-letter grade penalty. It was argued previously that greater discipline imposed by fiscal institutions is likely to force state governments to improve management structures and systems to ensure efficient and effective use of limited financial resources. It is more likely that fiscal rules have severely restricted the flexibility of state officials and administrators to deal with various infrastructure management issues. A recent study by Jimenez (1999), which uses state-level data from 1980 to 2005, also shows that states with TELs tend to reduce their shares in aggregate state and local expenditures for capital-intensive, development-oriented services such as highways, water and air transportation, sewerage, and sanitation. Jimenez points out that as states simultaneously deal

with the problems of rising cost of welfare entitlement programs such as Medicaid , and constrained capacity to raise new revenues as a consequence of TELs, policymakers are forced to sacrifice expenditures for other services such as operation and maintenance of fixed assets.

Not one of the fiscal condition indicators produced statistically significant effects. Other possible measures of state fiscal condition, such as short-term end-of-year debt, and changes in tax revenues, or one-year lag of these different measures, were introduced in the model, but the results were not encouraging. The analysis failed to provide evidence to support the hypothesis that access to sufficient resources is a sine qua non to improve management systems and processes in government. Earlier research by Tolbert, Mossberger, and McNeal (2008) also found that slack resources were not critical for state government officials' decision to invest in innovative management practices such as digital government.

Not surprisingly, infrastructure management quality is influenced by external environmental demand factors. Specifically, states that are more urbanized have better infrastructure management systems. It can be argued that public infrastructure issues become more severe and complex in urbanized states. For instance, a bigger, more urbanized state such as California faces multifaceted infrastructure issues compared to a small and largely rural state such as Montana. The need to deal with such issues forces states to improve their infrastructure management systems. The effects of urbanization, however, are relatively marginal, with a 1-percentage point increase in state population residing in urban areas associated with a 0.05 improvement in infrastructure management grade and a 0.1 percent decrease in the probability of having a grade lower than the maximum. Finally, the results suggest that states in the Frost-belt are also likely to have better infrastructure management systems, but this finding is not statistically significant.

Conclusion

There is much room for improvement in the infrastructure management practices and policies in the states. The challenges to improving infrastructure management are legion. The GPP study demonstrated that only a few states are doing a very good job at infrastructure management while a majority is facing crucial hurdles. Based on the results of the online survey, interviews, document analysis, and the empirical analysis, we present some key lessons for state governments:

- Institutionalize statewide capital planning. The empirical analysis demonstrates that state legislatures matter for infrastructure management. One important legislative contribution is the codification of accepted capital planning practices such as future infrastructure needs analysis, assessment of the condition of existing assets, prioritization criteria to determine capital project selection, and formal linkage between the capital plan and the budget. The GPP study shows that the leading states are more likely than mid-level and poor performers to have enacted long-term and comprehensive capital planning requirements as far back as the early 1990s.
- Invest in infrastructure maintenance. In 2004, most states suffered from fiscal stress and underinvested in infrastructure maintenance. By 2007, state fiscal condition improved and yet a number of state governments continued to neglect their infrastructure maintenance needs. As the empirical analysis shows, a state government's fiscal health does not determine the quality of its infrastructure management system. A look at the top performing states shows that what matters is the judicious and cost-effective use of resources. Rather than build new infrastructures, the strong states target available resources to areas which require immediate attention but provide less visibility, politically speaking. One such area is

infrastructure maintenance. States that receive high marks understand that maintenance deferral only pushes back the time when the state eventually will be required to fund an even more costly repair or replacement project.

- Link the capital and operating budgets. The costs of an asset include not only the initial construction costs, but also support for operation and maintenance. In most states, construction and major renovation are funded in the capital budget while operations and maintenance are planned for in the operating budget. The result of this segmented infrastructure budgeting process is underfunding of maintenance. Budgetary reform should target cross-linking of the capital and operating budgets. A unified budgeting process for infrastructure becomes all the more important as states implement capital projects supported through the stimulus program. State officials will be forced to consider the future costs of new facilities built through what is essentially a one-time infusion of federal infrastructure grants.
- Understand the consequences of tax and expenditure limits. The empirical results show that fiscal institutions have produced consequences far beyond the intended purpose of controlling public sector budgetary profligacy. The effects of budget rules spill over in the area of infrastructure management. In particular, precisely because they put a tight leash on government's ability to adjust revenue and expenditure decisions, an unintended impact is to constrain the capacity of public managers to respond to infrastructure-related issues. As the popularity of fiscal rules such as tax and expenditure limits increases, state governments should be wary of their unintended consequences.

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Box 1
Infrastructure Management Criteria

Criterion 1: Capital Planning Constructing a fixed asset should be an activity that derives from the state's assessment of its current and future needs. The state must plan for the fixed asset's long-term usability. A thorough and comprehensive capital improvement plan must include the state's best estimate of population growth, demographics, changes in the underlying economic base, transportation growth, technological changes, and the needs and demands of the citizens. These activities are elements of a comprehensive approach to effective capital planning (Dowall 2001; McNeil, Tischer, and DeBlasio 2005; Neumann and Markow 2004; Stich, Bethany and Eagle 2005).

