THE IMPACT OF STATE CAPITAL BUDGET AND MANAGEMENT PROGRAMS ON STATE CAPITAL BUDGET DECISIONS AND ECONOMIC PERFORMANCE

BY

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DISSERTATION

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The Impact of State Capital Budget and Management Programs on State Capital Budget Decisions and Economic Performance

BE ACCEPTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

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ABSTRACT

The normative public capital budgeting literature, including textbooks and public finance and budgeting associations, advocates a systematic capital management process in which four main components: long-range capital planning, long-range capital budgeting, project management, and maintenance should be included. Based on the principles of these components, the process is characterized as centralized, strategic, and knowledge-based.

While the normative literature recommends such strategic approaches, the benefits of the process are rarely empirically examined. If the strategic capital management approach leads to better infrastructure investment, it should enhance economic performance since public infrastructure is an input in production processes. This dissertation investigates the impact of strategic capital management programs on economic performance through public capital spending levels. The second purpose is to understand how strategic practices affect a capital budget decision process. The final purpose is to understand why some components are not fully adopted.

The empirical study utilizes the state economic growth model and is estimated using data from fifty states from 1997 to 2004. Like previous studies of state economic growth, the model controls for individual state characteristics, time trends, and serial correlations. Unlike previous studies, this study includes measures of state management practices. The estimation results indicate that the highly strategic management programs have indirect and positive impacts on state economic growth through state capital spending levels. The effects of the strategic capital management programs are important,

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given that public infrastructure provision is a responsibility of state governments. This finding also extends state economic development literature by showing that government management is another explanatory variable for state economic growth in addition to capital spending levels.

The Illinois capital budget process was also analyzed. The case study data included interviews and public documents. The results indicate that Illinois budgeters' perceptions are that the adopted strategic practices encouraged efficient and effective investment policies, while promoting the state's fiscal discipline. Interview data suggested that statewide long-range capital planning is not adopted because the state budgeters view that 1) the state government should allow local governments the discretion regarding investment choices and 2) elected officials' investment choices should not be constrained by long-range planning.

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To My Parents, Vicha and Sawina Srithongrung

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LIST OF ABBREVIATIONS

ACIR	Advisory Commission on Intergovernmental Relations
CBO	The United States Congressional Budget Office
CDB	Capital Development Board
CIP	Capital Improvement Plan
CV	Coefficient of Variation
FEMA	Federal Emergency Management Agency
GFOA	Government Finance Officers Association
GFRC	Government Finance Research Center
GOMB	Governor's Office of Management and Budget
GPP	Government Performance Project
GSP	Gross State Product
IBHE	Illinois Board of Higher Education
IDOC	Illinois Department of Correction
IDOT	Illinois Department of Transportation
ISBE	Illinois State Board of Education
MRB	Multiple Rationalities Model of Budgeting
MYP	Multi-year Highway Improvement Program
NASBO	National Association of State Budget Officers
OECD	Organization for Economic Co-operation and Development
RMSE	Root Mean Square Error
VIF	Variant Inflation Factor

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CHAPTER 1 INTRODUCTION

This dissertation is written in response to the suggestion by Arie Halachmi and Alex Sekwat (1997) in *Strategic Capital Budgeting and Planning: Prospects at the County Level* that the effectiveness of systematic management practices in capital budgeting processes should be empirically examined. In their study, Halachmi and Sekwat (1997) found that the use of separate capital budgets leads to strategic practices including capital planning and infrastructure inspection, in local governments. This finding leads to the following questions: "If governments adopt and practice a strategic capital process, what would be the benefit of doing so?", "How is the strategic capital process, which is considered centralized and systematic, executed in a state government institution?", and "How do systematic practices lead to better infrastructure investment decisions?"

The unit of analysis in this study is the state capital budgeting and management process. There are two reasons for selecting state government as the unit of analysis. First, state and local governments, rather than the federal government, are the primary owners of the core public infrastructure in the U.S. (Bureau of Economic Analysis, 2006b). For this reason, studying the capital budgeting and management process at the state level would yield results that better correspond to the reality of state responsibility for the U.S. infrastructure system. Second, since state government plays a major role in resource allocation and distribution throughout the state, the empirical results derived from state government samples will have direct implications on the government

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institutions whose influence is most important in laying out the statewide infrastructure environment.

Problem Statement

Kamps (2005) estimates that in 2001, the rate of U.S. real net public capital stock to the country real Gross Domestic Product was 250 percent. The statistics indicate that the country's public infrastructure system ranked 20th among the 22 OECD (Organization for Economic Co-operation and Development) countries. While the data point out that the U.S. public infrastructure is not large compared to the 22 OECD countries, a rational question arises: "Is the size of the U.S. infrastructure system adequate compared to American needs?"

The American Society of Civil Engineers—ASCE (2006) estimates that on average, the American infrastructure system is in poor condition. Approximately, $1.6 trillion is needed to address the country's inadequate and poor infrastructure problems. The ASCE (2006) reports that in 2005, about 27 percent of the bridges throughout the country were structurally deficient and functionally obsolete. Thirty-three percent of the dams throughout the country were estimated to be seriously unsafe, posing direct risks to human life. Americans spend 3.5 billion hours a year stuck in traffic, at a cost of $63 billion a year to the country's economy (ASCE, 2006). According to the ASCE (2006), total spending of $59 billion is well below the $94 billion needed annually to improve transportation infrastructure conditions nationally. These estimates indicate that there are large infrastructure needs relative to the country's capital stock size.

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While an increasing level of public investment seems to be a popular calling to address the country's infrastructure needs (e.g., see Aschauer, 1989; ASCE, 2006), a better capital budget and management process is equally important and may be even more realistic in a time where public resources are limited. However, such an approach has not been adequately examined. A strategic capital budget and management process not only assists public officials in identifying public investment levels relative to needs, but it also promotes investment efficiency and effectiveness through a centralized, future-oriented, and analysis-based approach. The result of a strategic capital budget and investment process is a well-targeted, systematic, and informed public spending policy, relative to those of an unplanned process.

What would be the outcome of an unplanned capital process? The economic impacts of Hurricane Katrina on the Gulf Coast region are a good illustration of the negative consequences of unplanned infrastructure management and budgeting. When category four Hurricane Katrina hit Louisiana on August 29, 2005, the flood walls (built in the 1960's to withstand category three hurricanes) failed to prevent water flow from Lake Ponchartrain which resulted in severe flooding of New Orleans and surrounding areas (Wikepedia Encyclopedia, 2006).

Flooded and damaged areas designated by the Federal Emergency Management Agency (FEMA) covered over 22,000 business establishments which housed 362,571 jobs in Louisiana and Mississippi (Bureau of Labor Statistics, 2005). The estimates of privately insured damage in the areas are about $40 to $60 billion (Foertsch & Rector, 2005). According to Foertsch and Rector (2005), these capital losses are considerable

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compared to $23 and $33 billion losses due to four hurricanes striking Florida in 2004 and the World Trade Center attacks in 2001, respectively.

Production processes in the Gulf region were interrupted, and lower productivity was expected to slow state economic growth by about one percent the following year (U.S. Congressional Budget Office—CBO, 2005). The one percent reduced growth rate is not negligible since it means that the economy has now been prolonged in reaching its steady state for one percent per year permanently.[1] This effect is significant, given that the average annual growth rate of the states' gross state products in the United States from 1997 to 2004 was 3.5 percent per year (Bureau of Economic Analysis, 2006a).

Research Problem

Capital spending at the state and local level has increased rapidly since 1980s (U.S. Congressional Budget Office—CBO, 1998). Questions, such as "Is the fluctuation in spending considered optimal or under-investment, relative to the public needs?" and "What should be an objective guide for public investment?" are of particular concern according to recent public policy literature (Gramlich, 1994). Strategic capital management programs seem to be a promising alternative for this policy problem since the program is a knowledge-based, future-oriented, and holistic management approach.

What is the tangible benefit of a systematic capital management program

[1] According to the exogenous growth model (Solow, 1957), an economy will always move toward its steady state where the growth rate of the economy depends only on the rate of technological progress. The exogenous model asserts that only technological progress can permanently change the speed of economy to reach its steady state, and thus other factors (including government policies) do not have a permanent effect on growth. On the other hand, endogenous theory (Barro, 1990) asserts that some factors (including government policy measures) can permanently change the growth rate of the economy, and thus they make the economy moves to its steady state at the faster and permanent rates.

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recommended by the literature? How and why do systematic capital practices affect capital budgeting and management processes? These questions are the central research questions for this dissertation.

Studies tend to approach capital budgeting issues in two ways. A large number of studies try to understand how capital spending decisions have been made (e.g., Temple, 1994; Balsdon, Bruner, & Rueben, 2003; Chudhury, Clingermayer, & Dasse, 2003). Within this group, some researches have focused on the roles of political institutions on spending levels (e.g., Chudhury, Clingermayer, & Dasse, 2003; Crain & Oakley, 1995), while the rest focus on the impacts of administrative institutions, including the uses of separate capital budgeting (e.g., Poterba, 1995; Gordon, Kleiner, & Natarajan, 1986) and debt rules (e.g., Johnson & Kriz, 2005; Poterba & Rueben, 1999a).

The second set of these studies tries to identify better ways for capital decision-making to be used as a tool in resolving the problem of how much to invest and how to allocate capital spending. The major studies in this group comprise case studies addressing the experiences of governments in practicing a strategic capital budget, typically known as a reform budget (e.g., Darr, 1998; King, 1995; Forte, 1989; Griffel & Hester, 1990). Only a relatively small number of studies in this group (Halachmi & Sekwat, 1997; Beckett-Camarata, 2003a; O'Toole & Stipak, 1988) explore whether such strategic practices can be integrated into capital processes, and none of them has adequately investigated the consequences of these strategic capital management programs.

If public infrastructure is beneficial to state production processes, the issues of whether a strategic capital management program has positive effects on economic

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productivity and how strategic practices are executed in a state capital budgeting process remain open questions. Understanding the characteristics of strategic capital management in the capital budgeting process and its roles and consequences for economic productivity at the state level is necessary. Such understanding provides explanations that move the normative literature one step forward in clarifying how the process is executed in real settings and what the tangible benefits, if any, are in committing to the process. Such clarification justifies the normative literature's recommendation of using strategic capital management practices.

This dissertation contributes to the knowledge base by conducting an empirical analysis of the effects of a strategic capital management program on state economic productivity and by examining one state's experiences with a systematic capital management approach. The first analysis, which is a cross-sectional four-year time series study, examines whether or not capital management programs have an effect on the growth rate of gross state products. It focuses on the influences of state capital management processes on state economic outputs. The second analysis, which is a case study of the State of Illinois' capital budget process, compares and contrasts the state's capital budget preparation by the state executive with normative practices. The case study also identifies how systematic practices lead to better results as perceived by people involved in the process. The study focuses on extending the theory of state capital budgeting and management process within a democratic government environment.

The organization of the dissertation is as follows. Chapter 2 reviews the normative capital budget and management process recommended by the literature, the characteristics of the process, and the process as it is actually conducted in real

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government settings. Chapter 3 reviews the state economic growth literature and the empirical results of budgetary institutions, fiscal policy outputs, and economic growth. Chapter 4 elaborates on the conceptual framework, sets up research hypotheses, and sets up the case study's questions. Chapter 5 presents the methodology, data, and empirical results for the impact of a state capital budgeting and management program on state economic growth. Chapter 6 presents the case study data, analysis, and findings. Finally, Chapter 7 provides conclusions and implications drawn from the study's results.

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CHAPTER 2 A CAPITAL BUDGET AND MANAGEMENT PROCESS

This chapter addresses the focal point of the study—the capital budgeting and management process. The chapter has three sections. The first section describes the capital budget and management process as recommended by the literature. In order to examine the benefits of adopting the process recommended by the literature, the characteristics of the process first need to be understood. Thus, the next section further defines the process by using two theories—the public strategic management model by Poister and Strieb (1999) and the budgetary institution model by Poterba and Von Hagen (1999)—as lenses with which to view the process. Finally, the chapter presents capital budget and management processes by state governments as actually practiced in order to compare the normative and positive practices.

A Systematic Capital Budgeting and Management Model

Definition and Importance

Howard (1973) defines capital budgeting as a "A process or system of administrative procedures which relates a long-term capital improvement program with the methods which will be used to pay for those improvements and provides for the implementation of these long-term financial and physical plans" (p. 238). In a policy framework, state capital management is a policy implementation program executed by a

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state government. The program is intended to provide and maintain state public infrastructure. The capital management programs are guided and directed by two forms of capital budgeting and management policies, constitutional or statutory requirements (i.e., debt restriction rules) and the management practices used by capital budget and management staff (Vogt, 2004). While the first form of policy is adopted by resolution or other actions of the legislative body, the latter depends on traditional practices and management values in budget organizations. These policies directly affect the program processes, identify roles and responsibilities of the capital management staff and other involved participants, and give the process legitimacy and continuity (Vogt, 2004). The two policies vary from state to state (e.g., see Advisory Commission on Intergovernmental Relations—ACIR, 1987; National Association of State Budget Officer—NASBO, 1997, 1999); and as a result, various capital management programs exist throughout the states.

Program Components

The capital budgeting literature, including textbooks (e.g., Mikesell, 1999; Steiss & Nwagwu, 2001; Lee, Joyce, & Johnson, 2004; Vogt, 2004), recommends a systematic capital process. In general, the process is comprised of four main components—long-term capital planning, long-term capital budgeting, project management, and maintenance (Ammar, Duncombe, & Wright, 2001; Government Performance Project—GPP, 1999, 2001; National Association of State Budget Officers—NASBO, 1999)—and two supplementary practices—intergovernmental and internal coordination (GPP, 2005).

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These components and practices are regarded as keys to capital program performance and outcomes because they bring together fundamental decisions and detailed action plans that a government will follow in managing its infrastructure.

Ammar et al. (2001) summarize the four components identified by the literature to lay out the model of the capital budget and management process. They refer to the process as "a strong capital management system" (p. 48) since the four components in the system emerged from careful evaluation of the impact of specified capital management practices on desired outcomes, i.e., the condition of the capital stock (Ammar et al. 2001). Using the framework and concepts provided by Ammar et al., the four components are described as follows.

Capital Planning. The first component, long-range and multi-dimensional capital planning, mainly involves preparing the capital improvement program (CIP). The CIP is a list of the major capital projects and acquisitions needed over a five to six-year period, appropriation of expenditures to be incurred by the identified projects, financial sources for the project funding, and the impacts of the projected outcomes on the future operating budget (Vogt, 2004). Projects listed in the first year of the CIPs are considered for funding in the current budget year. Since some projects may not be funded according to the CIP list, the CIP should be updated every year (Canary, 1992).

Although the literature suggests using at least a five-year period for a forecasting range (e.g., Steiss & Nwagwu 2001; Vogt, 2004), some CIPs, in practice, cover shorter or longer periods ranging from three to eight years (e.g., see NASBO, 1999). A long-range CIP will allow time for governments to prepare financial arrangements, coordinate

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projects with other governments, purchase land, select projects, and manage balance sheets (Vogt, 2004). The main objective of such a long-range plan is to consolidate, prioritize, and organize uneven capital needs that may be substantially varied from year to year into one capital budget plan (Gianakis & McCue, 1999). A budget that is established based on a long-range plan smoothes uneven needs and spreads acquisition costs across a multi-year framework, which results in a smooth tax rate (Mikesell, 1999). A capital budget that is based on a short-term plan tends to impose financial constraints on a future capital budget (King, 1995).

In addition to a multi-year focus, capital planning should be developed based on both comprehensive and strategic planning (Government Finance Research Center—GFRC, 1983; Government Finance Officers Association—GFOA, 2006). According to GFRC (1983), comprehensive planning coordinates broad policies regarding future land use and objectives for community expansion or containment over a relatively lengthy period. Strategic planning specifies future strategies that seek to make the best use of existing resources while limiting the impacts of internal (e.g., management changes, declining population) and external negative forces (e.g., national recessions) (GFRC, 1983). The CIP that is developed based on both forms of planning will reflect governmental goals or benchmarks (e.g., economic development, natural disaster preparedness, and educational improvement), which the budgeting participants can use as guidelines in their decision-making process (GFOA, 2006; Steiss & Nwagwu, 2001; Salluzzo, 1999).

Before the CIP is completed, the planned projects should be reevaluated against the existing infrastructure conditions, quantities, actual usage statistics, and future

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consumption projections. This information can be obtained from the infrastructure inspection programs in which facility conditions are assessed on a regular basis (Halachmi & Sekwat, 1997; Pagano, 1987). The comparison between the project needs and the existing stocks and future consumption changes will help establish the merits of the projects listed in the CIP. The last step in the capital planning process is to identify financial resources and impacts of the funded projects. The financial plan of the CIP will actualize the project lists by coordinating capital planning with fiscal planning (GRFC, 1983).

The long-range and multi-dimensional planning of the CIP will help ensure that the capital projects are really needed by a community and are executable by well-planned financing. In short, the planning component aims to increase effectiveness and efficiency of capital spending programs. The CIP makes governments commit to current and future citizens by establishing the plan for capital expenditure and service levels; and, thus by nature the CIP focuses on the future of the community as well as the ends of collective action (Gianakis & McCue, 1999). According to Gianakis and McCue (1999), if a government has a CIP, its capital budget process is unlikely to be an incremental budget since the CIP requires the government to focus on policy decisions. In contrast to a CIP, an incremental budget tends to focus only on incremental adjustments to prior-year expenditures rather than focusing on policy decisions.

The National Association of State Budget Officers (NASBO, 1999) and the Government Performance Project (GPP, 1999, 2001) use the following criteria to evaluate a state's long-range and multi-dimensional planning process.

- Does the state have a clear definition of capital expenditures?

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- How well does the state integrate planning for its capital budget with planning for its operating budget? Does the capital plan include specific operating costs for each capital project over a multi-year period? Are the costs and savings from capital plans taken into account in making operating plans?
- Does the state conduct a CIP for every fiscal year's capital budget to reevaluate and update the capital plan and to ensure that the original planning and execution schedule are timely and consistent?
- Does the state define all program outcomes for capital investment and link them to overall strategic goals?

Capital Budgeting. This component mainly involves capital budgeting, an annual process of deciding which public projects listed in the CIP are to be funded and how they are to be funded. The capital budgeting process should be systematic and knowledge-based because public infrastructure provides long-term benefits which have large socioeconomic impacts on a community (Vogt, 2004). The three important steps in program budgeting are long-range fiscal planning, financial and debt management, and the project selection process (Ammar et al., 2001). The information about the planned projects, their costs, and investment timing in the CIP are usually fed into the capital budget. In addition to this information, annual budget request forms completed by state agencies should be designed to convey information including estimated benefits, the project life cycle, unit-cost, project alternatives, project objectives and justifications, and

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the total budget request (Beckett-Camarata, 2003b). This information will be beneficial in the project selection process (Beckett-Camarata, 2003b).

Fiscal and debt management requires analyzing government funding capacity along with examining the impacts of funding on the operating budget. Governments should develop clear debt policies (NASBO, 1999; Forte & Cothran, 1991). Innovative funding practices, such as public-private partnerships and state revolving funds, aid in acquiring funding for large projects (e.g., see Johnson, 1995; Levine & Augustino, 1994), reducing the future debt burden (Jinks, 1992), and decreasing reliance on general revenue finance (Vogt, 2004). Effective financial and debt management will enable governments to fund planned projects while maintaining or improving their bond ratings for future loan requests (Darr, 1998; Fitch Rating, 2002) and stabilizing tax rates (Cohen, 2004; Proctor, 1994).

Suren (1996) uses an actual experience from a not-for-profit healthcare organization to show how careful long-range fiscal planning and resource analysis can help an organization afford capital assets and improve its bond rating at the same time. In this organization, a five-year affordability analysis was conducted to forecast the yearly surplus funds available after retaining restricted funds for operating expenses and bond rating improvement. The analysis takes into account both internal resources derived from board-designated funds and external resources mainly derived from debt financing. The restricted fund was set at a level such that the organization would have a high ratio of debt service coverage. In the first year of analysis, the organization did not have a surplus to invest in capital assets, but the surplus funds were gradually increased as the bond rating improved. This affordability analysis helped the organization to be

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able to afford the needed projects, valued at $595 million, within five years (Suren, 1996).

Since the capital budget is limited, projects identified in the first year of the CIP must be prioritized for funding. The project prioritization criteria should be objective, clear, and well written; officially practiced; and well integrated between capital and fiscal planning (Ammar et el. 2001). The project ranking criteria should include, but not be limited to, legal mandates, statewide strategic goals, and economic efficiency standards to ensure that budgeters consider all relevant information (Millar, 1988; Chan, 2004).

The Government Accountability Office (previously, the General Accounting Office, 1993a, 1993b, 1998) recommends governments split the proposed projects into two groups—investment-based projects and necessary projects—and then rank the projects within each group. This practice will help governments balance funding between necessary projects (i.e., legally-mandated, life-threatening, and safety projects) and investment-based projects (i.e., school and road improvements for economic development).

Since the prioritization process means making policy decisions on capital resource allocations, a value judgment is unavoidable. Nevertheless, this situation does not mean that the policy decision process cannot be improved to make such value judgments more objective, accountable, and goal-oriented. Hatry, Millar, and Evans (1984) observed the capital budgeting process in 10 local governments, surveyed 100 cities, and interviewed capital planning and priority-setting officials from 25 cities to better understand problems in the capital budgeting process. They recommend four practices for integrating value judgments and objective processes in capital decisions.

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First, substantive information from operating agencies should be collected to develop a specific set of project evaluation criteria with reasonably clear definitions and commonly requested information in order to rank project proposals. Second, a systematic rating and ranking procedure should be developed to rank the projects both within individual functional areas and across functional areas. The weighting system should be kept simple and should be guided, reviewed, and approved by elected officials, citizens, and chief executive officers. Third, maintenance options should be addressed; and, thus, agencies must be required to conduct and report condition assessments. Finally, the project criteria should be based on project benefits (Hatry et al., 1984). This practice not only encourages governments to use the budget as a planning tool for developing policy, but also helps in marketing capital decisions to the public.

The most critical aspect that capital budgeting literature accentuates is the need for strong coordination among the three elements; that is, capital planning must integrate fiscal planning, project selection, and whole-program effectiveness. If the capital improvement plan does not effectively link financial plans and program effectiveness analyses, the CIP will be only "a public wish list" and will not ensure the efficient use of public money (American Society of Planning Officials Association, 1980). In addition, a CIP that is linked with the operating budget in terms of future financing, fund and debt management, and future maintenance costs can help stabilize the community's tax rate through financial analysis and planning (Mikesell, 1990).

Strong coordination among the capital planning, fiscal planning, and project prioritization processes has helped the New York City government fund its public infrastructure with more stable outlays from year to year, relative to the fluctuating

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outlays that resulted from the city's previous traditional budgeting practices. According to Proctor (1994), when the city constantly and systematically reviewed its needs, policy priorities, evolving expenditures and revenues, and then brought these analyses together, the city was able to implement its capital improvement program without raising its tax rates. For New York City, the fluctuating capital outlays in the past were caused by the city's chronic deficit. This was because of the hefty amount of debt incurred during the years when infrastructure demands were soaring, and debt had to be issued without careful, long-term planning (Proctor, 1994).