To assure a rational and systematic building of the state's infrastructure, the capital plan should be clearly and logically linked to the state's capital budget. Rational planning of infrastructure also requires the state to estimate the attendant operating and maintenance (O&M) costs of new or rehabilitated capital assets. Those O&M costs ought to be linked directly to the state's operating budget. Likewise, expanding capital facilities has consequences for the state's operating budget, an impact that should be incorporated in a state's capital planning process.

Criterion 2: Project Monitoring Allowing an adequate time frame for the project, keeping track of the progress of the project, and addressing problems head-on are key components of project oversight. For example, the time frame of the project does not start with groundbreaking or construction. Projects that are identified in the multi-year capital improvement plan must work their way into the capital budget, which is effectively "year one" of the capital improvement plan that is authorized by the legislature. Once authorized, the project requires state appropriation of

funding; only then does the state begin the design and construction work. Similarly, monitoring the project once its construction has begun is critical. During the construction phase, the state is required to be vigilant in overseeing the project, and the state must have the legal and administrative capacity to intervene when problems are detected. Cost over-runs, unwarranted delays, threats to worker and citizens' safety, and other problems need to be detected and corrected in short order so that the project can be completed according to plan (Harder et al. 2005).

Criterion 3: Maintenance After project completion, facilities are "consumed" or used for their designated purposes. Trucks and cars travel on roads and bridges, government employees and petitioners use office buildings, state parks provide recreational facilities to the public, education facilities are used by students. Once a state decides to construct a facility, it is incumbent upon the state to assume the related responsibility of ensuring that the expected life span of the facility is reached. This, in turn, requires the state to maintain the facility in proper condition. The rate of deterioration depends on use, quality of the asset, the normal life-cycle of the asset, and regular repair and maintenance of the facility. Under-funding maintenance and repair activities can, over the long term, reduce the efficiency of the fixed asset and hasten its demise. When that happens, the social compact between generations is broken (Bittner and Rosen 2004; Klasny and Williams 2002 Maxwell School of Citizenship and Public Affairs 2003; Mead 2001; Neumann, Markow, and Lambert 2003; Petersen 2004; Baker and Lambert 2001; Transportation Research Board 2004)

Criterion 4: Internal Coordination The fourth criterion of effective infrastructure management requires cooperation and coordination across the various agencies of the state that have

infrastructure responsibilities. State-wide priorities and a state-wide review board can ensure that public facility construction is undertaken to further the collective interests of the state. When the state's parks department plans for expansion, is the department of transportation part of the deliberation process? Do the state's leaders view the construction and integration of the state's infrastructure from a systemic perspective? Coordination among state agencies in planning and building the state's infrastructure can improve the efficiency of state operations (Neumann, Markow, and Lambert 2003; Vogt 2004; Groden 2000; Lufkin, Desai, and Janke 2005)

Criterion 5: Intergovernmental Coordination The fifth criterion speaks to another form of cooperation and coordination, but from the intergovernmental perspective. Local governments, as creatures of the states, often receive infrastructure construction and operating support from the state. Does the state communicate needs, priorities, regulations (from both the state and the federal government) to the local governments, or require performance standards to be met, or actively plan infrastructure projects with local governments? State advisory commissions on intergovernmental relations are representative of the kinds of institutions that are designed to promote intergovernmental cooperation and coordination (Foster and Susan 2000)