To evaluate government performance in capital budgeting, the National Association of State Budget Officers (NASBO, 1999) and the Government Performance Project (GPP, 1999, 2001) use the following criteria:

- Does the state integrate capital planning in the operating budget and actually use the CIP in making the final operating decisions?
- Does the state develop a clear debt policy and integrate capital planning with debt affordability?
- How does the state establish its priorities for building? Do the criteria reflect the state's capital needs and strategic goals?
- Does the state have—and utilize—appropriate information to justify capital purchases?
- Does the state use objective cost estimation methods to justify project funds?

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- To what degree does the state review cost-benefit comparisons for private-sector participation in capital projects? Does the state review the benefits of long-term leases compared to those of purchasing?

Project Management. The third component is project management. It includes activities such as monitoring, supervising, and evaluating to ensure that the project funds are executed according to the plan (Ammar et al., 2001). Governments should establish central committees to supervise project construction, monitor project performance, track the use of funds, and report progress on funded projects to the central budgeting office (GPP, 1999, 2001). Centralized project management increases government accountability, capital program effectiveness, and funding efficiency (Sermier & Macone, 1993; DuPont & Harris, 1994). Program effectiveness can be achieved when governments are able to detect and solve problems in program execution as early as possible (GPP, 1999). Funding efficiency will be increased since project monitoring prevents cost overruns for large and time-consuming projects (Ammar et al., 2001).

The literature also recommends carrying out performance evaluations to obtain information such as cost per unit output and projected outcomes (Scheps, 2000; Kamensky, 1993). This information helps officials understand how projects are accomplished. As a result, they will be able to choose the least costly projects from all the projects that serve a similar goal in the next round of budgeting (Grifel, 1993).

To evaluate government performance in project management, NASBO (1999) and GPP (1999, 2001) use the following criteria

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- Does the state maintain centralized oversight for capital project implementation?
- Does the state use an effective process for monitoring infrastructure projects and acquisitions throughout their design and construction?
- Does the state establish a tracking system to keep projects on schedule and within budget? How well do state officials track the progress of capital projects?
- Does the state conduct performance analyses and performance evaluations for the funded projects?

Maintenance. Maintenance comprises planning and funding (Ammar et al., 2001). According to Ammar et al. (2001) and GPP (1999), maintenance planning includes assessing the condition of capital stock and tying that information to the actual use and wear and tear on the infrastructure, the depreciation schedule, and the replacement and repair costs. Maintenance funding should be performed in conjunction with planning. The activities include estimating and preparing future funds for the maintenance and repair of existing infrastructure (GPP, 1999). Maintenance should be conducted regularly to avoid deferred maintenance, which usually occurs during economic recessions (Pagano, 2002). An urgent need to fund deferred projects will hinder governments from executing parallel construction with careful financial planning and will result in high infrastructure and borrowing costs (Vogt, 2004).

To evaluate the state government performance in maintenance, NASBO (1999) and GPP (1999, 2001) apply the following criteria:

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- Does the state have a thorough analysis of its infrastructure needs? Does it maintain its infrastructure by adopting a life cycle approach to asset management? Does the state maintain and update an inventory system of capital assets?
- Does the state employ current condition assessments in setting priorities for infrastructure maintenance and renewal?
- Does the state fund maintenance at a level that minimizes the life cycle costs? Does the state ensure that the defined levels of services and safety standards are met?

Intergovernmental Coordination. The first supplementary practice recommended by the GPP (2005) is intergovernmental coordination and networking. This practice involves developing external relations with other governments (i.e., governments at the same level and at different levels) to mutually develop project selection criteria, coordinate infrastructure planning, and identify possible shared resources such as revolving funds and grants (GPP, 2005).

The success of Johnson County, Kansas, in using a Geographic Information System (GIS) to create an infrastructure database among its city governments in capital planning and growth management is evidence of the importance of this element. The county uses GIS to compile data from local capital improvement programs in order to create a repository of capital plans (Hokanson, 1994). The data include project costs, dates, types of improvement, locations, and financing methods for each project. This data repository, which can be updated by the city governments, helps the county

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planning staff to be able to track updated information, coordinate the projects among local governments in urban planning and growth management, assess the need for each project, and know the availability of funding. Because of the networking and planning, Johnson County, which is a fast-growing county in Kansas, could practice capital planning that is more comprehensive and pertinent to countywide goals and could avoid unnecessary funding that might occur from city governments' redundant capital planning processes (Hokanson, 1994).

Another success story of intergovernmental cooperation is a comprehensive debt management program in Saint Paul, Minnesota. The four governments overlapping in the St. Paul tax base cooperated to establish a joint-debt policy aimed at reducing debt burden and increasing municipal bond ratings (Norstrerm, Blees, & Schiller, 1989). The Joint Debt Advisory Committee—comprised of the city mayor and council members, the school district board chair, the St. Paul Port Authority's board members, and the Ramsey County board commissioners—mutually addressed a master bond plan and overlapping debt situation during the ten-year period from 1977 to 1986. The St. Paul budget director and agency staff assisted the committee in identifying general obligation bond needs, determining annual bonding priorities, and setting the joint debt policy goals. In the implementation period, the city treasurer and budget director closely monitored general obligation per capita debt and debt as a percentage of market value. The proposed projects were funded based on the identified bond priority. The program progress was tracked and reported to citizens, elected officials, and bond rating agencies annually in conjunction with the city's sale of general obligation debt.

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As a result of the joint debt program, the overlapping general obligation debt pledged by the St. Paul tax base declined from $286 million in 1976 to $223 million in 1985. The per capita debt was reduced from $983 in 1977 to $836 in 1985, and the general obligation debt, as a percentage of taxable property value, decreased from 9 percent to 6 percent from 1977 to 1986. A good share of this decline was due to the substantial reduction in school district debt. The city's bond rating was improved from AA to AAA. In addition to financial benefits, the cooperating debt management strategy reinforced a positive working environment and shared perspectives among elected officials and capital budget staff (Norstrerm, Blees, & Schiller, 1989).

The success stories from Johnson County and St. Paul suggest that intergovernmental cooperation helps reduce inefficiency that would result from duplication of projects and uncoordinated financing plans. Furthermore, it helps governments make better decisions not only on the amount of capital resources spent, but also on the location where the resources are spent. For economic development purposes, misallocating scarce resources can be a more serious problem than inadequate capital funding since the spending will be meaningless in attracting new investments and in creating jobs (Haughwout, 2000).

Internal Coordination. The last supplementary practice recommended by the GPP (2005) is internal coordination. The GPP (2005) states that a good capital management program should comprehensively manage its infrastructure by effectively coordinating project planning among intra- and inter-state agencies. Capital infrastructure provision and maintenance processes involve overlapping responsibilities

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from various state agencies. The mutual planning among agencies helps to reduce and consolidate the number of project proposals from various agencies that may be redundant. The program function-based budgeting practice helps to increase resource allocation efficiency since the proposed projects are prioritized and funded according to the programs' proposed benefits as compared to their cost.

In addition to coordinating agency planning, the capital management literature suggests that capital management program managers should assure that effective legislative involvement occurs throughout the capital planning and budgeting processes (NASBO, 1999, 1997; GPP 2005). This practice solicits political inputs, understanding, and agreements; it also prevents the political disagreement that might occur if the political and management staff were to focus on different goals in capital management programs and use different techniques to justify the processes.

In conclusion, the capital budgeting and management practices recommended by the literature are considered to be systematic, strategic, and knowledge-based information processes. The four key components are designed to help governments evaluate current environments and to anticipate and respond appropriately to future changes by setting their visions, identifying effective policies, and committing to effective implementation processes. Success stories discussed in this section indicate that the four components are synergistic in reforming the capital budgeting process. The next section distinguishes the characteristics of the systematic capital budget and management process using two theories, public strategic management and budgetary institution.

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The Characteristics of a Systematic Capital Budget and Management Process: Two Parallel Frameworks

In order to identify the benefits of the systematic process, functions and characteristics must be distinguished. This section uses two theories—public strategic management and budgetary institution—to explain how the process and its components work in government infrastructure management and capital resource allocation process, respectively. The systematic process in each of the two theoretical frameworks is discussed in turn.

Public Strategic Management Theory

The literature suggests that a systematic capital management program closely parallels the fundamental concepts of performance management (Kamensky, 1993), rational management (Grifel, 1993; Miller, Rabin, & Hindreth, 1987), strategic management (Poister & Streib, 1999; Streib, 1992), and results-oriented management (Kettl, 1997). These management approaches share the goal of strengthening organizational effectiveness and of emphasizing the need to integrate all major activities and functions in order to direct them toward advancing organization-wide strategic goals or fundamental policy agendas. Program outputs are used as implementation benchmarks and foundations in identifying implementation means or directions. All managerial decisions and actions including planning, organizing, directing, coordinating, supervising, and budgeting must be performed because integrated managerial activities

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blend future-oriented thinking, objective analysis, and subjective evaluation (i.e., citizen values) as they shape and guide the organizational missions, courses of actions, and justifications for actions (Koteen, 1989).

In addition to program effectiveness, these management approaches insist on operating efficiency so that the organization can achieve its goals at the lowest cost. Such an approach is usually adopted when organizations have limited resources but are still required to produce a given amount of output (Kettl, 1997; Reed & Swain, 1997). Strategic management approaches complement public management programs since their holistic approach in strategic management helps governments in such situations focus more on solving social problems in ways that truly pursue the public interest rather than on maintaining bureaucratic processes, internal management, and control (Kettl, 1997).

Poister and Strieb (1999) outlined the governmental strategic management model as follows. First, an organization identifies its missions, values, and visions. This process is brainstormed by involved stakeholders (i.e., program clients) to elicit different values, integrate these values, and ensure commitment in the execution of the project. The organization then adopts and performs four key managerial processes in driving itself to achieve its defined goals. These processes are usually performed at the same time and are integrated into one management process, even if they have competing values, because they are synergistic in increasing organizational effectiveness and operating efficiency. The four managerial processes are:

- *External Relations Management* which includes such activities as customer or constituent interfaces, intergovernmental relations in coordinating and planning, and legislative agenda analysis and adoption. These activities solicit inputs for

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strategic planning, draw upon existing expertise and new technologies, establish cooperation in program implementation, and seek common norms for program evaluation.

- *Program Goal and Service Management* which includes detailed program planning, project management, service and resource management, program evaluations, and performance measurement. These activities are key vehicles in executing processes to ensure that program goals and efficiency will be achieved.
- *Internal Program Management* which involves program budgeting, financial management, and performance management to make funds available for government programs or courses of action. This activity is vital in providing financial support to achieve program goals. These activities bring efficiency to program operations by controlling the use of resources through the coordination of program inputs with outputs or outcomes.
- *Internal Relations Management* is concerned with internal communication and staff relations (i.e., elected and appointed officials, central budgeters, and project managers). This process is necessary since there is more than one government unit executing the capital budget and management process. Skilled administrators usually try to nurture organizational cultures and values while ensuring that the execution process runs according to plan.

The goal of a systematic capital program is to allocate capital resources so that an optimal investment can be achieved in order to address social problems and enhance productivity. The implementation process of a systematic capital program requires the

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four synergic managerial processes. These characteristics make the systematic capital program equivalent to the strategic management program.

Table 1 presents a comparison between the strategic management model and the capital management model. Each management process in the strategic management model is shown in the first column along with the prescribed capital management practice (identified by the systematic capital program) in column two. As shown in the first row, for example, both models require administrators to identify a strategic goal (i.e., economic development) in order to set the government's course of action. Establishing an intergovernmental relations network in the capital management model fulfills the external relation management required in the strategic management model. Long-range capital planning, project management, and maintenance are equivalent to program goals and to service management in the strategic management model. Capital budgeting supports internal program management, while fiscal-rule compliance and internal coordination support internal-relations management as required in the strategic management model.

Public Budgetary Institution Framework

The policy study literature points out that the political institutions and the policy process in a state have profound effects on the ability of the state to make policies (Howlett & Ramesh, 2003). Howlett and Ramesh (2003) explain that in the U.S. government, the legislature is the core of the policy-decision process, and interest groups often dominate the process. Such an institution encourages a situation where group demands and benefits dominate and are pursued.

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TABLE 1

A Comparison of Capital Management Model and Strategic Management Model

Strategic Management Model (Poister & Strieb, 1999)	Capital Management Models Prescribed by Public Capital Management Literature	Activities
Resulted-Oriented Management	**Resulted-Oriented Management**	
Establish an organization's shared values, duties, and visions in order to set the whole strategic goal and the expected results.	Establish basic infrastructure policy (both by formal and informal policies) to serve two purposes: 1) to solve basic resource allocation and management problems by providing optimum quantity and quality and the right mix of capital assets, and 2) to pursue public interest through growth and productivity enhancement.	Identify the legislative agenda, obtain input from those elected and their constituencies; and analyze and define strategic goals.
External Relations Management	**Intergovernmental Network Management**	
Practice external relations management to solicit outside inputs, opportunities, and cooperation.	Practice intergovernmental ordinations to create an infrastructure management network among different government levels to establish regulations, coordinate project planning, and identify pooled resources (i.e. grant seeking).	Work on intergovernmental relations and citizens' inputs.
Program Goal and Service System Management	**Long-Range Multi-Dimensional Capital Planning and CIP**	
Practice program goal and service management to achieve the strategic goal defined by the shared vision.	Practice long-range and multi-capital planning to derive the CIP in which the schedule, cost, and impacts of the projects are contained. The CIP converts the general planning into detailed planning which identifies projects needed and details of the projects including location, types, and costs of public improvement that is appropriate for present and future benefits.	Work on program planning and evaluation, project and program management, program delivery system maintenance, and performance measurement.
	Project Management and Monitoring	
	Practice project management to ensure an effective process for monitoring infrastructure projects throughout their design and construction, track the budget usage, detect problems at the early stage, and prevent cost overruns.	
	Maintenance	
	Practice infrastructure maintenance in two aspects: planning and funding. The first aspect is to detect wear and tear assets, while the latter is to compare repair cost versus replacement costs. These activities ensure efficient use of capital resources.	
Internal Program Management	**Capital Budgeting and Programming**	
Practice internal program management to ensure that result-oriented programs and projects are adequately funded.	Practice program budgeting in which projects are prioritized according to program function and input usage is controlled, instead of using line items to achieve program goals.	Work on performance budgeting, financial management, performance management, and auditing.
	Adopt and use innovative/diverse/appropriate financing strategies in order to fund a project at the least cost for the given quality.	
	Practice prudential financial and debt management to maintain a good bond rating for future funding purposes.	
	Practice performance management or program audits in order to ensure technical efficiency (low cost per input unit in the production process).	
Internal Relations Management	**Fiscal Rules Compliance and Coordinating Central Committees**	
Practice internal relations management to ensure coordinated operations among involved entities.	Follow the fiscal rules (i.e., debt restriction, political demands and directions) and get political staff's input and involvement in the budget document preparation stages. This is to secure the shared values and vision during the allocation processes.	Focus on internal communications and comply with institutional rules, while operating programs.
	Practice internal coordination to comprehensively manage infrastructure by effectively coordinating project planning among inter and intra-agency and offices.	

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As a result, the government is not independent from self-serving and conflicting social pressures in the policy process. The division of powers between the executive branch and the legislative branch promotes difficulties for policy makers in generating and implementing effective policies, since unity between the two branches rarely exists (Howlett & Ramesh, 2003).

According to Howlett and Ramesh (2003), such a fragmented government institution has both an advantage and a disadvantage. The advantage is that the check-and-balance system and the separation of powers prevent each branch from generating ill-conceived predatory policies that benefit only the state elites, which would eventually lower general society welfare (Migdal, 1988). The disadvantage is that the policy outputs responsive to group demands may worsen welfare of the society as a whole (Olson, 1965). The latter case occurs when the decision-making process lacks institutional rules that can compel the decision-makers to internalize the aggregate social welfare into their personal decision making accounts (Poterba & Von Hagen, 1999).

In the fiscal policy context, Poterba and Von Hagen (1999) use a common pooled resource framework to explain collective action problems including overspending, inefficiency, and high debt burden in which the decision makers perceive personal cost lower than the social aggregated cost. In such a situation, the decision makers try to consume government central funds, which are equivalent to a common pool, as much as possible; and, as a result, the policy outputs serve personal or group benefits at the cost of the social aggregate. Aizenman and Powell (1998) refer to this behavior as "non-cooperation," (p. 68) which often leads to resource misallocation and to overspending problems.

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Political economy researchers, including Alesina and Perotti (1999), Valasco (1999), Poterba and Rueben (1999b), Von Hagen (1992, 1996), Campos and Pradhan (1999), Alt, Lassen, and Skilling (2000) maintain the view that if the budgetary institution has rules and procedures that are effective in compelling decision makers to realize the true social costs (or negative externality), collective action problems may be alleviated. These researchers assert that the budgetary institution, which is equivalent to regulations for common pooled resource consumption, has a significant effect on fiscal policies that are the outputs of the decision-making process.

Alesina and Perotti (1999) define the budgetary institution as "all rules and regulations according to which budgets are prepared, approved, and carried out" (p.14). De Hann, Moessen, and Volkerink (1999) and Von Hagen (1992, 1996) provide elements in the budgetary institution and characteristics and predicted effects on fiscal policy outputs in this way:

1) *The Position of the Minister of Finance (or budget director) in a Decision-making Organization*: This factor refers to the situation in which the central budget office and its director have a major role in setting the total amount of spending and debt in the apportioning process. By their job responsibilities, the finance director and the central budget office are constrained by the consideration of social welfare. If the finance director and the central budget office have a significantly influential role in determining the total amount of spending and debt level, the decision-making process is centralized in terms of fiscal planning, spending, and debt level. As a result, the appropriation process is less likely to produce over-spending and indebtedness.

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2) *The Position of Legislature:* This factor refers to the situation in which the legislature has strong power to change or negotiate the budget proposed by the executive. If the legislature does have such strong power, the decision-making is likely to be more fragmented than centralized. Since the geographically-based representatives are more concerned with their local constituencies' benefits than the benefits to society as a whole, the decision makers use their power to negotiate with the executive in the decision-making process. This situation makes it difficult for the executive to pursue its policy goals and results in policy outputs that are diverse and lack a central point of implementation.

3) *The Presence of Constrains* (or budget rules): This factor refers to the situation in which various kinds of binding constraints, ranging from constitutions to political agreements, are present. Such rules and regulations include balanced budget requirements and statutory debt limits. If such rules and regulations are present, the decision-making process tends to be centralized because the rules compel the decision makers to internalize the social cost into their personal accounts.

4) *The Transparency of the Budget:* This factor refers to the situation in which a budget document contains comprehensive fiscal information, a future debt plan, economic status of the jurisdiction, and whether or not the budget is easy to understand. If the budget is transparent and comprehensive, opportunistic behaviors (in terms of both branches choosing to spend at the expense of the whole society) are easily detected, and the true economic situation is revealed. As a result, opportunistic behaviors are controlled or reduced.

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5) *A Long-term Planning Constraint*: This factor refers to the situation in which the budget is formulated based on long-term planning and the spending agencies (both at vertical and horizontal levels) have planning autonomy. The first dimension pertains to the hypothesis that if the budget is tied to a multi-year plan, fiscal stability will be achieved. The second dimension pertains to the assumption that the greater planning autonomy of the spending agencies, the less centralized the budget will be and the more fragmented it will be since different proposals yield benefits to different groups.[2]

The budgetary institution framework by De Hann et al. (1999) and Von Hagen (1992, 1996) parallels the systematic capital budget and management process. Both frameworks advocate centralized fiscal planning (element 1 and 3), consolidated spending plans to achieve statewide goals (element 5), and the use of a transparent budget document (element 4). Both frameworks share the common goal of applying budgetary procedures to mitigate inefficient, careless, and ineffective capital spending problems that are likely to occur in an environment where the political institution has strong negotiating power in treating a capital budget as a political asset (element 2).

Table 2 presents a comparison between the systematic capital practices and the budgetary institution. Columns 1, 2, and 3 of the table present budgetary procedures, activities, and predicted fiscal policy outputs characterized by budgetary institution

[2] De Hann et al. (1999) added "The Flexibility during Execution of the Budget" as the last element in their framework. The concept for this element is that if a budget bill is strongly limited by law (measured by the possibility of a government to propose supplementary budgets during the implementation process), the budget is highly decentralized since there is no tool to bind decisions with implementation. Because this element is less relevant to the systematic capital budget and management framework, it is excluded from the comparison table and from the text.

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theory. Activities in column 2 (except for row 2, legislative power) indicate centralized activities which are expected to help mitigate non-cooperative behaviors. Non-cooperative behavior refers to the situation where geographically-based representatives choose to spend in order to benefit their local constituents at the expense of society as a whole (Aizenman & Powell, 1998). Column 3 of the table provides the predicted policy output due to a centralized budgetary procedure, except for row 2 of the column, which presents the results of a fragmented political institution. Column 4 of the table presents the activities or practices recommended by each component in the systematic capital budget and management process. Column 5 of the table presents the goals of adopting and conducting each of the systematic practices as identified in both normative and single-case study literature.

The table shows that the budgetary institution theory and the systematic capital budget and management framework share the common value of advocating centralized activities to promote prudent spending, efficiency (in terms of resource distribution), and effectiveness (in terms of resource allocation goals). For example, row 1 of the table indicates that centralized fiscal planning practiced by the central budget director in a budgetary institution is equivalent to the fiscal planning and debt management recommended by the budgeting component of the systematic capital budget and management process. The two activities have the same goal of enhancing fiscal discipline and prudent debt management. Row 3 indicates that budget constraints advocated by the budgetary institution are equivalent to clear debt policies advocated by the budgeting component of the systematic capital resources. These activities share

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TABLE 2

A Comparison of Capital Management Model and Budgetary Institution Model

Budgetary Institution Theory (De Hann et al. 1999)			**Systematic Capital Budget and Management Model**	
Element	*Roles/ Activities*	*Predicted Policy Outputs/Goals*	*Recommended Practices*	*Expected Spending Outputs/Goals*
1. Budget Director and Central Budget Office	Has significantly influential role in recommending spending and debt levels, sets the total amount of spending before appropriation process.	Fiscal discipline, prudent spending and debt management. This output results because the recommended spending prevents decision-makers from over consuming from the common pool (total government fund).	Budgeting Component: Fiscal planning, matching between capital needs and fiscal resources. Innovative financing strategies. Prudential debt management and bond improvement.	Fiscal discipline and prudent spending which help free government cash flows from unfavorable situations due to too high debt service burdens.
2. Legislative Power	High negotiating power awarded by the Constitution. Political institution tends to use this power to treat capital projects as a political asset, mainly for re-election purpose.	Non-cooperative behavior: geographically based representatives are concerned more for the local constituency's benefits than statewide benefits. Policy is diverse due to the lack of government consensus. Policy is hard to enact due to highly social conflicts.	Capital Planning Component: Identify the legislative agenda, obtain inputs from those elected and their constituencies, encourage political involvement in the capital planning process.	Shared values, duties, and visions are expected to prevent agenda conflicts between the executive and legislative branches.
3. Budget Constraints	Balanced budget rules, statutory debt limits, tax and spending limits	Fiscal discipline, prudential spending and debt management. This output results because the rules compel the decision makers to internalize the aggregated social cost into their personal decision-making accounts.	Budgeting Component: Adopt and commit to clear debt policies (i.e., debt service limits).	Fiscal discipline and prudential spending which help free government cash flows from unfavorable situations due to too high debt service burdens.
4. Budget Transparency	Transparent budget present comprehensive information including fiscal, spending, and debt plans. Transparent budget is easier to understand compared to an ambiguous budget that includes numerous special accounts, but it fails to consolidate all fiscal activities into a single bottom line. (Poterba & Von Hagen, 1996).	Opportunistic behaviors (choose to consume more due to political uncertainty) are easier to be detected in a budget plan. True aggregated social costs can be seen easily in comparison with benefits received by different groups.	A separate capital budget which is distinct from the operating budget. Contain capital process information, appropriation plan, financial sources and distribution summarization, and debt affordability analysis and debt service plan.	Budget format influences the nature of budget deliberation by suggesting what the conversation is about and what the focus will be (Grizzle, 1986). A separate capital budget makes capital and fiscal planning necessary since the distinct budget requires reporting sources and appropriation summarization (Mikesell, 1999).
5. Long-term Financial Planning Constraints	A budget is formulated based on long-term fiscal and physical planning. The more planning autonomy by the agencies, the more decentralized the budget. This situation generates the need for governments to consolidate capital plans at the top management level.	The decision-makers are obliged to commit to the multi-year plan. If the multi-year plan is centralized enough, the opportunistic behaviors and resource misallocation are reduced. If the multi-year plan is decentralized, the adverse effect occurs—that is, the fiscal resource is tied up with an inefficient plan for multiple years.	Capital Planning and Maintenance Components: Conduct a capital improvement program (CIP) to match capital needs with resources and to set investment timing. The CIP encourages different groups who favor different projects to commit to the central plan in favor of the whole social investment cost.	The CIP reduces duplication projects, inefficiency, and ineffectiveness. The capitals resources are programmed to be allocated where needs are the most—thus making resource allocation more effective.

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the common goals of reducing opportunistic behaviors[3] and promoting fiscal discipline.

In row 4, the budgetary institution framework advocates a transparent budget, which is equivalent to a separate capital budget in which comprehensive information about sources of revenue, an appropriation plan, and spending and bond plans are required. Both requirements of the two frameworks are designed to assure that the decision makers perceive the true aggregated social costs and benefits of funding received by various groups. The last row shows that long-term financial and capital planning by the budgetary institution and the systematic capital budget and management process share the characteristic of ordering resource allocation activities within a multi-year framework. These activities consolidate and order various types of spending to ensure that the resources are allocated where they are most needed.

The Strategic Practice Adoptions and Results

A systematic or strategic capital management program is typically viewed as an idealistic but impractical process (Nunn, 1990; Rubin, 1988) because it requires time, skilled personnel, advanced technology, cost-planning, and a thorough analysis of information—all of which are limited resources in governmental organizations (Rubin,

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[3] The non-cooperative government will have a strong bias toward excessive indebtedness simply because the current governments expect that the next administration will be the one to cope with it. The opportunistic behavior is a result of non-cooperative behaviors combined with uncertain political situations. Tabellini and Alesina (1990) explain that if there is uncertainty about which party will win the next election, the party currently in office will choose to run a deficit to constrain the public spending choices of a potentially different future government. Simply put, the uncertainty in political institutions and the imperfect information about the other competing groups' actions promote the decision makers' opportunistic behaviors where the competing groups prefer to use government funds at the present time rather than waiting for the future (which is uncertain). As a result, the common pooled resources are consumed on a current basis without concern for future benefits or aggregated cost to the society.

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1988). Political institutions, which are less committed to long-term processes and more focused on short-term goals, usually dominate the decision-making process (Zax, 1985). For these reasons, Nunn (1990) contends that governments do not always systematically plan infrastructure budgeting.

There is mixed evidence as to whether the strategic model can be integrated in real capital management programs. Forrester (1993) conducted mail surveys for municipal finance directors of large cities (population higher or equal to 75,000 inhabitants) to obtain information regarding the use of a systematic capital budgeting process. The results from 120 cities indicate that most cities implemented long-range capital planning (namely the CIP) in adopting a separate capital budget. However, since short-term focused analysis (which requires less information) and a streamlined budgeting process (which focuses on reaching short-term consensus and an annual budget balance) are more pragmatic than following the plan, a separate capital budget did not change the actors' orientations toward a strategic management model (Forrester, 1993).

Survey data from 400 counties show a strong relationship between adopting a separate capital budget and the CIP preparation, and show a relationship between the CIP and infrastructure maintenance programs (Halachmi & Sekwat, 1997). Although this study empirically suggests that strategic management can be used in capital budgeting, it is limited in indicating whether governments follow their long-term plans in appropriation processes and in detailing the benefits of the planning.

Beckett-Camarata (2003a) investigates these factors. Using survey data from 432 large cities (population equal or greater than 75,000 inhabitants), she finds that the cities that have written capital and fiscal plans that are tied to the city's goals, objectives, and

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mission statements tend to have higher per capita general fund balance and higher per capita long-term debt burdens than those of the cities that do not implement strategic planning. Using Streib and Poister's (1990) strategic management model, Beckett-Camarata asserts that a higher general fund balance is a result of carefully prioritized spending which occurs when the city governments link their budgeting process to city goals, objectives, and mission statements, while they monitor performance and use information from performance evaluation in the decision-making processes. She further asserts that the higher per capita long-term debt reflects the city's better credit to borrow in order to fund capital projects according to capital needs. The significant effects of strategic planning on the two financial indicators, increase in per capital general fund balance, and per capita long term debt, imply that strategic planning implementation adds financial and economic benefits to the cities.

Does a systematic capital budget make any difference on infrastructure? Zax (1985) asserts that capital management processes based on systematic and strategic practices will result in better infrastructure that can effectively attract private investments and new residents. This is because technical and professional systems, usually found in a community that has strong administration processes, treat capital spending as an investment tool to shape communities. In constrast, the unsystematic budget process, typically found in a community that has a dominant political institution, treats a capital budget as a political asset; and, thus, lacks economic development goals (Zax, 1985). Duffy-Deno and Dalenburg (1990) tested Zax's assumption by investigating the relationship between city government administration systems and cities' per capita public capital stocks. They found that the cities that are administrated by city-mangers have less

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per capita public capital stock than the cities that are administered by elected mayors. This finding supports Zax's assumptions in that the elected officials spend more on capital assets compared to appointed officials because they regard infrastructure investment as a political asset.

Capital Budgeting and Management in Practices

During the last four decades, most states have gradually changed their capital processes from simple ones to systematic ones. In the 1960s, 90 percent of the states practiced simple capital processes in which long-term planning was not conducted (Hillhouse & Howard, 1963). Forty years later, systematic capital and fiscal planning was conducted by 90 percent of the states (Ebdon, 2001). These statistics indicate that the states have gradually changed their capital management practices from simple to systematic processes.

Hilhouse and Howard's (1963) comprehensive survey of state capital budgeting indicates that in the 1960's only five states coordinated long-range capital planning and strategic goals with capital budgeting; only six states had clear, objective, and strategic criteria for appropriating funds; and only one state reported depreciation in the year-end financial statement. Based on these results, they conclude that most states needed better coordination between capital planning and budgeting, better criteria for project selection, and better planning analyses. This conclusion implies that in the 1960's, most states had not strongly committed to a systematic capital program.

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By the1980s, more states had adopted systematic capital practices including a separate capital budget.[4] In fact, 17 states had a separate capital budget (GAO, 1986). The use of a separate capital budget suggests that more states were trying to coordinate capital planning and fiscal planning. However, in reality, most states were not conducting a multi-year capital improvement program (CIP) because capital funding was more driven by general revenue than by debt financing, in which long-term planning and need analysis are necessary. Among the states using debt financing, 15 states coordinated projects' useful lives with the debt service schedules (GAO, 1986).

In the1990s more states moved from simple to systematic practices. In 1999, only nine states did not formally coordinate capital planning with the budgeting process (NASBO, 1999). Twenty states had established clear function-based criteria for project selection. Among these, 14 states formally prioritized projects based on critical needs, legal mandates, the governor's or legislative body's prioritized policies, and available funds. The remaining six states practiced informal project prioritizing; although they did have established criteria. These results indicate that almost half of the states were committed to program budgeting. Seventeen states did not conduct maintenance management by setting aside a maintenance fund, and almost half of the states (23) did not conduct a systematic maintenance program (i.e., facility inspection and need assessment). Overall, the states were moving toward more systematic capital planning and programming.

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[4] In a separate capital budget, capital expenditures are separated from operating expenditures and the budget deficit/surplus is defined as revenue less operating expenditure. The separate capital budget approach is in opposition to the unified budget approach since the latter treats capital expenditures as items in a budget document. In the unified budget, capital and operating expenditures are expensed in the period incurred; and thus, budget deficits or surpluses are defined as the current period's revenue less total expenditure (Gordon, 1983).

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As of the beginning of 2000, only five states did not have a CIP, and 32 states had a CIP that covered at least five years (Ebdon, 2001). Only seven states did not include state strategic goals in project prioritizing criteria. However, among the 40 states that did, only 10 states ranked the projects across agencies, and 30 states ranked projects only within an individual agency.

Table 3 summarizes the descriptive statistics for state capital management programs from 1960 to 2000. The main elements reported in Table 3 include planning effort, program budgeting effort, and maintenance commitment. The indicators for planning effort include the CIP usage and coordination between planning and budgeting. The indicators for program budgeting effort include formal project selection criteria and the ranking of projects according to their functions and across agencies (as in contrast to ranking a project within an individual agency). The indicators for maintenance commitment include depreciation accounting and set-aside maintenance funding. Overall, Table 3 shows that most states had adopted a long-range capital planning process by 2001, about half of the states practiced systematic maintenance, and less than half of the states actually carried out program budgeting.

TABLE 3

Systematic Capital Management Programs by States: 1960-2000

Period	Planning	Program Budgeting	Maintenance
1960s	5	6	1
1980s	17	Data not Available	Data not Available
1990s	41	14	27
2000s	45	Data not Available	Data not Available

Sources: Hillhouse & Howard, 1963; GAO, 1986; NASBO, 1992, 1999; Ebdon, 2001

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In conclusion, most states have gradually adopted and practiced a systematic capital management program since the 1960s. More states in the 1990s and 2000s adopted the capital management practices suggested by the literature. However, there is variation in the implementation of state capital management programs. The variations in capital practices due to state capital budgeting policies resulted from state constitutional or statute requirements (i.e., debt restriction rules) and traditional management practices used by capital budgeting and management staff (Vogt, 2004). These policies shape state capital program implementation by defining program processes, identifying roles and responsibilities of capital staff, establishing limits, and giving the capital process legitimacy and continuity.

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CHAPTER 3 GOVERNMENT POLICIES AND ECONOMIC GROWTH

This chapter addresses the relationship between state capital spending and state economic growth. In studying regional literature, there are two major governmental factors relating to state economic growth that stand out: 1) fiscal policies (tax and expenditure) and 2) public infrastructure. This chapter is comprised of two sections. The first section characterizes the relationship between fiscal policies (including tax and expenditure) and economic growth. Since capital spending is one among other fiscal policy outputs, the theoretical assumptions for the roles of capital spending and its financing methods on economic growth are also discussed. This section also shows the influence of economic analysis, political institutions, and administrative practices on the fiscal policy decision process since these elements mutually determine fiscal policies that are considered to be an output of the policy process.

The second section specifically characterizes the influence of state infrastructure (namely public capital stock) and capital spending on economic growth. The relationships between public capital spending and economic growth and between public capital stock and economic growth presented in this chapter establish testing models that respond to the two research questions previously set:

- What is the tangible benefit of a systematic capital management program recommended by the literature? Can better strategic management make government capital spending and infrastructure management more effective?

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- How is the capital budget and management process executed in an environment where the political institution has a significant influence on the decision-making process?
- Do the strategic practices lead to better results; and, if so, in what way?

Fiscal Policies and State Economic Growth

This section addresses the roles of fiscal policies on economic growth as postulated by the economic literature. It also discusses the roles of political institutions and administrative practices on fiscal policy outputs in order to lay a foundation for the case study questions in the next chapter.

Economic Growth Theories

There are two theories that explain how an economy grows: the exogenous model and the endogenous model. The exogenous growth model (Solow, 1957) asserts that government policy measures (e.g., tax cuts, spending, investment, and subsidies) have no long-term effect on an economy's growth rate. This is because the economy always moves toward its steady state, or "balanced growth path," where its permanent growth rate depends only on the rate of technological progress. Davarajan, Swaroop, and Zou, (1996) explain that for this model, public spending, taxing, and investment would affect

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only the economy's transitional growth rate; the steady-state growth rate would remain unaltered.

The endogenous growth model (Barro, 1990; Barro & Sala-i-Martin, 1992), on the other hand, argues that policy measures can have an impact on the long-run growth rate of an economy. The model hypothesizes that subsidies on research and development, educational spending, and infrastructure investment have a significant impact on an economy's growth rate. This is because these factors positively alter the economy's production function by promoting technological progress and investment (Barro, 1990).

Barro (1990) constructs an endogenous growth model that includes public service as a productive input for private producers. The model was extended to have three versions, according to the characteristics of the public services provided: publicly provided private services (rival and excludable), pure public services (non-rival and non-excludable), and publicly provided services that are subject to congestion (see Barro & Sala-i-Martin, 1992). According to Barro and Sala-i-Martin (1992), most of the core infrastructures provided by public spending (e.g., highway, water, sewage systems, and courts) are subject to congestion. In contrast, educational and health services are a combination of pure private and pure public services.

The growth model in the congestion version suggests that production satisfies constant returns to private input as long as the government provides public goods in proportion to the rise or decline of the numbers, or the usages, of private producers (Barro & Sala-i-Martin, 1992). Therefore, according to this model, financing public infrastructure that is subject to congestion by sales tax or user fees that can be collected in

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proportion to the level of output is superior to using income taxes, which discourage producers (including labor and entrepreneurs) from entering the production process. User fees that are equalized to private and social returns on output reflect private consumption, internalize congestion, and prevent private producers from excessive consumption. In contrast, for income taxation, since private producers would not have to be concerned about their consumption, the excessive use of public services leads to economic growth; but at the same time, it also leads to congestion.

Fisher and Turnovsky (1998) support Barro's model of endogenous growth by asserting that tax financing of public infrastructure being subject to congestion has both contractionary and stimulating effects. According to these authors, on one hand, income tax finance spending that is not consistent with consumption would be contractionary. On the other hand, the income tax and user fees will stimulate growth since collecting tax at the rate of consumption level will guarantee that public infrastructure will be provided and replaced proportionately to consumption. Thus, the endogenous model suggests that the growth rate would increase under tax finance spending if the tax rate is the optimal tax rate.

Fisher and Turnovsky (1998) further postulate that using both user fees and optimal income taxation at the same time would then enable the effects of income tax and expenditures to be decoupled. The results would depend on two factors, the degree of substitution between public and private capital and the degree of congestion. Their model suggests that financing public infrastructure by user fees and sales taxes would increase growth where private and public capitals are highly substitutable and where public goods are highly congested. On the other hand, user fee and sales tax financing will reduce

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growth if the degree of congestion is high and if public and private capitals are not substitutable. From this perspective, at the aggregate level, if most public infrastructure is subject to congestion, the degree of substitution between public and private capital should be the key in selecting modes of public infrastructure financing.

Fisher and Turnovsky's (1998) assumption stimulates further questions: Does public infrastructure work as a substitute for private capital? Does public capital do the same for different sectors of private production? Pereira and Andraz (2003) empirically find that, on the aggregate level, public capital supports private investment (elasticity is 0.397) and has a positive impact on private output (elasticity is 0.047). However, at the disaggregate level, public capital does not support private investment and output in the same way across production sectors. Public infrastructure promotes private investment in manufacturing, communication, and utility sectors, while enhancing private output in manufacturing and transportation.[5] These findings, when combined with Fisher and Turnovsky's (1998) and Barro's (1990) assumptions, imply that government decisions in taxing and spending may have an indirect impact on growth through fiscal policy outputs.

Political Institutions and Fiscal Policy Outputs

Lowry, Alt, and Ferree (1998) find that voters' reactions to tax and spending policies differ according to party ideology—that is, Republican gubernatorial candidates lose votes if the party's decision-making results in unanticipated increases in the size of

[5] Chandra and Thompson (2000) also empirically found that an increased interstate highway significantly raised economic growth through increased earnings in manufacturing, retail trade, services, and utilities.

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the state budget; while the Democrats are rewarded for small increases. The tax burden is higher in unified governments that are led by Democrats than by those led by Republicans (Alt & Lowry, 1994). Further, the states that have a Democratic governor are found to have higher spending levels than those in states that have Republican governors (Besley & Case, 1995). Tabellini and Alesina (1990) use econometric analyses to show that if there is political uncertainty, i.e., which party will win the next election, the incumbent party eligible for reelection will run a budget deficit to constrain the public's spending choices in a potentially different government in the future.

The literature suggests that political parties use fiscal policies as instruments for their next elections, rather than being concerned for fiscal policy outcomes (i.e., unemployment rate, deflation rate, or per capita income growth). In other words, the decision-making for taxes and spending conducted by the political institution are led by maximizing voting motivation, rather than being led by objective analysis. This mindset exists because the voters hold the political representatives accountable for tax and spending rates as a result of policy outputs instead of by fiscal policy outcomes (i.e., economy as a whole).

When economic situations are controlled for, voting maximization behavior is less present. To understand how political institutions make decisions when economic situations are taken into account, Dilger (1998) conducted separate multiple regressions to empirically examine the effects of 1) the governor's partisan affiliation; 2) the state's legislative partisan competition (whether the state legislature's upper and lower house had Democratic or Republican majorities or were divided); and 3) a state government interaction variable (whether the governor and a majority of both of the state legislature's

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houses were Republican, Democrat, or divided) on the yearly marginal change on overall state spending, overall state taxes, the five separate spending areas (health, education, welfare, correction, and highway) and debts. Each regression analysis has economic variables (per capita income and unemployment rates) and demographic variables (urban density and population size) as control variables.

Dilger's (1998) results indicate that partisanship did not have a significant impact on marginal changes in overall state taxing and spending policies—except on education policy when economic conditions were controlled for. A governor's partisan affiliation has an impact on the change in state education spending—that is, educational spending will increase about 4.3 percent, on average, if the state has a Democratic governor. Partisanship in a state's legislature had a significant impact on change in state debt—that is, state debt increases about 23 percent, on average, for states having a Democratic state legislature.

The above findings indicate that when economic situations are controlled for, aggregated taxes and spending are not determined by political institutions. However, in the same situation, disaggregated policies—including education and long-term debt (usually incurred by capital investment)—are determined by political institutions. In other words, political institutions do not explain aggregated taxing and spending levels, but they explain the composition of taxing and spending policies which reflect government financial decisions in resource allocation and distribution. Based on Dilger's (1998) findings, aggregated taxing and spending levels are determined by economies, not by political institutions. Kontopoulos and Perotti's (1999) assertion is supported by Dilger's findings that if the total amount of spending is set prior to the appropriation

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process by the finance director, overspending and debt problems tend to be reduced. In such a situation, however, misallocation and inefficient spending may occur since the geographically-based representatives choose the policies that benefit their local constituents rather than choosing the polices that benefit society as a whole.

Administrative Practices and Fiscal Policy Outputs

Robert D. Lee (1991, 1992) asserts that state budgetary processes, including budget preparation, budget documents, and the use of program analysis may affect state fiscal policy outputs. For the first element, Lee (1992) points out that if state central budget offices set the specific dollar ceilings on state agencies' budget requests in advance, state agencies may prepare their budget requests based on program priority and financial possibility. As a result, different types of spending policies appeared to be increasing or decreasing, depending on the priority of the programs set forth in that year (Lee, 1992). According to him, this practice helps state governments to better target their spending based on program effectiveness and fiscal capacities. Lee (1992) refers to this practice as a "fixed ceiling" method in budget preparation (p. 20). His survey results suggest that in 1970, about 59 percent of the states did not use the fixed ceiling method in their budget preparation processes. In the more recent period, Burns and Lee's (2004) survey results indicate that only 3 percent of the American states in 2000 did not use the fixed ceiling method. These longitudinal survey data indicate that state budget processes in the recent period were more target-oriented than the processes in the last four decades.

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For the second element, the GFRC (1983) asserts that the budget document that describes the relationship between agencies' goals, objectives, and activities and the effects of those activities on society or the environment helps the central budget office and the decision makers determine the efficient use of scarce funds through cost and benefit comparison and priority assessment. The GRFC (1983) also asserts that an appropriation that is based on a priority analysis may help stabilize the tax rate since spending needs are spread throughout several years by spending prioritization and programming.

Six individual case studies conducted by the American Society of Planning Officials Association (1980) indicate that when the agencies' budget documents do not contain the results of a program affordability analysis, the prioritization process and criteria, and the status of support (legal mandate, federal grants), the budget documents tend to be like "a public-wish list" in which the needs are not systematically programmed according to available resources and priorities. The information contained in the budget documents lead the decision makers to focus on particular issues as they appear in the budget; and, thus, they influence the decision-making process (Grizzle, 1986). These findings imply that a comprehensive budget may lead to a more efficient spending policy, relative to those that contain less comprehensive information.

For the last element, Hoehn and Randall (1989) and Zilberman (1986) assert that when the appropriation plan is based on a centralized technical analysis including various programs' benefits, their priorities, and their interactions among one another in a consolidated budget plan, overspending and resource misallocation for various policies tend to be reduced. This situation happens because multiple proposals from individual

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agencies that are a result of "the adding effects" are analyzed and compared in a holistic way in the appropriation preparation. "The adding effects" result when individual agencies attempt to add up the benefits of their programs to avoid getting cut as they describe the benefits of the proposed programs in the budget request proposals (Zilberman, 1986). Hoehn and Randall's (1989) and Zilberman's (1986) assertions are consistent with Kontopoulos and Perotti's (1999) empirical findings that countries that have a higher number of executive agencies (as an indicator for numbers of competing programs benefiting differently with competing groups) have a higher ratio of total spending to GDP than those countries that have fewer executive agencies.

In summary, the literature in this section asserts that fiscal policies (taxes, spending, and financing methods) have an effect on economic growth. The section also indicates that political institutions and administrative practices are influential factors in the fiscal policy decision-making process. Thus, when combined together, the literature in this section implies that administrative practices, technical analyses, and political institutions may have an indirect effect on growth through fiscal policy outputs.

Public Infrastructure Investment and State Economic Growth

The empirical results of the influence of public infrastructure on a regional economy are mixed depending on the researchers' model specifications. The studies in the early period (Aschauer, 1990; Munnell, 1990; Costa et al., 1987) indicate significant and positive relationships between public infrastructure stocks and spending and state productivity. By contrast, more recent studies (Holtz-Eakin and Schwartz, 1995;

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Moomaw et al. 2002) indicate either significant but small effects of public investment on state growth or insignificant influence of public investment on state growth (Garcia-Mila, McGuire, & Porter, 1996).

The leading study in the first group is by Aschauer (1990). He constructs his model by setting per capita gross state product (GSP) as the model's dependent variable and set the ratio of private investment to GSP, the ratio of core public infrastructure spending (road, sewage and waste water management system) to GSP, and the ratio of total government spending (minus core infrastructure outlays) to GSP as the model's independent variables. Aschauer uses data from 1965 to 1983 for the 50 states to test his model. Aschauer uses the Ordinary Least Square (OLS) technique to empirically show that spending on public infrastructure positively relates to states' marginal productivity levels. Although this model clarifies the influence of public spending on the macro economy, the model lacks control variables such as time trends that may inflate the variance of parameter estimates; and, as a result, the parameter estimates are less likely to reflect the true coefficients.