Table 1
2005 and 2008 GPP Infrastructure Management Grades

State	2005 Grade	2008 Grade	Capital Planning (2005)	Capital Planning (2008)	Project Monitoring (2005)	Project Monitoring (2008)	Maintenance (2005)	Maintenance (2008)	Internal coordination (2005)	Internal coordination (2008)	Inter-governmental (2005)	Inter-governmental (2008)	State	2005 Grade	2008 Grade	Capital Planning (2005)	Capital Planning (2008)	Project Monitoring (2005)	Project Monitoring (2008)	Maintenance (2005)	Maintenance (2008)	Internal coordination (2005)	Internal coordination (2008)	Inter-governmental (2005)	Inter-governmental (2008)
AL	D	C+	w	m	w	s	w	w	w	m	w	m	MT	B-	C+	m	m	m	m	w	w	s	m	m	m
AK	C+	C-	m	w	m	m	w	w	m	w	m	m	NE	B+	B+	s	m	m	m	m	s	m	s	s	s
AZ	B-	B-	m	m	s	m	w	m	m	m	m	s	NV	B+	B+	m	m	m	w	m	m	s	s	s	s
AR	C+	C+	w	W	m	m	w	m	m	m	m	m	NH	C+	D+	m	w	m	w	w	w	m	m	m	m
CA	C	C	m	S	m	s	w	w	w	w	s	s	NJ	B-	C+	s	m	m	m	w	w	s	s	s	s
CO	C+	C+	m	M	m	m	w	w	m	m	m	m	NM	D+	C	w	m	w	m	w	w	m	m	m	m
CT	C+	C+	w	W	m	m	m	m	m	m	m	m	NY	B+	B-	s	s	m	m	m	w	s	m	s	s
DE	B+	B+	s	M	s	s	m	m	m	s	m	s	NC	C+	B-	w	m	w	m	m	w	m	m	m	m
FL	B+	A-	m	M	m	s	s	s	m	m	s	s	ND	B-	C	m	m	m	m	w	w	m	m	s	s
GA	C+	B	m	M	w	s	w	m	m	m	s	s	OH	A-	B-	s	m	s	m	s	m	m	m	s	s
HI	C-	C	w	W	w	m	m	w	w	m	m	m	OK	C-	C-	w	w	m	m	w	w	m	m	m	m
ID	C+	B-	w	W	m	m	w	m	m	m	m	m	OR	B	C+	m	m	m	m	m	w	s	m	s	s
IL	C+	C	m	W	w	m	m	w	s	m	m	m	PA	B+	B-	s	m	s	s	m	m	s	m	s	s
IN	B-	B+	m	M	m	m	w	s	m	s	s	s	RI	B-	C+	m	m	m	m	m	w	w	m	s	s
IA	B	C+	m	M	w	m	s	w	m	m	m	m	SC	C+	C-	m	w	m	m	w	w	m	m	s	s
KS	B-	C+	m	M	m	m	m	w	m	m	m	m	SD	B	B	m	m	m	m	m	m	w	m	m	m
KY	B+	A-	s	S	m	s	m	m	s	s	s	s	TN	B-	B	m	m	m	m	w	m	s	s	m	s
LA	C+	C+	w	W	m	m	w	w	m	m	m	m	TX	B-	B-	w	m	m	m	s	s	m	m	m	m
ME	B	C+	m	M	s	m	w	w	s	s	m	m	UT	A	A	s	s	s	s	s	s	s	s	s	s
MD	A-	B+	s	S	s	m	m	m	s	s	s	s	VT	B-	B+	s	m	m	m	w	s	s	m	s	s
MA	C-	D+	w	W	w	m	m	w	m	m	m	m	VA	A-	B+	s	s	m	m	s	m	s	m	m	m
MI	B+	A-	s	S	m	s	m	m	m	m	s	s	WA	B	B+	m	s	m	m	m	m	m	m	s	s
MN	B	C+	s	M	s	m	m	w	s	m	s	s	WV	C	C-	w	w	m	m	w	w	w	w	m	m
MS	C+	C+	m	M	m	m	w	w	m	m	m	m	WI	C	B-	w	w	m	m	w	m	m	m	s	s
MO	B-	B+	m	S	m	m	w	m	m	m	s	s	WY	C	B	w	m	m	s	w	m	m	m	m	m

w - weakness, m - mid-level, s - strength

Table 2 – Results of Pooled Tobit Regression

Variables	Coef. (S.E.)	Mfx1	Mfx2	Mean	S.D.
Political Factors					
% employment in transportation	0.151 (0.348)	0.144	-0.002	3.210	0.733
% employment in manufacturing	0.078 (0.109)	0.074	-0.001	8.272	3.102
Divided government	-0.116 (0.560)	-0.111	0.001	45(a)	53(b)
Divided legislature	1.418*** (0.538)	1.311	-0.029	75(a)	23(b)
Legislative professionalization	-3.451 (2.437)	-3.298	0.036	0.1832	0.114
Legislative term limits	1.034** (0.512)	0.971	-0.016	70(a)	30(b)
Fiscal Institutions					
Strict anti-deficit rules	0.032 (0.113)	0.030	0.000	16(a)	84(a)
TEL stringency index	-0.536** (0.269)	-0.512	0.006	1.060	1.052
Referendum-based debt limit	0.037 (0.527)	0.035	0.000	58(a)	42(b)
Prohibition of guaranteed debt	-0.661 (0.518)	-0.639	0.005	82(a)	18(b)
Fiscal Condition					
Fund balance as a % of expenditures	0.002 (0.020)	0.002	0.000	11.172	13.317
Real total revenue per capita	-0.056 (0.139)	-0.054	0.001	5.593	1.737
Growth rate of real inter-governmental revenue	0.025 (0.018)	0.024	0.000	3.149	8.225
Environmental Demand Factors					
States in Frostbelt	-0.301 (0.556)	-0.288	0.003	72(a)	28(b)
% population in urban areas	0.054** (0.027)	0.051	-0.001	71.694	14.827
Constant	3.669 (2.742)				
N	98				
Censored observations	2				
LR chi2	70.04				
Prob > chi2	0.000				
Log pseudolikelihood	-187.837				

*** significant at 1%, ** at 5%, * at 10%
Mfx1 or marginal effects of 1-unit change in X on Y conditional on the observations being below the limit
Mfx2 or marginal effects of 1-unit change in X on the probability of being below the upper limit
a – Frequency if dummy = 0
b – Frequency if dummy = 1
Note: Standard errors (S.E.) are intra-cluster correlation and heteroskedasticity-robust.