Munnell (1990) constructs another model using public capital stock value instead of public capital spending level as an explanatory variable. Other independent variables include total number of workers and private capital stocks.[6] The model's dependent variable is gross state product in the same year as those of the independent variables. She controls for time trend effects by including an annual unemployment rate as the model's control variable. Munnell controls for state natural resources and technological advancements by adding regional dummy variables into the model. The testing data were

[6] Since the Bureau of Economic Analysis does not report public and private capital stocks at the state level, Munnell (1990) uses perpetual inventory methods and personal income as the basis to apportion public and private capital stock from public and private national stocks, respectively.

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from 1970 to 1986 for 48 states and were converted into natural log form. The regression results from the OLS indicated that the accumulated public capital stocks significantly and strongly related to gross state product levels.

The growth theories assert that the relationship between public stocks and growth is a non-linear relationship (or inverse U curve)—that is, public capital stocks can promote productivity enhancement at some specific amounts and in points of time from the starting point until they reach the optimal point where the productivity values are at their highest. This is because public infrastructure crowds out private capital; any public investment beyond an optimal point would prohibit growth.

Costa et al.'s (1987) empirical results support this theory. These authors use the value-added of each industrial group (manufacturing, non-agricultural, and all industries) as a dependent variable for each of the three separate regression models.[7] The models' independent variables are private and public capital stocks and total numbers of state workers. The testing model is converted into translog production function form[8], where, in addition to the regular terms, the squared term of the public, private, and labor stocks are added into the model. Public capital stocks are apportioned by perpetual inventory methods using state investment data from the U.S. Census during the years 1957 to 1971.

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[7] The authors asserted that using value-added as a model dependent variable is better than using gross state product since the gross value of production allows production technology to be separated into factors of production and intermediate inputs; hence the effects of production inputs is not mixed with intermediate outputs.

[8] The translog production function is a generalization of the Cobb-Douglas production function. The name stands for 'transcendental logarithmic (Meyer, 2006). The translog production function assumes a non-linear relationship between output and factor inputs including cross-product terms, which indicate the substitutability or complementarities of the inputs. Variables are entered in the equation as deviations from their means (Munnell, 1990). Quadratic terms of the main inputs are included in the testing model to see the nature of inputs in the production process over a long-term trend. The quadratic term's coefficient determines whether the U-shaped curve opens up or down. If the coefficient of a quadratic term is positive, the curve of input opens *upward.* If the coefficient of a quadratic term is negative, the curve of input opens *downward* over a long-term period. The functional form of the translog production function is: $y = a + bx + cx^2$.

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As expected by the theory, the OLS results for the squared terms of public capital stock imply that public infrastructure has a diminishing return to scale characteristic. Like Munnell and Aschauer, Costa et al. find that public infrastructure increases value-added in non-agricultural, manufacturing, and all industrial sectors.

Some studies disaggregated the total public capital stocks into different types of infrastructures in order to understand the individual effect of each infrastructure type on state productivity. Garcia-Mila and McGuire (1992), for example, use GSP as a model dependent variable, while using the number of employees, private capital stocks, highway capital stocks, and annual education spending for K-12 and post-secondary education as the model's independent variables. The control variables of the model include total population, industrial mix ratio (which is the ratio of personal income in the manufacturing sector to all industrial sectors by states), and a dummy year variable as a proxy variable for trend effects. All independent variables in the model are one-year lagged from the dependent variable in order to control for a simultaneous effect resulting from the possibility that productivity growth may stimulate investment and public stock in the same year. All variable measures are converted into natural log forms. Data were from 48 contiguous states during the years 1970 to 1983 for dependent variables, and from 1969 to 1982 for independent variables. The estimated results from the OLS indicate that state and local highway stocks and state and local education spending positively and significantly relate to the GSP level in the following year.

The studies in the second group include those from Holtz-Eakin and Schwartz (1995) and Moomaw et al. (2002). The first study finds significant, but small, effects of public capital stock when the models were specified more rigorously—that is, when the

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independent variables show differences between the current year and the previous year values. The latter study does not find a significant effect of capital spending on state growth when an individual state's economy was controlled for by adding last year's GSP level to the model.

Holtz-Eakin and Schwartz (1995) use the difference between the per capita GSP in the current year and the previous year as the model's dependent variable and use the difference in the ratio of capital spending to the total GSP in the current year and those in the previous year as independent variables. They use an annual percentage change in total population, estimated infrastructure depreciation rate (5 percent), and the estimated technological advancement (2 percent) as control variables for socio-economic change and capital needs. The model also includes an individual state dummy variable to control for state natural resource endowments and also includes the previous year's GSP as a control variable for the economy's accumulated wealth. Data are from 1971 to 1986 for 48 states, adjusted for inflation, and presented in natural log forms. The regression results by the OLS indicate that public infrastructure has a significant, but small, effect (coefficient 0.10) on state economic growth rates.

Moomaw et al. (2002) use a state's GSP level instead of GSP growth rate as a dependent variable and use aggregated physical stocks, including those of public and private sectors, as the model's independent variable. Like Holtz-Eakin and Schwartz (1995), they control for states' accumulated wealth by adding previous year's GSP in the model and by using the population growth rate, estimated technological progress rate (2 percent), and infrastructure depreciation rate (3 percent) as control variables for capital needs. The data cover the years 1977 to 1997 for 48 states and are adjusted for inflation

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and presented in natural log forms. All independent variables are one-year lagged from those of the dependent variable. The regression results by the OLS indicate that the aggregated physical stocks are not significant to state productivity when the initial wealth is controlled for. They conclude that location-specific differences in underlying production technologies and the initial level of per capita income have more influence on state economic productivities than do regional infrastructures.

In summary, this section indicates that there is mixed evidence for the influence of public infrastructure and capital spending on state economic productivity level and growth rates. In the model specification where individual state's characteristics (i.e., initial economic status or dummy variable for unique production function) are controlled for, public capital spending has a negligible effect on state growth. In the model where the independent variables and the dependent variables are the differences between the current year's values and previous year's values, the difference in public capital spending has a significant, but small, effect on growth. Finally, for the early models that use gross amount of gross state product as a dependent variable, public capital spending (Aschauer, 1990) and public capital stocks (Munnell, 1990; Costa et al. 1990; and Garcia Mila & McGuire, 1992) are found to have a significant and large effect on growth.

Literature Review Conclusions and Policy Implications

This section combines the literature from the previous and current chapters to lay out the study's background and central research questions: 1) Does the capital budget and management process play a significant role in state economic growth?, and 2) How can

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the strategic capital process, which is considered highly centralized and systematically oriented, be executed within a fragmented government institution?

The literature in the previous chapter indicates that a systematic capital budget and management process is equivalent to a strategic management process. The strategic capital management process relies on a holistic management approach in which managerial decisions and actions including planning, organizing, coordinating, and budgeting are integrated. The integrated managerial activities blend future-oriented thinking, objective analysis, and subjective evaluation (i.e., citizen values) in shaping and guiding the organizational missions, courses of actions, and justifications for actions. The systematic capital budget and management process and the strategic management model share the common value of relying on multiple management approaches to ensure the efficiency and effectiveness of infrastructure investment.

Furthermore, the previous chapter suggests that the two main components (capital budgeting and capital planning) in the systematic capital budget and management system centralize and consolidate the capital spending plan, which is comprised of various proposals from agencies and competing groups. From this perspective, the systematic capital budget and management process and budgetary institution theory rely on technical administrative practices—such as proposal and policy consolidation, budgetary rules, and centralized fiscal planning—in organizing the competing needs and matching them with available resources.

The findings that public capital stocks and capital spending policies have significant effects on state economic growth in this chapter have implications for public policies and management, especially in deciding how U.S. governments should set

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investment policies and how much they should invest. Gramlich (1994) applies four methods to identify infrastructure needs. The analysis indicates that since most national infrastructure is owned by state and local governments, infrastructure management should be decentralized to permit these governments to decide and direct their own policies in order to address national infrastructure inadequacies (Gramlich, 1994). This analysis clearly indicates that reforming public infrastructure management at the state level may be one of the most sensible policy tools in addressing national infrastructure problems. However, given that state governments have limited resources and must maintain a balance between consumption and investment spending—what would be an optimal amount of investment-based spending?

The problem in finding the balance between consumption and investment-based spending is found in both public and private sectors (Murdick & Deming, 1968). This basic management problem is more complicated when dynamic changes in socio-economic factors from both internal (i.e., population growth or decline) and external (national policies) regions are taken into account (Murdick & Deming, 1968). Some systematic capital management practices (i.e., program budgeting, debt management, financial and capital planning) are found to promote efficiency and effectiveness in a government's infrastructure decision-making and management by previous case studies (Norstrerm, Blees, & Schiller, 1989; King, 1995; Forte, 1989; Suren,1996; Hokanson, 1994). These findings lead to the next question: Is the whole systematic program helpful for state governments in guiding strategic investment policies?

Mikesell (1999) outlines four benefits of a systematic capital management model in a state capital budgeting process. First, careful financial and debt management

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practices within the model improve a state's bond rating, thus allowing governments to fund large projects with long-term debt. Debt financing increases intergeneration equity[9] and also allows governments to make efficient use of general revenue for other appropriate spending. Second, capital and fiscal planning helps governments divide the construction cost of a large project over its service life (either by debt financing or the use of reserve funds). This practice helps stabilize state tax rates, even when the governments have to fund large projects. Third, project management controls cost through performance measurement and evaluation processes. Finally, fiscal planning helps smooth out the peaks and valleys of capital outlays in a specific period. The lumpy spending is due to funding large projects according to the availability of funds; and, as a result, it delays projects and inflates costs in the years when funds are unavailable. These assertions by Mikesell imply that fiscal planning, infrastructure inspections, capital planning, and the scheduling of project funding are helpful in controlling local tax rates and improving bond ratings. According to Mikesell (1999), systematic practices are necessary for state and local governments that do not have the ultimate power to enact a monetary policy to cover government deficits.

If systematic capital management practices can help state governments make better capital resource allocations, either by strategic management or by centralized fiscal and capital planning approaches as discussed above, then the next question is: "Does the capital budget and management system play a significant role in state productivity since public infrastructure is found to have a significant effect on state production processes?"

[9] Intergeneration equity means that people in the different generations who receive the same benefits of the public services should pay the same tax. In the case of debt financing, since large capital projects require large costs and have long-useful life, the following generations who will receive the benefits from the projects should share the cost of project by paying for debt services.

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Investigating the capital program's benefits is important in the capital budgeting literature because the program's effectiveness must be verified by empirical evidence—especially in the modern period where information technology is widely spread and more number of governments are adopting a strategic capital program (Halachmi & Sekwat, 1997). What is the tangible benefit of a systematic capital management program as recommended by the literature? How is the strategic capital process, which is considered highly centralized and systematically oriented, executed within a fragmented government institution? Do the strategic practices lead to the better results; and, if so, in what way? These questions are central research questions for this dissertation. The next chapter presents a conceptual framework for this study.

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CHAPTER 4 CONCEPTUAL FRAMEWORK

The first section of this chapter presents a conceptual framework for the relationships among the administrative practices (namely the capital budget and management processes), fiscal policy outputs (namely marginal changes in capital spending and capital stocks), and state economic growth. This section's aim is to identify the central research questions of this dissertation. The next section presents research hypotheses for the dissertation's empirical analysis that examines the relationships among the three factors in the conceptual model. The last section presents research questions for the Illinois capital budget and management case study.

Central Research Questions

The capital budgeting and management literature suggests that the strategic capital management program moves capital budgeting and management practices from demand-driven operations to results-driven operations where success is defined by the program's effects. Kettl (1997) asserts that it is important for public policy makers, evaluators, and administrators in a results-oriented management program to shift their focus from inputs (How much should we spend?) to outputs (What activities do inputs produce?) and to look forward to program outcomes (what consequences do outputs produce). Kettl (1997) uses the experiences of governments in New Zealand, the United Kingdom, Australia, and the United States (Government Performance and Result Act—GPRA) to outline the important elements of a results-oriented public management

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program. According to Kettl, the major activities of results-oriented management are: 1) setting program goals, 2) measuring program results against goals, and 3) using analysis to guide the next policy decision.

The key components of results-oriented management are strategic planning, performance measurement, and analyses; but problems arise when it comes to the question of what to measure—outputs or outcomes. Kettl (1997) suggests that output measurement is easier than outcome measurement. Output measurement focuses precisely on government operating behaviors; however it fails to answer the important question of whether the citizens' problems have been solved. By contrast, outcome measurement responds directly to the basic question of: Does the program work? However, outcome measurements may not be valid and reliable since there are other outside factors affecting a program's results.

For these reasons, Kettl (1997) suggests that policy makers and administrators conduct both output and outcome measurements but place the priority and emphasis on output measurement. From this perspective, in order to investigate the effects of a strategic and centralized capital management program on local economic performance in states, the framework for this study is constructed as presented in Figure 1.

Figure 1 presents the conceptual framework for this study by depicting the effects of the capital budget and management processes on capital spending, public capital stocks, and state economic growth. The bold letters represent the concepts of policy processes and administrative practices (i.e., strategic and centralized capital budget and management system), policy outputs, and policy outcomes. The words in parentheses represent operationalized concepts. First, the framework indicates that since the strategic

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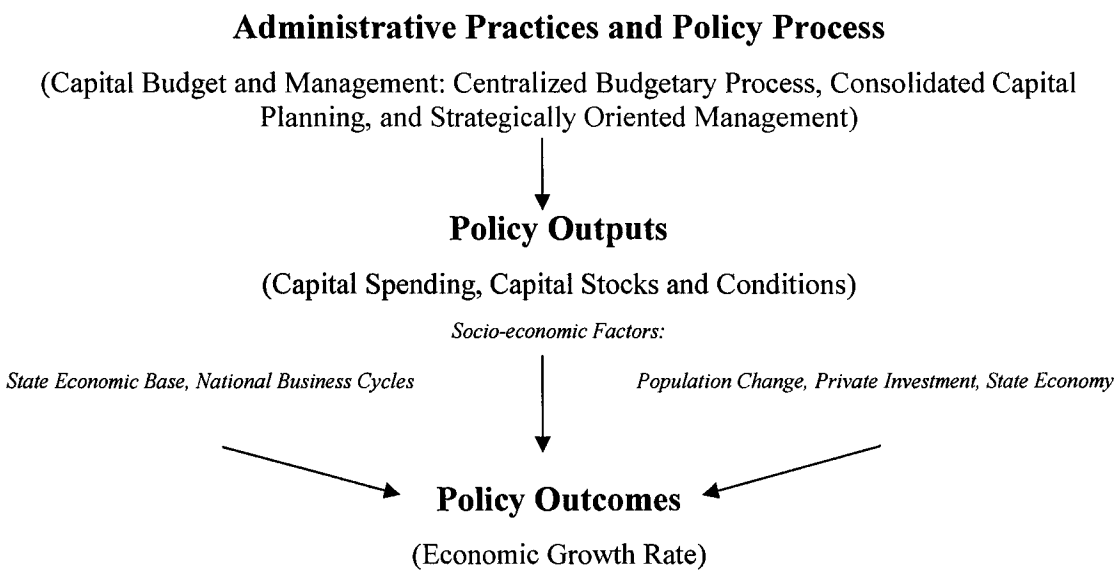
public management program focuses on outputs and their effects (outcomes) rather than inputs, a systematic capital program which parallels the strategic management concepts should play a significant role in determining public infrastructure spending and capital stock levels. This role is suggested because holistic and inclusive management processes in a systematic capital program will help administrators solve the basic management problem of strategically choosing optimal investments and providing the right mix of capital assets in order to achieve a balance in short-term (balancing annual operating budget) and long-term goals (investment-purposed spending).

FIGURE 1

Conceptual Framework



Next, when viewed through the budgetary institution by De Hann et al. (1999), the two main components (capital budgeting and capital planning) in the systematic

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capital budget and management process play a major role in mitigating collective action problems, namely resource misallocation and inefficient spending. The two problems commonly occur in a fragmented government institution. In such a situation, the decision makers tend to express non-cooperative behavior when deciding on the central spending plan. As a result, the plan will be more decentralized, diverse, and beneficial to local constituents at the expense of the whole society.

Fiscal planning, prudent debt management, strategic financing, and capital programming (i.e., CIP and prioritization) are considered technical practices when objective analyses are applied in order to promote spending efficiency, especially in terms of matching resources to needs and in allocating the resources where there is the most need. Based on Fisher and Turnovsky's (1998) perspective, a fiscal policy—namely capital spending—that is a result of technical analysis (i.e., revenue forecast, clear debt policies and plans, and strategic financing—using sales taxes and user fees to fund congestible and privately substitutable infrastructure and using income taxes to fund infrastructure which cannot be substituted by private facilities) should contribute to economic growth. This should come about because governments use the right sources of funds (i.e., user fees versus income taxes) to finance infrastructure acquisitions. In Fisher and Turnovsky's concept, if the government misuses the public funds that are derived from household incomes (through various tax collections), investment spending would hinder growth rather than enhance it.

Finally, the four main components in the systematic capital program help administrators detect dynamic changes in both the internal and external factors of their economies. These future-oriented management approaches should lead administrators to

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invest and manage capital stocks in a way so as to enhance productivity levels in response to outside and inside economic, social, and environmental changes. At the outcome level, public capital stocks that result from a strategic management approach (both in terms of budgeting and management) should significantly and positively affect productivity levels relative to public capital stock that would result from random spending and unplanned management.

According to the strategic management concept, a state capital management program creates outputs of public capital spending and stock but does not directly create program outcomes (Sorber, 1993). Instead, the program outputs interact with other socio-economic factors (as represented by the small and italic letters in Figure 1) to produce outcomes (Kettl, 1997). Therefore, public capital spending and stocks resulting from different capital management programs from across the states may indirectly affect state economic performance in different magnitudes, depending on the program outputs (and other production inputs).

The whole framework suggests that not only do capital spending and stock levels (which are outputs of the policy process) affect economic growth (which is a policy outcome), but the policy process and administrative practices also affect economic growth. In other words, the public capital management process indirectly affects state economic growth through public capital spending and stock, which are the outputs of the capital management process. The management's indirect effect on economic growth is a result of the administrative practice and policy process determining how to spend and how much to spend, which results in public infrastructure that positively alters state economic production function; and, thus, enhances state output.

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Past empirical studies suggest that state public capital stocks and spending positively relate to state economic productivity since publicly provided infrastructure reduces private production cost. These relationships are characterized by the empirical results of Garcia-Mila and McGuire (1992), Aschauer (1990), Munnell (1990), Costa et al. (1986), and Holtz-Eakin and Swartz (1995), and Pereira and Andraz (2003), which indicate that public infrastructure investment, either in terms of public capital stocks or spending levels, have a significant effect on economic output which ranges from small to large.

This study identifies three major research questions to investigate the influence of state capital management programs on state capital budgeting processes and on state economic performances. The research questions are listed below.

1. **Do state capital stocks have a positive effect on state economic growth? Does state capital spending have a positive effect on state economic growth? Do the different types of infrastructure—namely highways and streets, school facilities, and correctional facilities—affect state economic growth differently? Does the timing of capital spending within a specific time period (i.e., spread evenly or concentrated in particular years) significantly affect economic growth?**

2. **Do the strategic capital management programs practiced by state government have a significant effect on state economic growth rate?**

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3. **How and why do systematic capital practices affect capital budgeting and management processes? How is the strategic capital process, which is considered centralized and systematic, executed within a fragmented government institution? Do the strategic practices lead to better results, and, if so, in what way?**

To address these three research questions, this dissertation employs two types of analyses. The first analysis, which is a cross-sectional, four-year time-series study, empirically examines whether the capital budget and management process affects state economic growth. It focuses on the effects of the state capital budget and management process and on the effects of public infrastructure spending, or stocks, on state economic outputs. The first analysis specifically deals with the first and second research questions.

The second analysis, which is a single case study of the State of Illinois' capital budget and management practices, specifically examines how the systematic capital process (which is considered centralized and strategically–oriented) is executed in the state of Illinois and what benefits are perceived by the people involved in the process. This part, in particular, deals with the third research question. The primary aim of the analysis is to provide supplementary explanations for the empirical results in the first analysis—to determine how the public capital management process affects public investment decisions. The secondary aim is to test and extend the Multiple Rationalities theory by Thurmaier and Willoughby (2001a, 2001b), which asserts that the public budgeters in the state central budget offices have a significant role in state budgetary policy through their policy recommendations and the state administrative process.

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Hypotheses for the Empirical Study

This section presents research hypotheses for the first analysis: the cross-sectional and four-year time series study that empirically examines the effect of the capital budget and management process on state economic growth through policy outputs—namely public capital stock and spending levels. Eight hypotheses are stated below.

Hypothesis 1: A state government's increase in per capita public capital stock level positively affects the state's change in per capita Gross State Product (GSP) level.

According to the strategic management concept (or results-oriented management), a state capital management program creates outputs of public capital stock, but it does not directly create outcomes of the program. Instead, the program's outputs interact with other social factors to produce outcomes. Therefore, the public capital stocks resulting from different capital management programs across the states may affect state economic performance in varying magnitudes, depending on the program outputs. Theories and past empirical studies suggest that state public capital stocks will significantly and positively relate to state economic performance. These relationships are demonstrated by the empirical results of Garcia-Mila & McGuire (1992), Munnell (1990), and Costa et al. (1986), which indicate that public capital stocks have an effect on GSP—the magnitude of which ranges from small to large.

Hypothesis 2: A state government's increase in public capital spending rate to Gross State Product (GSP) positively affects the state's change in per capita GSP level.

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The endogenous growth model (Barro & Sala-i-Martin, 2004; Barro & Sala-i-Martin, 1992) argues that policy measures have an impact on an economy's permanent growth rate. This impact is due to taxing and spending on research and development, on education, and on infrastructure investment purposes that provide public services that alter the economy's production function by promoting technological advancement and capital stocks in the long-run. Aschauer (1990) uses data from 1965 to 1983 from the 50 U.S. states to test the hypothesis of whether public infrastructure spending has a positive effect on marginal change in productivity level. His results indicate that spending on public infrastructure positively relates to state economic growth (elasticity equals 1.96). Holtz-Eakin and Schwartz (1995) found that a state's yearly change in the ratio of per capita public capital to per capita gross state product has a significant, but small, effect (elasticity equals 0.10) on the state's change in per capita gross state product when an individual state's unique characteristics are controlled for.

Hypotheses 1 and 2 have the same purposes in testing a government's infrastructure provisions on economic growth. The only difference between the two hypotheses are that while the first uses public capital stock as an indicator for public infrastructure provision, the latter uses public capital spending as an indicator for the same concept. These alternative indicators are used for sensitivity testing since the existing literature is not clear as to what should be an indicator for this type of public service provision.

Table 4 presents the model specification, the indicators for public service infrastructure provision (public stocks versus public capital spending), control variables, and analysis techniques used by previous studies. The table indicates that model

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TABLE 4

Model Specifications and Empirical Results in State Economic Growth Literature

Studies/ Designs	Costa et al (1987)	Aschauer (1990)	Munnell (1990)	Garcia-Mila-McGuire (1992)
Study Questions	How do public capital stocks interact with other production inputs? How do public capital stocks work in increasing productivity?	Does core spending increase productivity?	Do pubic capital stocks enhance productivity, when an economy reaches a steady stage of growth?	What types of public capital stock enhance productivity?
Dependent Variable	Gross Value added	Per Capita GSP	Gross GSP	Gross GSP
Independent Variables	Gross public capital stocks, gross private capital stocks, and total number of labor	Per capita core infrastructure spending, per capita educational spending	Gross public stocks, gross private stocks, total number of labor	Gross highway capital stocks, K12 educational expenditure, private capital structures, private capital equipments, median years in school for population age 25 and over
Control Variable	Variables' means as a data center	Regional dummy variables	Annual unemployment rates	Total number of population, industrial mix ratio, dummy year variable
Unit of Analysis	State (48)	State (50)	State (48)	State and Local (48)
Study Period	1972	1965-1983	1970-1986	1969-1983
Analysis Techniques	Translog Production Function/ OLS/Log	Least Square Method/OLS/Log	Least Square Method/OLS/Log	Least Square Method/OLS/Log
R^2	Not Reported	0.988	0.993	0.995
Findings/ Output Elasticity	0.20	1.96	0.15	0.004 (highways), 0.072 (Education)
Conclusions	Public capital stocks and labor are complementary inputs in the production function. Public capital stocks have a diminishing return to scale characteristic in the production process.	Core public infrastructure spending (transportation and sewerage system) enhances growth. Educational spending enhances growth.	Public capital stocks enhance productivity in a steady stage economy.	Highways and education stock are productive inputs with the latter having a strong impact on output.

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TABLE 4 (Continue)

Model Specification and Empirical Results in Sate Economic Growth Literature

Studies/ Designs	Holtz-Eakin & Schwartz (1995)	Lobo & Rantisi (1997)	Storm & Feiock (1999)	Moomaw et al (2002)
Study Questions	Does public capital stock enhance permanent growth rates?	What types of public capital stocks enhance productivity?	Does higher education spending enhance growth?	Do physical capital stocks enhance permanent growth rates in the long-run?
Dependent Variable	The difference between per capita GSP growth rates and per capita capital stock growth rates	Growth rate of metropolitan wage per worker	Per capita GSP	Per capita GSP
Independent Variables	Annual growth rate of public capital stock, annual growth rate of private stocks	Total capital outlays, total public capital stock (measured by long-term debt accumulation), total transportation spending, total sanitation spending	Per student higher education expenditure, per capita state R&D grant, per capital federal R&D grants, economic development incentive index, poor-condition highway mileages	Percent of public and private investment to total GSP, Percent of total educational spending to total GSP, federally funded R&D stocks
Control Variable	Interactive variable of differences between initial per worker GSP and individual state dummy variable, year dummy variable	Gross Metropolitan Product (GMP), ratio of manufacturing share to total industries, ratio of service share to total industries, ratio of employment to population	Initial GSP(1-year lagged)	Initial GSP (1 year lagged), capital need: population growth rate, capital depreciation rate, and technological progress rates (estimated by authors), state fixed effects
Unit of Analysis	State and Local (48)	Metropolitan areas (261)	State (50)	State (48)
Study Period	1971-1986	1969-1996	1990-1993	1977-1997
Analysis Techniques	Non Linear Seemingly Unrelated Technique/OLS/Log	Least Square Method/OLS/Log	OLS with panel corrected standard errors	Least Square Dummy Variable
R^2	0.795	0.394	0.980	0.613
Findings/ Output Elasticity	0.10	0.02 (capital outlays), 0.02 (public stock), 0.01 (transportation), -0.002 (sanitation)	0.107 (higher education spending)	not significant at the 0.05 conventional level (-0.302)
Conclusions	Public capital stocks have a significant but small effect on growth rates.	Different types of capital stocks have different effects on wage growth rates	State supports on higher education have a significant, positive short-term effect on economic outputs	Physical capital investment rate to GSP does not generate short-term business cycle performance within sub-national economies. Growth rate models are more appropriate than productivity models for investigating long-run behaviors of physical stocks.

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TABLE 4 (Continue)

Model Specification and Empirical Results in Sate Economic Growth Literature

Studies/ Designs	Garofalo & Yamarik (2002)	Lee & Perry (2002)
Study Questions	Do aggregated physical stocks enhance growth rates?	Do Information technology (IT) stocks enhance growth?
Dependent Variable	Growth rate of per employee GSP from 1977 to 1996	Gross GSP
Independent Variables	Mean of gross public and private physical stocks from 1977 to 1996, mean of population growth rates, depreciation rates, and technological progress rates, percent of population age 25 and over who have college degree or higher in 1980	Total IT stocks (IT operating performance), capital outlays, total number of public employees, total state expenditure minus total capital outlays
Control Variable	Regional dummy variable, Initial GSP (1-year lagged)	Total number of population, individual state dummy variable, individual year dummy variable
Unit of Analysis	State (48)	State (50)
Study Period	1977-1996	1990-1995
Analysis Techniques	Least Square Dummy Variable	OLS/Log
R^2	0.465	0.992
Findings/ Output Elasticity	0.31	0.01 (IT stock), non IT public stock not significant
Conclusions	Given that the states have different natural resources and production functions, physical capital stocks have a positive and significant effect on the growth rate in the long-run (20-year period). The physical stocks enhance the speed of a state's growth rate.	IT stock is significant for state productivity

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specifications have an effect on the empirical results. As shown in Table 4, for the model specifications in the early period that do not control for simultaneous effects between dependent and independent variables (Aschauer 1990), an individual state's unique characteristics and production functions (Aschauer 1990; Munnell, 1990), time trends (Costa et al., 1987), public capital stocks (Munnell's and Costa et al.'s) and, spending levels (Aschauer's) are found to have significant and large effects (elasticities ranging from .15 to 1.96). Furthermore, the R square (R^2) in these studies are extremely large (about .99).

When the flaws of the models in the previous study are corrected in the recent studies (Holtz-Eakin & Schwartz, 1995; Lobo & Rantisi, 1999) public capital stock and spending are found to have a significant but small effect on economic growth (.10 and .02 for Holtz-Eakin & Schwartz's and Lobo & Rantisi's, respectively). Moomaw et al. (2002) do not find the significance of public capital stocks on state economic growth. The findings of Holtz-Eakin and Schwartz (1995) and Moomaw et. al (2002) are indicative of the mixed evidence for the role of public capital stock on the change in GSP. However, the finding of Lobo and Rantisi indicates that public capital spending has a significant, but small, role in enhancing economic output. For this reason, the effects of public capital stock and public capital spending (that are considered different outputs of the administrative and policy process) on economic growth are alternately examined.

The next three hypotheses investigate the effects of different types of public capital stocks on state economic performance.

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Hypothesis 3: A state government's increase in per capita highway stock level will positively affect the state's change in per capita GSP level.

Hypothesis 4: A state government's increase in per capita education stock level will positively affect the state's change in per capita GSP level.

Hypothesis 5: A state government's increase in per capita corrections stock level will negatively affect the state's change in per capita GSP level.

Since state agencies propose a variety of capital projects—including transportation, education, and correctional projects—different project prioritizing processes from various capital management programs across the states will yield different mixes of these infrastructure types as a program's output. From this perspective, a state's annual capital budget and CIP will reflect the state's policy priorities, its strategic planning orientation, and its ability to balance between investment-based and non-investment based spending.

The growth theories and empirical evidence (i.e., Vijverberge, Vijverberge, & Gamble, 1997; Pinnoi, 1994) explain that public infrastructure increases productivity outputs by reducing private sector input costs in production processes. At the aggregated level, public capital is found to support private investment and has positive impacts on private outputs (Pereira & Andraz, 2003). However, at a disaggregated level, different types of public infrastructure support private productions differently.

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As shown in Table 4, different types of public capital stocks have different effects on state and local economic performance. Lobo and Rantisi (1999) use data from 1977 to 1992 for 261 metropolitan areas throughout the states in order to investigate the different effects of government expenditures on different types of infrastructure and on metropolitan areas' wages. The regression analysis for the 15-year period data indicates that total capital outlays, existing capital stocks, and total transportation outlays statistically have significant and positive effects on metropolitan areas' wage growth rates. On the other hand, in the same regression model, they find that the total sanitation outlays have negative, but not statistically significant, impacts on metropolitan areas' wage growth rates.[10] Garcia-Mila and McGuire (1992) also empirically discover that transportation systems, i.e., highways and airports, have larger effects on state economic productivity relative to education, than other types of infrastructure systems. These findings suggest that different funding across infrastructure types yields different effects on economic outputs.

Highways facilitate industrial production by providing access to the production base and by helping to reduce the private sector cost of transportation (Wayne, 1996). Education structures help production by enhancing the knowledge and skills of the labor force and encouraging research and development activities that may result in advanced technology, specifically for local production (Landau, 1999; Gittleman & Wolff, 2001). Like highways, the benefits of higher education systems spill over the boundaries of the

[10]The two regression models have initial wage in 1997 as a control variable for the fixed effects of accumulated wealth. However, the authors did not find significant effects of total capital outlays, existing capital stocks, transportation outlays, and sanitation outlays on wage levels when they used separate regression models for each of the four year's data (1977, 1982, 1989, and 1992). This model does not control for initial wealth effects since the dependent variable is wage level, as opposed to wage growth rate.

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jurisdiction where they are located. Better university facilities attract highly educated residents (i.e., scientists, university professors); help increase the number of qualified laborers; and help improve research, knowledge, and technology.

In contrast to highways and education, correctional outlays may or may not have a positive effect on a state's productivity. The *Union Tribune* (July 27, 2003) reports that in 2002 the cost for housing, feeding, and caring of prison inmates was about $40 billion nationwide; most of this cost is accounted for by construction, which costs $100,000 per cell (Anderson, 2004). According to the *Union Tribune* (July 27, 2003), based on the Justice Department's estimate that the number of prisoners increases about 2.1 percent a year—despite the reduced crime rate—the correctional cost will keep soaring (Anderson, 2003).

There are mixed beliefs on the correctional spending issue. On one hand, elected officials and citizens tend to view new correctional facilities as helping increase a jurisdiction's share of federal grants due to the increase in population, especially in a rural area; and, thus, they support correctional construction (Hook, Mosher, Rotolo, & Laboa, 2004). On the other hand, correctional facility outlays, which are not considered capital investment-based spending, may compete for funds with other infrastructure types (GAO, 1993a, 1993b). If a state government does not have a strategic prioritization method in which investment-based and non investment-based projects are ranked separately, the correctional outlays may deplete funds for other beneficial projects such as road and school improvement.

Hook et al. (2004) use data from 1969 to 1994 for 3,100 counties throughout the states to investigate whether new and existing correctional facilities relate to employment

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growth rates. The regression results indicate that correctional facilities do not significantly relate to the employment growth rates in non-metropolitan areas from 1969 to 1994. However, they do significantly relate to the employment growth rate in metropolitan areas in the period from 1989 to 1994. These previous studies indicate that the roles of disaggregated capital stocks on economic growth may be different, depending on the types and the purposes of the services. Hypotheses 3, 4, and 5 test this assumption.

The next hypothesis investigates the roles of the capital budget and management process in enhancing the positive relationship between *public capital stocks* and state economic outputs.

Hypothesis 6: The stability of a state government's annual capital spending will positively impact the relationship between the state's changes in *per capita public capital stock* levels and the state's changes in per capita GSP levels.

Another aspect of the outputs from the capital management process relates to timing of capital spending. Some states maintain relatively constant levels of capital spending from one year to the next, while other states have more variation in annual capital spending. Pagano's (2002) analysis indicates that local governments tend to fund their capital projects with their own sources of revenue surplus rather than long-term debt, which requires fiscal planning. As a result, the spending reaches a peak point during economic booms and declines when economies slow down. This practice makes capital outlays vulnerable to becoming one of the first items to be cut when governments face a budget shortfall (Pagano, 2002). To date, the capital budgeting and productivity

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literature has not been clear in explaining the major causes that lead states to fund their infrastructures in different ways in specific time periods and in explaining what the results of the different funding types are.

Four decades ago, Hillhouse and Howard (1963) called for three policy reforms in infrastructure management and budgeting: 1) utilizing objective and clear criteria in project selection; 2) including functional budget and depreciation accounting in capital planning; and 3) financing infrastructure at a stable level over a period that has both an expansive and recessive economy. Although the capital budgeting literature advocates clear and objective project selection and depreciation practices, and a greater number of state governments have adopted such practices, the funding trends issue has not been adequately explored. Nevertheless, funding stability may be a desirable practice and is an empirical issue that deserves to be investigated.

The last two hypotheses investigate the role of administrative practice—the capital budget and management processes—on state economic performance through fiscal policy output, namely capital stocks and capital spending.

Hypothesis 7: The state capital management processes will positively impact the relationships between the increase in *per capita public capital stock* levels and the change in per capita state GSP levels.

Hypothesis 8: The state capital management processes will positively impact the relationship between the increase in *public capital spending rates* and the changes in per capita state GSP levels.

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A systematic capital budget and management process helps governments to be able to better discern infrastructure needs in order to accommodate future growth and to plan spending in a manner that does not get tied up in the current revenue or in the anti-deficit rules that an operating budget is subjected to (Darr, 1998; Griffin & Hester, 1990; Forte, 1989). The study framework asserts that the four key components in a systematic capital management program, which stem from a strategic management model, will help state administrators manage their assets in a way so as to encourage the state production function. The outputs of the policy process are *public capital stock* and *spending* that will enter the state production function as a productive input. This well-managed input will, in turn, interact with other production inputs (i.e., population growth, state economic base, and private investment) resulting in a higher level of productivity.

In addition to being strategically oriented, the four main components (capital planning, capital budgeting, maintenance, and project management) in the systematic capital budget and management process are considered to be a centralized budgetary process. The centralized process consolidates various proposals from different programs that benefit competing groups differently, prioritizes the needs of different groups based on objective criteria, centralizes fiscal planning so that the needs match available revenues, and finances the public infrastructure service based on technical analysis (i.e., user fees and sales taxes versus income taxes, debt affordability analysis).

De Hann et al. (1999), Kontopoulos and Perotti (1999), and Lee (1991, 1992) asserts that the centralized budgetary process mitigates the decision makers' non-cooperative behaviors, which result in collective action problems including diverse spending plans, inefficient spending, and resource misallocation. Based on Fisher and

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Turnovsky's (1998) concept, technical analysis for public infrastructure finance plays an important role in economic growth. They assert that public infrastructure spending can lead to output growth if governments use the right source of funding (income taxes versus sales taxes and user fees) to fund the right type of infrastructure (public goods that are subjected to congestion and can be substituted by private facilities). Tax dollars that are spent on productive public service (i.e., infrastructure and education) should yield benefits to an economy rather than harm it. This yield is due to resources being used to provide public services that positively alter the economy's production function in terms of accumulated public stocks, skilled labor, and research and development. As discussed in the last section, Lobo and Rantisi (1997) and Aschauer (1990) find that capital spending positively impacts growth. These functional characteristics should produce an infrastructure output that can attract new investments and stimulate job creation—thereby increasing economic productivity.

The relationships between a capital management program and its final outcomes (i.e., economic productivity) have not been adequately investigated, and such investigation should be the next step in strategic and capital management research (Halachmi & Sekwat, 1997). Gordon, Kleiner, and Natarajan (1986) use a simulation experimental technique to show that an investment-based capital budget can have a positive impact on gross national product (GNP) through increased disposable income, consumption, and short-term interest rates.

Previous survey studies (e.g., Halachmi & Sekwat, 1997; Sekwat, 1999; Beckett-Camarata, 2003a) and single case studies (e.g., Darr, 1998; Norstrem et al. 1989; Forte, 1989; King, 1995) indicate that strategic capital management practices are essential

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elements of capital budget reforms. Some of these studies show that strategic capital planning (Forte, 1989) and fiscal planning (Darr, 1998; Norstrem et al. 1989; King, 1995) help governments make better decisions regarding what is to be funded first and how to fund the needed projects with efficiency and objectivity. These study findings stimulate another question: Do the systematic or strategic capital practices affect public capital spending levels?

Previous empirical evidence shows that systematic capital practices, including a separate capital budget, create significant changes in capital budget outputs. Poterba (1995) uses 1962 data from 50 states to investigate the effects of a systematic capital practice, namely a separate capital budget and capital improvement program (CIP) and of the use of pay-as-you go financing as opposed to bond financing on annual capital spending. His regression results indicate that a separate capital budget positively relates to capital spending, but a separate capital budget does not significantly relate to non-capital expenditure. In the same model, he finds that pay-as-you go financing significantly and negatively relates to capital spending levels. By contrast, the interactive variable pay-as-you go and separate capital budget is not statistically significant. In a separate regression model, Poterba finds that the states that adopted both separate capital budgets and CIPs have higher capital spending levels than states that adopted only a separate capital budget.

Poterba's (1995) findings substantiate Gordon's (1983) assertion that a separate capital budget encourages governments to use accounting and management techniques to formally define capital expenditures, to strategically plan capital needs based on depreciation, to prudently finance capital projects, and to objectively control for fund

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usage. For these reasons, a separate capital budget will typically be more investment-driven and future-oriented when compared to a unified budget in which capital and operating outlays are combined. The next section elaborates on the theoretical background for the case study questions.

Research Questions for the Case Study

This section presents case study questions for the second analysis: the Illinois capital budget and management process. The case study has three main purposes: 1) to understand how the strategic capital budget and management process is executed in a state government; 2) to understand the attitudes of the state public capital budgeters, both in the state agencies and in the central budget office, toward the benefits of the systematic capital practices in the decision-making process; and 3) to test and extend the Multiple Rationalities Budget theory by Thurmaier and Willoughby (2001a, 2001b) by identifying the factors that influence the state budgeters' decision-making and policy recommendations.

The three case studies from Minnesota, Virginia, and Texas (King, 1995; Darr, 1998; Griffin & Hester, 1990) suggest that each strategic tool the state government adopts and practices has its own unique function but that they are also synergistic in helping governments make better infrastructure and management decisions. For example, financial planning helps governments locate potential funding sources and decide how much and when to fund the needed projects. Capital planning and maintenance helps governments identify actual capital needs based on long-term benefits and purposes.

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When the three governments used these tools together, they found that they could accommodate the needed projects within a specific time frame in a well-organized manner. Acquiring the funds required by a multi-year plan is plausible when governments adopt strategic financing methods and well-planned financial management.

In theory, these cases assert that the systematic process has benefits in promoting spending efficiency, effectiveness, and careful infrastructure financing. However, in practice, a problem may arise when taking into consideration that the systematic capital budget and management process is considered a highly centralized process. As a result, conducting the systematic process requires a high level of cooperation among the policy decision makers in pursuing consolidated capital and unified fiscal plans. This observation leads to the research questions for the present case study:

1) To what extent, if any, is the State of Illinois capital budget and management process comparable to the strategic process recommended by the normative literature?

2) According to the state budgeters' viewpoints, do the strategic capital practices lead to better decision-making, and, if so, in what way?

3) What are the factors influencing the state capital budgeters to adopt and commit to systematic practices? What are the factors hindering the state capital budgeters from adopting and committing to some systematic practices?

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The fiscal policy process is not only influenced by the administrative practice that relies on technical analysis and objective process but is also influenced by the political institutions in the decision-making process. The U.S. government is fragmented due to the separation of power between the executive and legislative branches; and, thus, the decision makers use their Constitutional powers to pursue group demands and benefits in the policy decision-making process (Howlett & Ramesh, 2003). In such a government institution, the non-cooperation practices, in which the decision makers' concerns for local constituent benefits outweigh concerns for overarching social benefits, generate a decentralized and diverse policy which benefits particular groups at the expense of society as a whole (Olson, 1965).

Aizenman and Powell (1998) use econometric analysis to explain the situation in which fiscal policy decisions are not made by maximizing a specified government social welfare function but, rather, are made by an internal political process in which groups compete for scarce resources. As a result, collective action problems, including resource misallocation and overspending, are likely to occur. They also show that in such situations, unless there is a strong center to impose a cooperative solution and compel the decision makers to internalize the aggregated social cost into their personal accounts, the collective action problems are less likely to be mitigated.

For the State of Illinois, the results from previous case study (Anton, 1963) suggest that the state's budget process in the 1960s was more decentralized relative to the present period since the state's budget policy decision-making was dominated by political processes. However, at present, the state is in the process of reforming. According to GPP (2005), the state does not have a coordinated capital plan but is in the process of

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developing one. In the past, as GPP reported, the state's capital planning, maintenance, and project management was a diffused process, which resulted in infrastructure backlog, cost overrun, and delayed projects. Since Governor Blagojevich took the administration in 2003, Illinois capital management has been moving toward a coordinated and centralized process (GPP, 2005).

The state introduced a separate capital budget book that is distinct from the operating budget book in Fiscal Year 2005. Before this fiscal year, the state had a separate chapter on the capital budget within the operating budget book. The state initiated its statewide facility condition assessment, using both an engineering standard and life-cycle analysis to compile the state deferred maintenance and facility condition information, consolidate state facilities, and establish a multi-year plan for the future (GPP, 2005). This information suggests that Illinois is moving toward a centralized capital management process.

According to Rubin, King, Wagner, and Dran (1991), Illinois' budget process has been evolving during the last several decades. Before the 1970s, the legislature dominated the budget process. After the 1970s the budget has been dominated by the executive (Rubin et al. 1991). Anton (1963) described the Illinois budget process in the 1960s as an incremental process where fair-share benefits for districts functioned as the fundamental principle in the appropriation process. This procedure resulted from reviews of agency budget requests conducted by the Budgetary Commission, which was an office housed in the legislature. The governor had limited power over budget preparation. The budget was not prepared to deal with policy issues but, instead, for fair resource distribution among the competing groups (Anton, 1963).

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According to Rubin et al. (1991), the incremental budget was changed after the Constitution added a reduction and amendatory veto power for the governor in 1970s. This reform increases the governor's power to pursue his policy priorities and to prepare and control budget requests. Since the 1970s, Illinois has been a strong executive state, where the governor uses his budget office and his veto powers to control the budget requests coming from the state agencies and to present his policy priorities that previously were being overwhelmed by the legislature's cuts. If the governor's opponents do not agree with the governor's original plan, as a rule, the opposition bill can only be incrementally adjusted to the original bill in order to reflect the goals of the legislature. According to Rubin et al.'s case study (1991), from 1985 to1990, the governor's original plan was modified only about 5 percent on average.

The above information indicates that reform activity has a high potential to be continued in the future, since it is supported by the governor who has the dominant power over the budget preparation and decision process. However, this does not mean that the legislature and interest groups do not have access to insert their agendas into the plans. Instead, the competing groups and their agendas penetrate the process both during the preparation process in the governor's office and during the legislative session's decision-making process (Rubin et al. 1991). This situation makes the State's policy making process highly fragmented. Such a situation may obstruct strategic capital budget processes. Chapter 6 presents the case study which examines how Illinois' capital budget is prepared and formulated in an environment where political processes play an influential role in policy decisions.

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CHAPTER 5 EMPIRICAL STUDY

This chapter presents the study's methodology, data, and empirical results of the impacts of capital budget practices and fiscal policies on a state's economic growth. The first section summarizes the research design. The second section presents the empirical results. The chapter concludes with a discussion of the empirical results and implications of the study.

Model Specification and Research Design

Barro and Sala-i-Martin (1992) use the Cobb-Douglas production function to develop a growth model in which government services are an input of economic production functions. The model is specified in three versions, in which each of the three types of government services is the production's input. The three versions include: 1) a model that has publicly- provided private goods as a government's input; 2) a model that has publicly-provided public goods as a government input; and 3) a model that has publicly- provided public goods, which is subjected to congestion, as a government's input. Each model is specified and explained below.

Publicly-Provide Private Goods

$$y = Ak^{1-\alpha} g^{\alpha} \text{ ; where } 0 < \alpha < 1 \qquad (1)$$

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In this model, y is per capita output, k is per capita private investment, and g is per capita public spending for publicly-provided private goods. Since this type of government service is "rival" and "excludable" (i.e., consumption spending—welfare, per pupil spending) public service in this version is in a per capita term (*g*). This is because each producer has property rights to a specified quantity of pubic service. In this model, since α is less than 1, the total inputs k and g are subjected to constant returns to production *y*. This specification indicates that the change in government size positively relates to a change in economic output *y*. The government size is considered optimal when the level of *g* affects *y* at the magnitude α ; at this point, government consumption is productive.

Publicly-provided Public Goods

$$y = Ak^{1-\alpha}G^{\alpha}, \text{ where } 0 < \alpha < 1 \qquad (2)$$

In this model, *G is* as an aggregate quantity of government purchases for publicly-provided public goods. *G* represents the total amount, instead of per capita, because the public goods are non-rival and non-excludable; thus they can be spread over all the *n* numbers of producers. The examples of this public service type include public lighting and national defense. Like the first version, the change in public service *G* positively relates to change in output *y*. The government size is considered optimal when the level of *g* affects *y* at the magnitude α ; at this point, the government consumption is productive.

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Publicly-provided Public Goods that Are Subject to Congestion

$y = Ak(G/K)^{\alpha}$, where $0 < \alpha < 1$ (3)

In this model, *G* is publicly-provided public goods which is rival but non-excludable; and thus, it is subjected to congestion. This type of public services includes roads, highways, sewers, and courts. *G/K* is a constant return to scale (one unit input increase results in one unit output increase) as long as the government can maintain a given state of congestion at the ratio of public service to total private capital investment *G/K*. As the number of producers *(n)* increases, *k* increases; thus, the total *K* (or *n*k*) increases. If *K* is increased, while *G* is not increased, then *G/K* is decreased. If the congestion increases and public service is not increased, the decreased public service generates diminishing return α to output *y*. The model in this version shows that the optimal public investment (where α is higher than 0 but is less than 1) depends on the number of private producers or the demands for public service.

Barro and Sala-i-Martin (1992) assert that since each unit of public spending *g* requires the government to use one unit of resources (that come from output), the "naturally efficient condition" for determining the size of public sector is $\partial y / \partial g = 1$. That is, the change in *y* equals the change in *g*. Barro and Sala-i-Martin (1992) show that the marginal product of public capital can be determined:

$\partial y / \partial k = (1-\alpha)A^{1/(1-\alpha)}(g/y)^{\alpha/(1-\alpha)}$, where $\partial y / \partial k$ is computed for a given value of *g* (4)

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This model asserts that if the size of government is optimal, *g/y,* which is the size of government relative to the economy, the government's consumption will satisfy the condition g/y = α .

Since the present study focuses on state public infrastructure, including highways, school facilities, and correctional facilities, the growth model in the second version, publicly-provide public goods, is used. The efficiency condition for determining the size of public sector is:

$$y = Ak^{1-\alpha}(G/Y)^{\alpha} \tag{5}$$

This model indicates that if the size of government (for publicly-provided public goods) is optimal, G/Y will be significant and its effect on an economy will be equal to α . In other words, the size of government's spending needs to be at the optimal level relative to an economy to make public capital input productive.

Like the second version, the third version of Barro and Sala-i-Martin's model shows the effect of government consumption in public goods on the economy. However, this model is not used in this study since the relationship between private investment and government consumption must be considered to examine the effect of public input on growth. This examination is beyond the scope of this study.

Equation (5) is re-written in logarithm form and yields;

$$\ln y = \ln A_0 + a\ln k + b\ln(G/Y) + \varepsilon \tag{6}$$

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Where: *G/Y* indicates the size of government investment relative to an economy. The model indicates that per capita input k and public investment G/Y is the function of per capita output y.

Table 5 presents the previous studies' model specifications, results, and interpretations for the relationships between state or state and local fiscal policies and state economic growth. The specific characteristic of these models is that tax and spending policies are included in the same model in order to investigate the effects of each type of government policy while the other is controlled. These models are based on the concept that both government taxing and spending have effects on growth. That is, while taxing is believed to prohibit growth, spending encourages growth through supporting public services; thus, the effects of public spending may be neutral, positive, or negative, depending on the types and levels of taxes governments use to finance their services.

As shown in the table, the independent variables of the three models are measured in terms of taxing and spending rates relative to state economies (e.g., state property taxes divided by state gross state product value). This measurement represents the size of government investment relative to state output or income earned. Note that in these models, taxing and spending policies are disaggregated so that the effects of different types of taxing and spending policies can be understood individually, while the remaining policies are controlled for. Thus, in this type of model, the effects of fiscal policy levels and the composition of government expenditure and taxing can be simultaneously investigated.

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TABLE 5

Model Specifications for State Taxing and Spending Policies and Economic Growth

Studies/ Designs	Helms (1985)	Tomljanovich (2004)	Mofidi & Stone (1990)
Study Question	What is the effect of using tax to fund transfer payment on state personal income growth?	Do state tax and spending policies have a significant impact on state growth?	What is the effect of increasing taxes to fund transfer payment, when other types of expenditure are control for?
Dependent Variable	State personal income in 1967 dollar value.	Two-year percentage changes in per capita real GSP.	Employment rate: the logarithmic rate of change in full-time employment (F) during the five-year interval. That is, (log Ft5) - (log Ft1).
Independent Variables	**Revenue:** Property tax rate to total personal income, user fee rate to total personal income, total other taxes rate to total personal income. **Expenditure:** Health expenditure rate to total personal income, highway expenditure rate to total personal income, school expenditure rate to total personal income, higher education expenditure rate to total personal income, and other expenditure rate to total personal income. **Budget constraint:** Total federal grants and total deficit.	Two-year change in the following fiscal policies. **Revenue**: total state income tax rate to total GSP, total state sales tax rate to total GSP, total state property tax to total GSP, total corporate tax rate to total GSP. **Expenditure**: total education spending rate to total GSP, total welfare spending rate to total GSP, total hospital spending rate total GSP, total highway spending rate to total GSP. Per capita real federal grants.	**Revenue:** Total state and local tax rate to total personal income, total other revenue (i.e., federal grants and non-tax revenue) to total personal income. **Expenditure:** Total health spending rate to total personal income, total education spending rate to total personal income, total highways spending rate to total personal income, total other expenditure rate to total personal income, surplus rate to total personal income, and the unemployment insurance expenditure rate to total personal income. Transfer payment is omitted as a based case for the combination of state expenditure
Control Variable	Relative wage measured by the average hourly earnings of productive workers in manufacturing expressed as a percent of national average in that year. Non-agricultural unionization rate. Population density. State and time fixed effects.	State and time fixed effects.	Unemployment rate, ratio of female to total population, ratio of non white to total population, ratio of children aged 13 to 17 to total population, ratio of population aged 18 to 65 to total population, union ratio (percent of non-agricultural workforce covered by collective bargaining treatment), industrial mix ratio (percentage of non-agricultural employment in durable goods industries), regional effects and time trends.
Unit of Analysis	State and local (48)	State (50)	State (50)
Study Period	1965-1979 (14x48=672)	1972-1998 (two-year lagged independent variables and two-year GSP growth rate: 22 year series, 22x50=1100).	1962-1987, five year interval, logarithmic rate of change for both independent and dependent variable, no lagged independent variables (contemporaneous testing). Five year intervals are 1962, 1967, 1972, 1977, 1982). 50 states * 5 series = 200 cases.
Analysis Techniques	Weight least square method: least-square calibration (LSC)/Log	OLS	OLS/Log
R2	Not Reported	0.475	0.56
Main Findings/ Output Elasticity	(-.01), (-.008), and (-.007) for state and local property taxes, other taxes, and user fees, respectively. (-.01) and (-.01) for federal grant and deficits, respectively. (.02), (.01), (.01), (.01), and (.01) for health, highways, local schools, higher education, and other spending.	(7.2) for corporate tax rate change. (-1.15) for welfare rate change. Other disaggregated tax and spending changes are not significant.	Significant coefficient b of tax rate (-4.96), significant coefficient b(s) 5.62, 4.33, 5.49, 5.71, -4.34, for health, education, other expenditures, surplus, and unemployment insurance, respectively. Coefficient b of highway spending is not significant.
Conclusion	State and local property taxes, user fees, and other taxes used to finance transfer payment have negative impacts on state personal income growth. Health, highways, local schools, higher education, and other spending are productive spending compared to transfer payment funded by taxes.	Property, sales, and income taxes do not have significant effect on growth, while corporate tax rate enhances growth. The effects are only in a short-run (less than five-year time span). Welfare spending hinders growth, but only in a short-run (less than five-year time span).	State and local taxes have a negative effect when revenues are devoted to transfer payment programs. When tax is held constant, increase spending on health and education at the expense of transfer payment has a positive effect on employment growth rate.

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The models in Table 5 are specified such that one type of disaggregated spending and taxing policies is omitted in order to prevent perfect collinearity among the disaggregated taxing and spending policies. As shown in the table, Helms (1985) omits sales taxes from the revenue policy category and omits welfare spending from the expenditure policy category. In Tomljanovich's (2004) model, user fees are omitted from the revenue policy category, while other public spending (i.e., public safety and recreation) is omitted from the expenditure category. For Mofidi and Stone (1990), state and local revenue other than general revenue (i.e., utility revenue, liquor store revenue, and insurance trust revenue) is omitted while, in the same model, transfer payment is left out of the model.

As indicated in the table, Helms (1985) and Mofidi and Stone (1990) find negative coefficients of the tax policies on economic growth. Since the two authors omit transfer payment in their model, they interpret this finding that transfer payment funded by state and local taxes negatively impact state growth. Helms (1985) and Mofidi and Stone (1990) also find that in the same models, education and health policies have a positive effect on growth. They interpret these findings that education and health services that are financed by state and local taxed enhance state growth; but they do so at the expense of the omitted variable, which is transfer payment.

The empirical findings in Table 5 provide evidence that not only taxing but spending also affects state growth. The effects of these policies may be neutral, positive, or negative depending on the types of taxes used to fund government consumption. As suggested by these empirical results, tax is added into the model to examine the effects of using state government taxes (non-tax revenue is omitted) to fund public services

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including capital investment and other consumption such as welfare and health and hospitals.

Thus, equation (6) is re-written as:

$$\ln y = \ln A_0 + a \ln k + \sum_{i=1}^{k} \beta_i \ln X^i + \varepsilon \qquad (7)$$

Where $X_{st} = (x_{st}^1, \ldots\ldots x_{st}^k)$ represents the government's taxing and spending policy combination that can alter individual production function A and output y. Disaggregated tax and spending variables are included in the same model in order to investigate the impacts of government financial policies on state economic growth.

For this study, on the revenue side, total state taxes are included in the model, while non-state tax revenue is omitted. On the expenditure side, the disaggregated spending policies include welfare, health and hospital operation, highways operation, and aggregated capital outlays (including education, transportation, and public safety). Operational education spending and other types of public services (i.e., environment and housing) are omitted for two reasons: 1) to avoid perfect colinearity in state expenditure composition, and 2) to examine the effects of using total state taxes to fund these types of public spending.

Note that here, state total taxes and aggregated state capital spending are included in the same model. This specification is to specifically examine the impact of state capital spending on economic growth when state total taxes are held constant. Based on this type of specification, empirical result (which is the coefficient b of the capital

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spending) derived from this model will indicate the impact of using total state taxes to fund state capital investment. This investigation is the focal point of this study.

In the aforementioned studies (and in the present study), individual state economies are affected by their individual specific characteristics, including climates, natural resource endowments, and economic bases, as well as national growth and business cycles. Helms (1985) suggests including state specific characteristics M(s) and time trends $\lambda(t)$ into the state economic growth models since these factors are assumed to have significant impacts on regional growth. Thus, rewriting equation (7), including individual state unique characteristics, μ, time trends, λ, and random error term ε_{st} yields the OLS regression model:

$$\ln y_{ti} = A + b_1 \ln k_{ti} + b_2 \ln t_{ti} + b_3 \ln h_{ti} + b_4 \ln r_{ti} + b_5 \ln w_{ti} + b_6 \ln c_{ti} + \mu_s + \lambda_t + \varepsilon_{st} \quad (8)$$

In this model:

y is per capita real private, non-farm GSP, in year t for state i,

k is per capita real private capital stock , in year t for state i,

t is the ratio of total state taxes to total state GSP (D/Y) in year t for state i,

h is the ratio of total hospital expenditure to total GSP (H/Y) in year t for state i,

r is the ratio of total operation expenditure for highways to total GSP (R/Y) in year t for state i,

w is the ratio of total welfare spending to total GSP (W/Y) in year t for state i,

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c is the ratio of total capital outlays to total GSP (C/Y) in year t for state i[11],

μ is individual state characteristic for state s

λ is time trends and for time t

Endogeneity, or the simultaneous relationship between the dependent variable (per capita GSP) and the independent variables (the ratios of tax or spending to GSP), may exist if the variables on the left- and right-hand sides of the equation come from the same period. To control for endogeneity, one-period lagged independent variables are specified to create an overlapped space between fiscal policies and compound growth of GSP in the subsequent period. This is the standard approach to deal with endogeneity (e.g., see Garcia-Mila & McGuire, 1992;Tomljanovich, 2004; Dye & Feiock, 1995; Bleaney, Gemmell, & Kneller, 2001). The issue of the length of the lag must be determined.

Table 6 summarizes the testing scheme used to control endogeneity. Study data are from fifty states over the period ranging from 1997 to 2004. As presented in the table, the first two years of fiscal data (1997 and 1998) were used to construct changes in tax and spending rates for the first series. The last two years of GSP data (2003 and 2004) were used to construct the logarithmic growth rate of per capita GSP for the last series in panel data. The testing data are changes in a three-year period. This results in

[11] In concept, state public capital spending rate to GSP is different than per capita public capital stocks in that while public capital stock value reflects the accumulated public capital spending policy both in the past and at present, public capital spending rate to GSP reflects marginal change in investment policy or government investment decision relative to an economy in the current year. Public capital stock is equivalent to the depreciated value of past public spending plus the additional values of public spending in the current year. In other words, public capital stocks represent accumulated value of public spending accounted by depreciation rate and marginal investment in the current year. Meanwhile, public capital spending rate represents governments' decisions relative to output levels in the current year without accounting for the past spending. Since the present study focuses on investigating the effect of government size relative state economies on state productivity levels, public capital spending rate to GSP is treated as the interested variable.

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200 observations (50 states * 4 years from 1999 to 2002). The model is specified so that the independent variables are one-period lagged from the dependent variable per capita GSP growth rate. This design was chosen, given two data limitation problems. First, gross state product data are not available after 2004 by BEA at the time this study was conducted. The second data limitation is that capital management practice data are available only in the periods of 1999-2000, 2001-2002, and 2004-2005. The last data set, 2004-2005, was not included in the study since there is no gross state product data available after 2004, and the Government Performance Project's criteria for evaluating the management practices were changed.

TABLE 6

Testing Design

Y	X
1999-2001	1997-1999
2000-2002	1998-2000
2001-2003	1999-2001
2002-2004	2000-2002
No GSP data beyond 2004 from BEA as of April 2006	Not Available until 2004-2005

The potential problems with the regression model (Equation 8) include unit root in Y value (per capita GSP level) and cointegration between the dependent variable and independent variables. Unit root is a specific problem in time series data. Unit root problem occurs when the current-year data are determined by last-year data in a time series. When both independent data (*Xs*) and dependent data (*Y*) have unit roots, the regression results are spurious, since *Xs* and *Y* values will coincidently rise together, leading researchers to believe that there is a significant and large relationship between *Xs* and *Y*. Time series data are non-stationary when they have unit roots. When independent

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and dependent variable data are non-stationary, cointegration tends to exist since the values of this variable tend to rise together.

Kennedy (1998) specifies the model: $y_t = y_{t-1} + \varepsilon$; where y_t is per capita output in the current year, y_{t-1} is per capita output in the last year, and ε is an error term. In this model, in the previous period, a differenced value, $y_t - y_{t-1}$, instead of a level value, y_t, is used in an econometric model to control for the unit roots in the time series data. However, the recent econometric studies show that such differenced value may still carry the deterministic trends in time series data. This is because the deterministic trends could come from other unknown variables in the error terms instead of the last year output value y_{t-1}. If this is the case, change in this year data may be explained by change in last year output value y_{t-1} due to these unknown variables. For this reason, he suggests that researchers should conduct a unit root test and cointegration analysis between *Xs* and *Y* before proceeding to regression analyses.

According to Kennedy (1998), the differenced value of the independent variable $(X_t - X_{t-1})$ can be used to eliminate the cointegration problem. However, the long-run equilibrium properties of the data represented by X_t (which is equivalent to $X_{t-1} + \varepsilon$) would be lost at the expense of a no cointegration property. By this method, the marginal changes in independent variables or short-term effects of independent variables (Xs) are tested, without holding long-term effects of these variables constant. The long-run effect of the independent variable will be held constant only if X_t is included in the model. However, the cointegration problem arises again if the researchers add X_t into the

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econometric model in addition to $X_t - X_{t-1}$ to restore the equilibrium property of the independent variables due to the unit root of X_t.

Kennedy (1998) explains that the above problem inspires econometricians to develop an Error Correction Model (ECM) in which both level and differenced values of the independent variable *Xs* can be presented in the model without producing cointegration. There are two sets of the independent variables in the ECM. The first set is comprised of the differenced independent variables; the second set comprises of the error correction terms ($Y_{t-1} - X_{t-1}$) that are added to restore equilibrium in the econometric model. Kennedy (1998) explained that when the error terms or the differenced values between dependent and independent variables in *the last year series* are added into the model, the unit roots of independent and dependent variables are canceled out. Meanwhile, the leveled data of the independent variables restore equilibrium lost by using differenced independent values.

When time series data are used in an econometric model, Kennedy (1998) suggests the following steps.

1. Use a unit root test to determine if dependent variable Y is stationary:

$$\begin{aligned} &y = \alpha y_{t-1} + \varepsilon_t \\ &\alpha = 1 \Rightarrow y = I(1) non - stationary \\ &\alpha < 1 \Rightarrow y = I(0) stationary \end{aligned} \tag{9}$$

   If I*(1)* is found, the data must be differenced between the last year series and current year series for one time to acquire I*(0)*

2. Run cointegration regression:

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$$yt = B_0 + B_1 x_t + B_2 x_{t-1} + B_3 y_{t-1} + \varepsilon_t \quad (10)$$

$$\Delta yt = B_0 + B_1 \Delta x_t + (B_3 - 1)(y_{t-1} - x_{t-1}) + \varepsilon_t \quad (11)$$

Model (10) is the econometric model in which unit roots of x and y are held constant. If the residuals from model (10) show I*(0)* property, cointegration assumption is accepted. That is, the I*(0)* residuals show that when the unit roots of independent and dependent variables are controlled, the residuals are no longer co-integrated. If cointegration is found, use model (11) and lagged residuals from model (10) to estimate the relationship of Y and Xs. Model (11) is equivalent to model (10), but it allows convenience in testing and interpretation. The error correction terms in (11) restore equilibrium properties of variables in the model. The residuals from model (10) control cointegration between independent and dependent variables.

Following Kennedy's (1998) approach, Equation (8), which is the testing model to estimate the relationship between capital spending and growth in this study, is adjusted to derive the cointegration and error correction models as follows.

$$\ln y_{1999} = B_0 + B_1 \ln x_{1999} + B_2 \ln x_{1997} + B_3 \ln y_{1997} + \varepsilon_{t1999} \quad (12)$$

$$(\ln y_{2001} - \ln y_{1999}) = B_0 + B_1 (\ln x_{1999} - \ln x_{1997}) + (B_3 - 1)(\ln y_{1997} - \ln x_{1997}) + \varepsilon_{1999} \quad (13)$$

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$$(\ln y_{t,i} - \ln y_{t-2,i}) = B_0 + B_1(\ln t_{t,i} - \ln t_{t-2,i}) + B_2(\ln h_{t,i} - \ln h_{t-2,i}) + B_3(\ln r_{t,i} - \ln r_{t-2,i})$$
$$+ B_4(\ln w_{t,i} - \ln w_{t-2,i}) + B_5(\ln k_{t,i} - \ln k_{t-2,i}) + B_6(\ln c_{t,i} - \ln c_{t-2,i}) + (B_7 - 1)$$
$$(\ln y_{t-2,i} - \ln t_{t-2,i}) + (B_8 - 1)(\ln y_{t-2,i} - \ln h_{t-2,i}) + (B_9 - 1)(\ln y_{t-2,i} - \ln r_{t-2,i})$$
$$+ (B_{10} - 1)(\ln y_{t-2,i} - \ln w_{t-2,i}) + (B_{11} - 1)(\ln y_{t-2,i} - \ln k_{t-2,i}) + (B_{12} - 1)$$
$$(\ln y_{t-2,i} - \ln c_{t-2,i}) + \sum_{j=1}^{49} B_{13} S_t + \sum_{k=1999}^{2001} B_{14} T_i + u_{i,t} \qquad (14)$$

Equations (12) and (13) are cointegration regression and error-correction models (ECM), respectively. The two models are constructed according to Kennedy's specifications in step 2. These equations give the specific year in order to show how the lagged residual data (of the testing period 1999-2002) were derived. Equation (12) is estimated first to derive residuals. Next, the residuals from equation (12) are tested to determine if there is the cointegration between dependent and independent variables. If the cointegration is found, equation (13) will be used as an error correction model (ECM) for this study. The error corrections terms in ECM will make the testing model equilibrium. The residuals from the cointegration regression model will be included to control for the cointegration in the independent and dependent variables. Equation (14) represents the full error correction model constructed according to Kennedy's approach. This equation will be used *only if* the residuals from equation (12) are found I(*0*).

The terms $\sum_{j=1}^{49} B_{17} S_t + \sum_{k=1999}^{2001} B_{16} T_i + u_{i,t}$ are included into model (14) to control for individual state fixed effects and time trends as specified by Equation (8). If cointegration assumption is rejected, Equation (8) will be used as an empirical testing

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model. Thus, Equation (8) or (14) will be used as a basic model to test hypotheses 1 through 8 of the present study, depending on cointegration analysis results.

Equation (14) is modified to test the effect of per capita capital stock on state per capita GSP (hypothesis 1, 3, 4, and 5). The modified model is:

$$
\begin{aligned}
&(\ln y_{t,i} - \ln y_{t-2,i}) = B_0 + B_1(\ln t_{t,i} - \ln t_{t-2,i}) + B_2(\ln h_{t,i} - \ln h_{t-2,i}) + B_3(\ln r_{t,i} - \ln r_{t-2,i}) \\
&+ B_4(\ln w_{t,i} - \ln w_{t-2,i}) + B_5(\ln k_{t,i} - \ln k_{t-2,i}) + B_6(\ln k_{gov,t,i} - \ln k_{gov,t-2,i}) + (B_7 - 1) \\
&(\ln y_{t-2,i} - \ln t_{t-2,i}) + (B_8 - 1)(\ln y_{t-2,i} - \ln h_{t-2,i}) + (B_9 - 1)(\ln y_{t-2,i} - \ln r_{t-2,i}) \\
&+ (B_{10} - 1)(\ln y_{t-2,i} - \ln w_{t-2,i}) + (B_{11} - 1)(\ln y_{t-2,i} - \ln k_{t-2,i}) + (B_{12} - 1) \\
&(\ln y_{t-2,i} - \ln k_{gov,t-2,i}) + \sum_{j=1}^{49} B_{13} S_t + \sum_{k=1999}^{2001} B_{14} T_i + u_{i,t}
\end{aligned}
\tag{15}
$$

where; $k_{gov,t,i}$ is per capita value of aggregate public capital stock for state *i* at year *t*. In this equation, change in public capita spending rate is replaced by change in per capita private investment to examine the effect of *the accumulated* public capital spending on state per capita GSP growth. Equation (15) tests the relationship between capital stock and growth when other fiscal policies (except capital spending) are controlled for (hypothesis 1). The variable change in public capital spending is omitted to avoid collinearity between public capital stock and public capital spending since public capital stock is the depreciated value of public capital spending in the past plus the marginal change of public capital spending in the current year. The aggregate capital stock $k_{gov,t,i}$ is replaced by disaggregated public capital stocks, education, correction, and highway

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stock ($k_{ed,t,i}; k_{hyw,t,i}; k_{cor,t,i}$, respectively) to test the relationship between education, correction, and highway facilities and growth (hypotheses 3, 4, and 5).

To examine whether relatively stable annual capital spending (as opposed to large variations across years) has a positive impact on productivity, the interactive variable $\ln k_{gov,t,i} * \ln CV_{t,i}$ was included in the model in addition to the $k_{gov,t,i}$ variable. CV represents the coefficient of variation for annual state capital outlays within the last ten-year period. The model allows for an understanding of both the main effects of public stock and the effects of public stock that are relatively stable from one year to the next. The testing model for hypothesis 6 is:

$$
\begin{aligned}
&(\ln y_{t,i} - \ln y_{t-2,i}) = B_0 + B_1(\ln t_{t,i} - \ln t_{t-2,i}) + B_2(\ln h_{t,i} - \ln h_{t-2,i}) + B_3(\ln r_{t,i} - \ln r_{t-2,i}) \\
&+ B_4(\ln w_{t,i} - \ln w_{t-2,i}) + B_5(\ln k_{t,i} - \ln k_{t-2,i}) + B_6(\ln k_{gov,t,i} - \ln k_{gov,t-2,i}) + \\
&B_7(\ln k_{gov,t,i} - \ln k_{gov,t-2,i}) * \ln CV / Mean + (B_8 - 1)(\ln y_{t-2,i} - \ln t_{t-2,i}) + \\
&(B_9 - 1)(\ln y_{t-2,i} - \ln h_{t-2,i}) + (B_{10} - 1)(\ln y_{t-2,i} - \ln r_{t-2,i}) + (B_{11} - 1)(\ln y_{t-2,i} - \ln w_{t-2,i}) \\
&+ (B_{12} - 1)(\ln y_{t-2,i} - \ln k_{t-2,i}) + (B_{13} - 1)(\ln y_{t-2,i} - \ln k_{gov,t-2,i}) + \sum_{j=1}^{49} B_{14} S_t + \sum_{k=1999}^{2001} B_{15} T_i + u_{i,t}
\end{aligned}
\tag{16}
$$

This means $(\ln y_{t,i} - \ln y_{t-2,i}) = (B_6 + B_7 CV_{t,i})\ \Delta \ln k_{gov,t,i}$ or $y = Ak^{b5} k_{gov}^{b6+b7CV}$. If the estimated coefficient CV, B_7, is zero, there is no effect of CV on growth. If the estimated coefficient B_7 is larger than 0, then k_{gov} is more productive for the sample data. That is, a state's relatively stable annual capital spending rate enhances the impact of change in per capita public capital stock on state per capita GSP growth.

To investigate the roles of state capital budget and management practices on public capital spending, which, in turn, influence a state's output, the interactive variable

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$\Delta \ln c_{t,i} * CM$ was included in the model in addition to the $\Delta \ln c_{t,i}$ variable. CM represents the level of capital budget and management practice (high and low). The model allows for the understanding of both the main effects of capital spending and the effects of capital spending that are characterized by state capital management practices. The model to test hypothesis 8 is:

$$
\begin{aligned}
&(\ln y_{t,i} - \ln y_{t-2,i}) = B_0 + B_1(\ln t_{t,i} - \ln t_{t-2,i}) + B_2(\ln h_{t,i} - \ln h_{t-2,i}) + B_3(\ln r_{t,i} - \ln r_{t-2,i}) \\
&+ B_4(\ln w_{t,i} - \ln w_{t-2,i}) + B_5(\ln k_{t,i} - \ln k_{t-2,i}) + B_6(\ln c_{t,i} - \ln c_{t-2,i}) + \\
&B_7(\ln c_{t,i} - \ln c_{t-2,i}) * CM_{t,i} + (B_8 - 1)(\ln y_{t-2,i} - \ln t_{t-2,i}) + \\
&(B_9 - 1)(\ln y_{t-2,i} - \ln h_{t-2,i}) + (B_{10} - 1)(\ln y_{t-2,i} - \ln r_{t-2,i}) + (B_{11} - 1)(\ln y_{t-2,i} - \ln w_{t-2,i}) \\
&+ (B_{12} - 1)(\ln y_{t-2,i} - \ln k_{t-2,i}) + (B_{13} - 1)(\ln y_{t-2,i} - \ln c_{t-2,i}) + \sum_{j=1}^{49} B_{14} S_t + \sum_{k=1999}^{2001} B_{15} T_i + u_{i,t}
\end{aligned}
\tag{17}
$$

This means $(\ln y_{t,i} - \ln y_{t-2,i}) = (B_6 + B_7 CM_{t,i})\ \Delta \ln c_{t,i}$ or $y = Ak^{b5} c_{t,i}^{b6+b7CM}$. If the estimated coefficient CM, B_7, is zero, there is no effect of CM on growth. If the estimated coefficient B_7 is larger than zero, then c is more productive for the sample data. That is, a state's capital budget and management program enhances the impact of change in per capita public capital stock on state per capita GSP growth.

To test hypothesis 7 (the relationship between capital budget practices and public capital stock on state growth), $B_7(\ln c_{t,i} - \ln c_{t-2,i}) * CM_{t,i}$ is replaced by $B_7(\ln k_{gov,t,i} - \ln k_{gov,t-2,i}) * CM_{t,i}$ to investigate the role of the state capital budget and management program on state economic growth to state public capital stock (or state accumulated spending on public capital investment). The significance of B_7 indicates

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that state capital budget and management programs significantly enhance the impact of public capital stock on state per capita GSP growth.

Data Description

Table 7 presents variables, data definitions, sources, and periods that the data cover. All fiscal policy data (taxes and spending) were from State and Local Government Finance section, U.S. Census Bureau (2006b). Personal income and the U.S. private capital stock data used to apportion state private capital stocks were from the Bureau of Economic Analysis—BEA (2006c). State capital outlays and public capital stock data used to apportion state public capital stocks were derived from State and Local Government Finance, U.S. Census Bureau and the BEA (2006c). Gross state product data came from BEA (2006d). State grades for capital budget and management practices were from the Government Performance Project (GPP) website. Capital outlay data for calculating state coefficient of variation in capital spending were from the State and Local Government Finance, U.S. Census Bureau (2006a). State population data were derived from the BEA.

Per Capita Real Private Non-farm Gross State Product (GSP): This dependent variable is used as an indicator for a state's aggregated economic output and shift in economic performance during a three-year cycle. According to Solow (1957), measuring economic activity by including only the outputs from private and non-farm sectors has two main advantages: 1) the data skirt the problem of measuring government outputs, and 2) they eliminate heterogeneity among samples due to fundamental differences in

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TABLE 7

Data Definition

Variable	Data Definition	Source	Year
$y_{t,i}$	Real per capita GSP in state i at time t. (year 2000 dollar value)	Bureau of Economic Analysis	2001-2004
$y_{t-2,i}$	Two-year lagged per capita GSP	Bureau of Economic Analysis	1999-2002
$t_{t,i}$	Total state taxes (including individual income corporate income taxes, sales taxes, property tax, license tax, and other taxes/ total GSP	U.S. Census Bureau, Bureau of Economic Analysis	1999-2002
$h_{t,i}$	Total state health and hospital spending less health and hospital capital outlays/ total GSP	U.S. Census Bureau, Bureau of Economic Analysis	1999-2002
$r_{t,i}$	Total state highways spending less highways capital outlays/ total GSP	U.S. Census Bureau, Bureau of Economic Analysis	1999-2002
$w_{t,i}$	Total state welfare spending/ total GSP	U.S. Census Bureau, Bureau of Economic Analysis	1999-2002
$c_{t,i}$	Total state aggregate capital spending/ total GSP	U.S. Census Bureau, Bureau of Economic Analysis	1999-2002
$k_{t,i}$	Per capita private capital stock (2000 dollar value)	Bureau of Economic Analysis	1999-2002
$k_{gov,t,i}$	Per capita public capital stock (2000 dollar value)	Bureau of Economic Analysis	1999-2002
$v_{t,i}$	A state's relatively stability of annual capital spending during 10 year period.	U.S. Census Bureau	1999-2002
High CM	State capital management grade A, A-, B+,	Government Performance Project (GPP)	1999-2002
Low CM	State capital management grade B, B-, C, C-, D+, D, D-	Government Performance Project (GPP)	1999-2002

agricultural sectors. The GSP data were derived from the Bureau of Economic Analysis (BEA). By definition, the GSP is the value added in production by the labor and property located in a state (BEA, 2006d). GSP for a state is derived as the sum of the gross state product from all state industries. According to BEA (2006d), an industry's GSP, referred to as its "value added," is equivalent to its gross output (sales or receipts and other operating income, commodity taxes, and inventory change) minus its intermediate input values (consumption of goods and services purchased from other U.S. industries or

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imported). GSP excludes the compensation of federal civilian and military personnel stationed abroad and the government consumption of fixed capital assets for its military (BEA, 2006d).

Fiscal Policy Variables: Tax rate data were derived by dividing current total state tax (including property, sales and gross receipts, individual income, corporate income, motor vehicle licenses, and other taxes) by current state product GSP. Hospital and highway operation spending rates were derived by dividing current total hospital spending less hospital capital outlay by current total state product GSP, and by dividing current total highway spending less highway capital outlay by current total state product GSP, respectively. Welfare spending rate data were derived by dividing current total welfare spending by current total state product GSP. Per capita real federal grant data were derived by dividing real intergovernmental revenue received by a state (2000 dollar value) by total population. The Consumer Price Index from the Bureau of Labor Statistics was used to deflate intergovernmental revenue received by a state.

Private Capital Stock: Because the BEA does not report private non-residential assets, the data were apportioned by using an income-based method as demonstrated by Garofalo and Yamarik (2002). Appendix A includes a detailed description and formula for this apportioning process. By this method, total U.S. private capital stock data for each of the nine industrial sectors (farming; forestry, fishing and others; mining; construction; manufacturing; transportation; trades; finance, insurance, and real estate; and services) were divided by the total U.S. personal income in the same sector to derive the share of each individual state's personal income to the U.S. total. For example, the manufacturing personal income in the state of Alabama was divided by the total U.S.

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personal income in manufacturing, the transportation personal income in the state of Alabama was divided by the total U.S. total personal income in transportation, and so on. Then the shares of personal income in a state from each of the nine sectors as compared to the total U.S. personal income in each of the nine sectors were multiplied by the total U.S. private fixed assets in each of the nine sectors.

According to Garofalo and Yamarik (2002), apportioning private capital stock by industry sectors yields capital stocks that closely reflect reality since each industry has a different income; and, thus, its private investment is different from state to state. If a state's total private capital stock is apportioned by dividing aggregate total personal income of the state by aggregate total personal income of the U.S., the share of wealth and stock value is just an average for all sectors, which may not be realistic since different states have different wealth and investments across sectors according to their economic bases.

The private capital stock data for nine industries in each individual state were then summed together to derive total private stock data for each individual state. Personal income data were obtained from the BEA and inflation was adjusted by the BEA's Chain-Type Quantity Indexes. Data for national non-residential fixed assets by industry were derived from the BEA. The non-residential fixed asset data were adjusted for inflation by the BEA's Chain-Type Quantity Indexes for Net Stock of Private Non-Residential Fixed Assets by Industry Group. The state total private capital stock data were divided by the state's total population to derive the state's per capita public capital stock data.

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Public Capital Stock: The BEA does not report public capital stock by state. The total U.S. public capital stock data were apportioned by using the perpetual inventory method as demonstrated by Holtz-Eakin (1993). Appendix B describes the detailed method and specific equations for deriving the benchmark stock calculation, the depreciation rate calculation, and the state public stock calculation. Through this method, the national government's fixed asset data for the benchmark year (for this study, the benchmark year is 1995) were first apportioned to each individual state based on each state's percentage share of the total expenditure to the U.S. total expenditure in the same fiscal year. The benchmark capital stock data for each state were then adjusted by the deprecation rate (4.2 percent; this percent was calculated by using state investment data from 1995 to 2002 according to Holtz-Eakin's (1993) method). The depreciated capital stocks in the benchmark year were then added to the value of the state investment in the next fiscal year to derive state capital stock for the first year of the data panel (which is year 1996). The next series, the 1997 series, was used to construct the per capita public capital stock change for the first testing series--1999 ($k_{gov,1999,i} - k_{gov,1997,i}$).

The total expenditure and capital outlays data by state and for the U.S. were obtained from the U.S. Census Bureau's homepage. The data were adjusted for inflation by using the BEA's Price Indexes for Government Consumption Expenditures and Gross Investment. National public stock data were derived from the BEA's Government Fixed Asset Table. The data were adjusted by using the BEA's Chain-Type Quantity Indexes for Net Stock of Government Fixed Assets. The total public capital stock data for each state were then divided by the total population of the respective state to obtain state per capita public capital stock data.

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Coefficient of Variation (CV): This data were used to measure the degree of variation in the annual capital spending outlays by a particular state within a ten-year time period. CV can be derived by dividing the state annual capital spending standard deviation by its mean. A ten-year period has been chosen because it is considered to be long enough to cover both recessive and expansive trends in the economy. A state CV indicates how the state dealt with funding during a period that covers both good and bad times. A higher CV indicates less funding stability—that is, the annual capital spending by a state varied widely over ten years. State total capital outlay expenditure data reported by the U.S. Census were used to calculate state CV. The outlays were adjusted for inflation by using the Bureau of Labor Statistics' Consumer Prices Index (year 2000 base). Table 8 presents time series data to calculate coefficient of variation (CV) in state annual capital spending.

TABLE 8

Time Series Data to Calculate Coefficient of Variation (CV)

Ten-year Capital Outlay	Ten-year Mean	CV Entered into Regression
1990-1999	1990-1999	1999
1991-2000	1991-2000	2000
1992-2001	1992-2001	2001
1993-2002	1993-2002	2002

For sensitivity analysis, variation in ten-year annual state capital spending also was measured by dividing a state's Root Mean Square Error (RMSE) for ten-year annual capital spending by the state's mean of ten-year annual capital spending. The RMSE (or standard error of estimate) is the standard deviation of the error terms in the state's ten-year annual capital spending statistics. To calculate RMSE/Mean, the following steps

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were conducted. First, state annual capital spending data were adjusted by Bureau of Labor Statistics' Consumer Prices Index (year 2000 base), to obtain a constant value of state capital spending. Second, ten-year annual capital spending data for each of the fifty individual states and each of the four time series (1999, 2000, 2001, and 2002) were regressed against year to obtain RMSE for each individual state in each single time series. Last, each individual RMSE for each state in each time series was divided by the mean of the ten-year annual capital spending of each individual state.

State Capital Management Practice: This variable indicates to what extent a state government does well in its capital management practices, relative to other states, based on the key elements previously identified in the capital budget and management section (Chapter 2). Capital management practices by the fifty states were evaluated and assigned performance grades by Government Performance Project (GPP) researchers (including faculty from the Maxwell School of Citizenship and Public Affairs of Syracuse University and the project staff from Governing Magazine). The GPP utilized criteria-based assessment methodology to assign capital management grades for each state during the years 1999-2000 and 2001-2002. According to the GPP's *Path to Performance in State-Local Government* (2002), performance (or government practices) can be compared against sets of clearly stated and widely accepted descriptions of desirable conditions, which are used as a base for comparison between desired practices and actual practices. The criteria that the GPP used to evaluated state performance in capital management included (1) long-term planning, (2) long-term fiscal planning, (3) project management and monitoring, and (4) asset maintenance. GPP accentuates that for the best practice, long-range capita planning must be well matched with long-range fiscal

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planning. Thus, if a state lacks one of these planning elements, the state will not receive a good grade. As stated by the GPP (2002), these criteria focus on the process used for capital management, not on the quantity of resources available. Therefore the assessments do not penalize a government that operated with resource constraints.

The GPP data for capital management performance assessment came from three sources: a 17-page mail survey regarding state capital budget and management process completed by fifty individual states; public documents including state budget documents and published CIP of each of the fifty states, and in-depth interview with four government officials and an academician or researcher in each state. The directors of the state budgeting offices were among the key informants. Data coding was conducted by trained research assistants from the Maxwell School. The final assessments were conducted by the whole team of researchers. Letter grades (A, A-, B+, B, B-, C+, C, C-, D+, D, and D-) were assigned to each state reflecting how well an individual state managed its capital relative to the other 49 states.

Based on interviews with the researchers of the project, it was recommended that the grades be transformed into a three-level ordinal scale (high, medium, low) or a dichotomous scale (high and low) since the 11 grades were not mutually exclusive. For sensitivity analysis both three-level ordinal scale and dichotomous scale will be alternately entered into the regression to see if the regression for the two management measurement method yields different results. The description for performance classification in the two scales by 11 grades is presented in the following section.

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Descriptive Statistics

This section presents descriptive statistics for empirical testing. Table 9 displays descriptive statistics of the data. All dollar values are in constant 2000 dollars. The dependent variable is per capita real private non-farm gross state product (GSP). The time period for the pre-constructed data was from 1999 to 2004, and the time period for constructed data entered into the model was from 1999 to 2002. The mean annual per capita gross state product value is $28,900, with variation between a minimum of $18,000 and a $54,400 maximum.

The annual state tax and spending data are from fifty states covering the years 1997 to 2002. The three-year cycle testing data address the years 1999 to 2002. The annual state tax and spending data are from fifty states covering the years 1997 to 2002. The three-year cycle testing data address the years 1999 to 2002. The state tax rates were constructed by dividing total state taxes (including sales, individual income, corporate income, property, motor vehicle, and other state taxes) with total GSP. The average for annual total tax rates over the time period was 6.7 percent. Tax rates varied between 2.8 and 11 percent over the time period.

Public spending data were disaggregated into four types: operational hospital spending, operational highway spending, welfare spending, and total direct capital outlay. As suggested by Helms (1985) and Tomlajnovich (2004), disaggregated spending allows for insight into which tangible public spending influences economic agents. Disaggregated capital outlays for highways and hospitals were subtracted out of the total

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TABLE 9

Descriptive Statistics: Tax and Spending Rates and Gross State Output Values By States 1997-2004 (n=300)

	Mean	Standard Deviation	Minimum	Maximum
State Per Capita GSP (Real Private-Non Farm, BEA Chained Index Adjusted) ($)	$28,899	$6,120	$17,933	$54,359
State Taxes (individual income, corporate income, and sales taxes, property taxes, license taxes and other taxes)/State Total GSP (%)	6.70%	1.45%	2.75%	10.99%
Capital Spending/Total GSP (%)	1.18%	0.50%	0.37%	3.18%
Operational Hospital Spending/Total GSP (%)	0.39%	0.30%	0%	1.26%
Operational Highway Spending/Total GSP (%)	0.39%	0.30%	-0.06%	1.93%
Total Welfare/Total GSP (%)	2.84%	1%	1.10%	5.81%
Per Capita Real Federal Grant to a State ($)	$996	$297	$474	$2,646
Per Capita Real Public Capital Stock Value ($)	$6,146	$2,286	$3,888	$18,678
Per Capita Real Private Capital Stock Value ($)	$61,164	$21,807	$31,108	$157,452
Per Capita Real Public Education Capital Stock Value ($)	$865	$487	$255	$3,497
Per Capita Real Highways Capital Stock Value ($)	$4,498	$2,077	$1,255	$11,986
Per Capita Real Correction Capital Stock Value ($)	$186	$133	$19	$705
Ten-Year Capital Spending Variation measured by RMSE/Mean*	-0.134	0.621	-0.192	1.790
Ten-Year Capital Spending measured by Coefficient of Variation[a]	0.148	0.059	0.054	0.388

[a] For this variable, n = 200 observations for time series 1999, 2000, 2001, and 2002 (50 state x4 series).

for direct state highways and out of the total for hospital expenditures reported by the U.S. Census. This results in the operating expenditure for the two spending types. All

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public spending data were divided by total GSP to derive the effective public spending rates. As reported in Table 9, on average, hospital, highway, welfare, and capital spending rates are 0.39, 0.39, 2.9, and 1.2 percent, respectively. The maximums of hospital, highway, welfare, and capital spending rates are 1.3, 2, 6, and 3 percent, respectively. The minimums for hospital, highway, welfare, and capital spending rates are 0, 0.05, 1, and .4 percent respectively. The statistics indicate that the states, in the years from 1997 to 2002, did not spend highly on highways compared to the means of this spending type in the period of 1972-1998 as reported by Tomljanovich (around 1.2 percent).

Annual, aggregated public capital stock ranges from a minimum of $3,888 per person to a maximum of $18,678. The average value is $6,146 per person. Annual, education capital stock ranges from a minimum of $255 per person to a maximum of $3,500 per person. The annual average for educational facilities is $865 per person, per year. Per capita highway capital stock ranges from $1,255 to $11,986; the average is $4,498. Annual per capita correction facility stocks range from a minimum of $19 to a maximum of $705, with an average value of $186.

The RMSE/mean measures the variation of a state's annual capital spending during a ten-year period as compared to its mean. RMSE is the standard deviation of the error terms in the state's ten-year annual capital spending statistics. The RMSE is divided by its mean to standardize the RMSE of the fifty states whose size of capital spending may be largely different. The states' RMSE/mean statistics range from a minimum of -1.92 to a maximum of 1.79, and have an average of .134. A state's large

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absolute value of RMSE/mean indicates that the state's annual capital spending varied widely during the ten-year period.

The coefficient of variation (CV) measures the variation in annual per capita capital outlays within a ten-year period. A state's CVs were computed from the state's annual real per capita capital outlays from the years 1990 to 1999, 1991 to 2000, 1992 to 2001, and 1993 to 2002—for the CV of 1999, 2000, 2001, and 2002, respectively. The CV is computed by dividing the standard deviation of each state's time series data with its mean. The CV has a unit-free value since the standard deviation and mean are measured using the same units. To measure and compare the variability of the states' ten-year capital spending, CV is more appropriate than standard deviation since it does not take the different sizes of capital spending or the mean of the ten-year process into consideration. The states' CVs range from a minimum of .05 to a maximum of .38, and have an average of .14. A large CV value reflects a large variability in capital spending within 10 years.

Table 10 presents the capital management practice data and grading classification from fifty states from the years 1999 to 2002. The grading distribution indicates that 14, 34, 29, 18, and 5 percent of the observations are A to A-, B to B+, B- to C+, C to C-, and D classes, respectively. The dichotomous scale—highly systematic capital process (class A to B+) and low systematic capital process (class B-D-)—was used since it was recommended by the project's researchers. The three-ordinary scale was used for sensitivity analysis. On average, the states perform at the B+, B, B-, and C+ levels (126 cases). About one-forth of the total samples (200) performed at the low level (46 cases

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for C, C-, D+, D, and D-), and about one-eighth of the samples performed at the very high level (28 cases for A and A-).

TABLE 10

Capital Management Performance by States 1999-2002

	Grading Distribution	
	Grade	**Count (Percent)**
	A, A-	28 (14%)
	B+, B	68 (34%)
	B-, C+	58 (29%)
	C, C-	36 (18%)
	D+, D, D-	10 (5%)
	Total	200 (100%)
	Three-level Ordinal Scale	
	Grade	**Count (Percent)**
High	A, A-, B+,	56 (28%)
Medium	B, B-, C+	98 (49%)
Low	C, C-, D+, D, D-	46 (23%
	Total	200 (100%)
	Dichotomous Scale	
	Grade	**Count (Percent)**
High	A, A-,B+	56 (28%)
Low	B, B-, C+, C, C-, D+, D, D-	144 (72%)
	Total	200 (100%)

Source: The Government Performance Project (2006). *Path to Performance in State and Local Governments*. Retrieved from http://www.maxwell.syr.edu/gpp/

Unit Root Test and Cointegration Analysis

This section presents the results of unit root test for independent variable (Y) and the cointegration analysis for independent variables (Xs) and (Y) as suggested by Kennedy (1998). The criteria to determine if the dependent variable log y is stationary are:

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$y = \alpha y_{t-1} + \varepsilon_t$

$\alpha = 1 \Rightarrow y = I(1) non-stationary$

$\alpha < 1 \Rightarrow y = I(0) stationary$

Tables 11 and 12 present the unit root test for Y to determine if dependent variable y is stationary (Kennedy's Correction Model's Step 1). Table 11 presents the results when $\ln y_{t,i}$ is the dependent variable and $\ln y_{t-2,i}$ is the independent variable. The results indicate that $\ln y_{t,i}$ is non-stationary, *I (1)*, since the coefficient α is about 1 (coefficient b of .985). Table 12 presents the unit root test results when $\ln y_{t,i} - \ln y_{t-2,i}$ is the dependent variable and $\ln y_{t-2,i}$ is the independent variable. The results indicate that $\ln y_{t,i} - \ln y_{t-2,i}$ is stationary, *I (0)* , since α is less that 1 (coefficient b of -.008). These results indicate that the y level (represented by $\ln y_{t,i}$) is non-stationary, I*(1)*, and it needs to be differenced (or integrated by order one) to achieve stationary. Thus, the independent variable $\ln y_{t,i} - \ln y_{t-2,i}$ or the logarithmic changes of y were used to test the study hypotheses, instead of using $\ln y_{t,i}$, to avoid non-stationarity of $\ln y_{t,i}$.

TABLE 11

Unit Root Test of Dependent Variable $\ln y_{t,i}$

Model		Unstandardized Coefficients		Standardized Coefficients	t	Significant Value
		B	Standard Error	Beta		
	Constant	.190	.138		1.375	.171
	$\ln y_{t-2}$	.985	.014	.982	72.718	.000

Dependent Variable: $\ln y_t$

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TABLE 12

Unit Root Test of Dependent Variable $\ln y_{t,i} - \ln y_{t-2,i}$

Model		Unstandardized Coefficients		Standardized Coefficients	t	Significant Value
		B	Standard Error	Beta		
	Constant	.118	.114		1.034	.302
	$\ln y_t - \ln y_{t-2}$ (1997-2002)[a]	-.008	.011	-.054	-.755	.451

Dependent Variable: $\ln y_t - \ln y_{t-2}$ (1999-2004)

[a] Independent variable data are one-period lagged from dependent variable Y.

The next step is to test the residuals from the cointegration regression $\ln y_{1999} = B_0 + B_1 \ln x_{1999} + B_2 \ln x_{1997} + B_3 \ln y_{1997} + \varepsilon_{t1999}$ to determine if *Xs* and *Y* in the model are cointegrated (Kennedy's step 2). The residuals derived from this cointegration model were regressed against their own lags. Kennedy (1998) provides the criteria to determine if cointegration exists:

> If a set of I(*1*) variables are cointegrated, then regressing one on the other should produce residuals that are I*(0)*; most tests for cointegration therefore take the form of a unit root test applied to the residuals resulting from estimation of the cointegrating (long-run equilibrium) relationship (p. 270).

From the above statement, if the α of the lagged residuals is I*(0),* then cointegration between the set of variables exist; and thus, it is necessary to use Kennedy's Error Correction Model (ECM) to correct cointegration.

Tables 13 and 14 present the results of cointegration testing for residuals from the capital spending model and the capital stock model, respectively. As shown in Table 13, since α is smaller than 1 (b=.472), the residuals are *I(0)*; and thus, the cointegration

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between dependent and independent variables *exists* for the data set in capital spending regression model. The Error Correction Model is needed to estimate the relationships of *Xs* and *Y* for the present study's capital spending model. As shown in Table 14, since α is smaller than 1 (b=.489), the residuals are *I(0)*; and thus, the cointegration between dependent and independent variables exists for the data set in the capital stock regression model. The Error Correction Model is needed to estimate the relationships of independent variables (*Xs*) and dependent variable (*Y*) for this capital stock model.

TABLE 13

Cointegration Test of Residuals from the Capital Spending Model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Significant Value
		B	Standard Error	Beta		
	Constant	-.005	.002		-2.448	.016
	Lagged Unstandardized Residual	.472	.082	.438	5.751	.000

Dependent Variable: Residuals from Capital Spending Regression Model (Kennedy's Step 2, Co-integrating Model)

TABLE 14

Cointegration Test of Residuals from the Capital Stock Model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Significant Value
		B	Standard Error	Beta		
1	Constant	-.005	.002		-2.355	.020
	Lagged Unstandardized Residual	.489	.080	.462	6.149	.000

Dependent Variable: Residuals from Capital Stock Regression Model (Kennedy's Step 2, Co-integrating Model)

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Bivariate Analysis

This section presents correlation analysis for the model's dependent and independent variables. Bivariate analysis was conducted for two reasons. The first is to establish the correlation between the dependent and the independent variables. The second is to detect highly correlated independent variables. High correlations between two independent variables may cause a multicollinearity problem that makes it difficult for a regression to assess the individual role of each independent variable. Multicollinearity will be discussed in more detail in the diagnostic section.

Table 15 presents Pearson's Correlation coefficient indicating the association between each pair of variables. The correlation coefficient ranges from 0 to 1. A correlation coefficient of 0 indicates no correlation between the variables; while a correlation coefficient of -1 and 1 indicate perfect correlation between the two variables, negatively and positively, respectively.

As presented in Table 15, the GSP change ($\ln y_t - \ln y_{t-2}$), which is the dependent variable of the models, statistically correlates with welfare spending (Δw) , private capital stock (Δk) , public capital stock (Δkg), school capital (ΔSchool), correction capital stock (ΔCorrection), and the interactive variable capital spending variation RMSE/Mean (Δkg*RMSE/Mean) at .01 level. The dependent variable ($\ln y_t - \ln y_{t-2}$) statistically correlates with the interactive variable of public capital stock and medium-grade management practice (Δkg*CM medium) at the 0.05 level. However, the magnitudes of these associations are not large (ranging from .144 to.320).

The bivariate analysis results indicate that there is no significant association

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TABLE 15

Pearson's Correlations

	lnyt-lnyt-2	Y-T	Y-H	Y-C	Y-R	Y-W	Y-K	Δt	Δh	Δc	Δr	Δw	Δk	Δkg	Y-Kg	Δc* HighCM	Δc* Medium CM	Δc* Low CM	Δkg* Low CM	Δkg * Medium CM	Δkg * HighCM	Δ School	Δ Highways	Δ Correction	Δkg * RMSE/M	Residual C*	Residual K**
lnyt-lnyt-2	1																										
Y-T	-.084	1																									
Y-H	.011	.657**	1																								
Y-C	-.137	.680**	.576**	1																							
Y-R	-.137	.624**	.450**	.631**	1																						
Y-W	-.064	.788**	.666**	.675**	.652**	1																					
Y-K	-.117	-.328**	-.278**	-.242**	-.446**	-.341**	1																				
Δt	-.041	.102	.027	.059	-.035	-.080	.010	1																			
Δh	.055	.090	.210**	.087	.064	.099	.074	.064	1																		
Δc	.006	-.034	.016	.217**	-.032	-.103	-.055	-.129	-.042	1																	
Δr	.057	-.007	.172**	.133	.217**	.113	.055	.059	.230**	.076	1																
Δw	.144**	-.064	.019	-.037	-.007	.041	.114	.043	.332**	-.065	.284**	1															
Δk	.228**	.033	.026	.011	-.073	.014	.155**	-.121	-.009	-.029	-.091	.124	1														
Δkg	.210**	-.201**	-.241**	-.630**	-.290**	-.255**	-.043	-.133	-.023	.079	-.175*	.05	.071	1													
Y-Kg	-.088	.628**	.521**	.779**	.584**	.631**	-.191**	.066	.128	-.003	.131	.021	.026	-.295**	1												
Δc*High CM	.01	.010	-.095	-.194**	.02	.076	.043	-.040	-.027	-.632**	-.048	-.018	-.002	.000	-.014	1											
Δc*Medium CM	-.092	-.036	.011	-.123	-.046	.004	.05	.233**	.071	-.618**	-.038	-.011	.015	-.129	.025	.009	1										
Δc*Low CM	.093	.104	.078	-.043	.102	.114	-.005	.023	.034	-.479**	-.048	.174*	.044	.001	-.008	.014	-.006	1									
Δkg*Low CM	.093	-.183**	-.156*	-.384**	-.175*	-.181*	.159**	-.023	.031	.022	-.006	.261**	.101	.470**	-.203**	-.004	.002	-.043	1								
Δkg*Medium CM	.163*	-.059	-.062	-.348**	-.086	-.089	-.112	-.089	-.064	.145*	-.048	-.133	-.038	.595**	-.186**	-.01	-.231**	.007	-.002	1							
Δkg*High CM	.102	-.119	-.197**	-.362**	-.237**	-.176*	-.078	-.104	.002	-.029	-.220**	.01	.071	.637**	-.131	.012	.016	.026	-.008	-.017	1						
ΔSchool	.320**	.024	.023	-.090	-.102	-.019	.076	-.282**	.021	.031	-.123	.197**	.221**	.179*	-.088	-.011	-.142*	.133	.178*	.097	.054	1					
ΔHighways	-.064	-.188**	-.192**	-.159**	-.199**	-.310**	.063	.131	.073	.249**	-.043	.054	.036	.344**	-.221**	-.159**	-.09	-.200**	.167*	.13	.285	-.423**	1				
ΔCorrection	.231**	.049	.098	-.097	-.119	-.039	.048	.044	-.008	.016	-.049	-.026	.053	.196**	-.091	-.058	-.08	.146*	.089	.211**	.039	.430**	-.155*	1			
Δkg*RMSE/M	-.206**	.196**	.242**	.630**	.285**	.259**	.038	.130	.023	-.082	.177*	-.049	-.067	-.999**	.290**	.002	.129	.005	-.477**	-.596**	-.629**	-.181*	-.342*	-.195**	1		
Residual C*	-.152*	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	-.026	-.113	-.054	-.009	.081	-.159*	.071	.011	-.089	-.022	.015	.030	1	
Residual K**	-.133	.000	.000	.063	.000	.000	.000	.000	.000	-.039	.000	.000	.000	.000	.000	-.032	.015	.104	-.167*	.057	.071	-.091	.007	.017	.004	.972**	1

Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).*

** Residuals from Capital Spending Co-integration Model* *** Residuals from Capital Stock Co-integration Model*

between change in capital outlay spending (Δc) and change in state per capita GSP ($\ln y_t - \ln y_{t-2}$). Meanwhile, there is a significant association between change in public stock (Δkg) and change in GSP ($\ln y_t - \ln y_{t-2}$). Nevertheless, the relationships between growth and each of the two variables were further studied in a separate model since the causal relationships between fiscal policies and growth cannot be drawn from only correlation analyses.

Pearson's correlation matrix is a common method to initially check for multicollinearity among independent variables. The higher the correlation, the more severe the collinearity problem is likely to be. As a rule of thumb, a correlation over .90 indicates a serious problem. As shown in the table, statistically significant associations among the main independent variables[12] range from the absolute value .175 to .344 for the association between public capital stock and highway operation spending, and the association between highway capital stock and aggregate capital stock, respectively.

The cross-product term capital outlay * management practice (low, medium, and high) shows no correlation with the main variables, except for change in tax rate and medium-level management (.233) and change in welfare and low-level management (.174). The cross product variable significantly correlates with change in capital spending (Δc) at moderate degrees (.479, -.618, and -.632, for low, medium, and high grade, respectively). The cross-product term capital stock and management practice (low, medium, high) shows moderate correlation with the capital stock variable (Δkg) at

[12] The main independent variables are the variables of interest. They include change in total taxes, change in capital spending rate, change in health and hospital operation expenditure rate, change in highway operation expenditure rate, change in welfare spending rate, the interactive variable public capital outlays and capital management (the cross product term), and the interactive variable public capital stock and capital management (the cross product term).

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the magnitude .470, .595, and .637, for the associations between cross-product term low, medium, and high and the capital stock variable, respectively. The cross-product term change in capital stock and capital spending variation (RMSE/M), Δkg*RMSE/M, perfectly correlates with change in public capital stock, (Δkg) (.972). However, since the cross-product term must be used to test the effect of government spending stability on growth mediated by aggregate public capital stock variable, this variable was not dropped.

As displayed in the solid border within Table 15, each of the error correction terms included for a cointegration correction purpose[13] has a significant association with each member of that group (ranging from the absolute value .191 to .788 for error terms *Y-K* and error term *Y-Kg* and error terms *Y-T* and *Y-W*, respectively). However, these error correction terms do not have large correlations with the main variables. The associations in this group range from the absolute value .155 to .295 for error term private stock (*Y-K*) and change in private stock (Δk), and error term public stock (*Y-Kg*) and change in public stock (Δkg), respectively). In conclusion, the correlation matrix shows significant but moderate associations between some independent and dependent variables and shows significant but moderate correlations among some pairs of independent variables.

[13] According to the Error-Correction Model for non stationary independent variables, this variable must be included to control for unit roots in independent and dependent variables. This variables included lagged GSP-lagged tax rate, lagged GSP-lagged capital spending, lagged GSP-lagged health and hospital expenditure, lagged GSP –lagged highway expenditure, lagged GSP-lagged welfare spending, , and lagged GSP-lagged public stock.

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Empirical Results

This study focuses on the roles of the state capital budget and management process in state economic growth through the channels of a changed level in the state's public capital stock and a changed level in public capital spending. The changed level of public capital stock represents the net change in the state's infrastructure, which is a result of the current year's capital investment policy process. Meanwhile, the change in capital spending levels represents marginal investment as the output of the capital budgetary process in each fiscal year. The analysis in this section responds to three research questions: 1) Do state capital stocks have a positive effect on state productivity level?; 2) Does state capital spending have a positive effect on state productivity?; and 3) Do capital budget and management processes have a significant effect on state economic performance? The null hypotheses are:

1) Change in a state government's per capita public capital stock level does not affect change in the state's per capita gross state product.
2) Change in a state's average capital spending rate does not have an effect on change in the state's per capita gross state product.
3) Change in a state government's per capita highway capital stock does not affect change in the state's per capita gross state product.
4) Change in a state government's per capita education stock does not affect change in the state's per capita gross state product.
5) Change in a state government's per capita correction stock does not affect change in the state government's per capita gross state product.

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6) The stability of a state government's annual capital spending does not enhance the relationship between the changes in the state's per capita public capital stocks and the per capital gross state product.
7) A state's current year's capital budgetary process does not enhance the state's economy through the channel of the net change in public capital stock from the three years prior to the capital investment decision.
8) A state's current year capital budgetary process does not enhance the state's economy through the channel of policy change in capital investment spending.

Tables 16 and 17 present the estimated results from the error-correction models for capital spending and for capital stock, respectively. Individual state's fixed effects, time trends, and a set of lagged dependent variables minus lagged independent variables and residuals from the cointegration testing model are included in the models in order to control for state unique characteristics, national business cycle, and cointegration. Appendix C and D presents the effects of these variables from capital spending model (Table 16) and capital stock model (Table 17), respectively.

The estimation results for basic and management models are reported in each of the two tables. The basic model does not include the cross product term capital spending (or stock) and capital management performance as an explanatory variable. This model examines the effect of capital spending (or stock) when capital management is not included. The management model includes the cross product term capital spending (or stock) and capital management as an explanatory variable. This model examines the effect of capital spending (or stock) when capital management is included. The

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regression results of the models that uses three-level ordinal scale capital management performance (high, medium, and low) and the model that uses dichotomous scale capital management performance (high and low) as an indicator for state capital practices are not significantly different. Thus, Tables 16 and 17 report only the results from the dichotomous scale model.

TABLE 16

Regression Results: Public Capital Spending

	Basic Model	*Management Model*
Dependent Variable: 3-Year Per Capita GSP Growth		
Constant	3.582	3.687
	.56	.551
	6.881***	6.690***
Total State Tax (B1)	.09	.1
	.025	.025
	3.612***	4.034***
Operational Health and Hospital (B2)	.028	.028
	.01	.01
	2.769***	2.830***
Operational Highway (B3)	.016	.015
	.005	.005
	3.386***	3.145***
Welfare (B4)	.037	.039
	.013	.013
	2.804***	3.043***
Private Capital Stock (B5)	-.013	-.011
	.031	.03
	-.414	-.351
Public Capital Outlay (B6)	.032	.048
	.011	.013
	2.844***	3.833***
State Capital Outlay *High (B7)		.045
		.017
		2.620***
State Capital Outlay*Low		---

Adjust R Square	.756	.766
F Statistics	10.24	10.648
Durbin Watson	1.984	1.994

*** Significant at 0.01. ** Significant at 0.05, Standard error is reported in parenthesis, followed by t-score.

Note. Coefficients of lagged residuals, time trends, individual state-fixed effects, and error-correction terms (Yt-1-Xt-1) were included in regression estimation but are not reported in this table. Appendix C presents these coefficients.

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TABLE 17

Regression Results: Capital Stock

	Basic Model	*Management Model*
Dependent Variable: 3-Year Per Capita GSP Growth		
Constant	3.524	3.445
	.455	.465
	7.748***	7.411
Total State Tax (B1)	.048	.047
	.023	.023
	2.105***	2.043***
Operational Health and Hospital (B2)	.03	.028
	.009	.009
	3.365***	3.138
Operational Highway (B3)	.018	.018
	.004	.004
	4.183***	4.148***
Welfare (B4)	.042	.042
	.012	.012
	3.569***	3.564***
Private Capital Stock (B5)	-.079	-.08
	.028	.028
	-2.786***	-2.834***
Public Capital Stock (B6)	.471	.445
	.119	.123
	3.963***	3.625***
Public Capital Stock *High (B7)		.116
		.137
		.848
Public Capital Stock *Low		---

Adjust R Square	.756	.808
F Statistics	10.24	13.385
Durbin Watson	1.984	2.224

*** Significant at 0.01. ** Significant at 0.05, Standard error is reported in parenthesis, followed by t-score.
Note. Coefficients of lagged residuals, time trends, individual state-fixed effects, and error-correction terms (Yt-1-Xt-1) were included in regression estimation but are not reported in this table. Appendix D presents these coefficients.

The sensitivity analysis for the different measurement of state capital management practices, namely three-level ordinal scale (high, medium, and low) and dichotomous scale (high and low) were conducted. Two separate regressions which include the

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regression model that uses three-level ordinal scale (high, medium, and low) and the model that uses dichotomous scale (high and low) were run. The estimation results indicate that there are no major differences between the two estimated models' coefficients of model fit. Thus, Tables 16 and 17 report only the results from the dichotomous scale models.

The coefficients of the error correction terms (*B-1*), the residuals from the cointegration model, individual state fixed effect, and time trends are not reported in Tables 16 and 17. Appendixes C and D report the coefficients of these variables. In capital spending regression (Table 16), all coefficients *(B-1)* of the error correction terms ($Y_{t-1} - X_{t-1}$), except those of private stock, are significant and have negative signs. The significance and negative *B-1* statistics indicate that the real growth rate in state per capital GSP on the left-hand side of the model, Δy, needs to be subtracted by the auto-trends in independent variables *(Xs)* and dependent variable Y in order to obtain long-term equilibrium property of the model (see Kennedy, 1998).

Like the error correction terms, the coefficients of the cointegration residuals in the same model show the significant and negative sign (-.592). This result indicates that cointegrations between *Xs* and Y exist in the models: most change in per capita GSP is caused by these cointegrations. When the coefficient of the residuals shows negative and significant sign, it suggests that per capita GSP growth rates in the left hand side of the equation must be accounted for the negative effects of the residuals (or cointegration) in the right hand side of the equation.

In capital stock regression (Table 17), all coefficients *(B-1)* of the error correction terms ($Y_{t-1} - X_{t-1}$), except the error term of public capital stock variable, are significant

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and show negative signs. These results indicate that the real growth rate of the state per capita GSP Δy needs to be subtracted by the autocorrelations (or unit roots) in the independent and dependent variable data of the model. The insignificant coefficient b of the error term public capital stock indicates that the error correction term of public capital stock does not capture the unit roots in the independent variable public capital stock. In other words, the growth rate of per capita GSP on the left hand side of the model is not affected by unit roots in the independent variable capital stock (k_{gov}). Like the error correction terms, the coefficient of the cointegration residuals in the same model shows significant and negative sign (-.802). This coefficient suggests that cointegrations between *Xs* and *Y* exist in the capital stock model: most change in per capita GSP is caused by these cointegrations. Thus, the real growth rate of per capita GSP in this model must be accounted for the cointegrations.

As described in the previous section, the model in this study is specified in the same way as the public finance models of Helms (1985) and Mofidi and Stone (1990), where both tax and spending categories are included into the model. These researchers assert that both tax and expenditure affect an economy and that the expenditure effect is not neutral according to the conventional beliefs. Mofidi and Stone (1990) include both tax and non-tax revenues for the taxing side, and include all categories of expenditure except transfer payment for the expenditure side in order to examine: 1) the effects of using state tax and non-state tax (e.g., federal grants money) to fund the omitted spending category (which is transfer payment) on state growth, and 2) the effects of spending on the presented public service categories (all expenditure excepted transfer payment) as

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compared to the omitted spending category (transfer payment), *holding state taxing policies constant.*

Mofidi and Stone (1990) find the significant and negative effects of both state tax and non-state tax on growth; their interpretion is that if the states use these revenues to fund the transfer payment, then the states will experience negative growth. On the expenditure side, they find significant and positive effects of public spending in the model. Mofidi and Stone (1990) interpret that holding tax and non tax revenue constant, funding the types of public service presented in the model increases state growth, *as compared to funding transfer payment.* Since the model in this study is specified in the same way as those of Mofidi and Stone (1990), the regression results in the following section are interpreted in the same way.

As presented in Table 16, the results from both basic and management models indicate that change in state tax policy relative to state economy is significant to state per capita GSP growth (an estimated coefficient b of .09). On the spending side, the results show that policy changes on consumption spending including operational highway, operational health and hospital, and welfare are significant to state growth in both basic and management models (an estimated coefficient b of .015, .028, and .039 for operational highways, operational health and hospital, and welfare spending, respectively). Policy change on capital investment spending relative to state economy is statistically significant to state growth in both basic and management models (an estimated coefficient b of .032 and .048 in the basic and management models, respectively).

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In the management model, the cross product term policy change in capital management spending and high capital management performance is significant to state growth. The magnitude of the effects is moderate (coefficient b is .045 at .01 critical level). The small result is consistent with recent studies (i.e., Lobo & Rantisi, 1999; Holz-Eakin and Schwartz, 1994) that control for cointegration and found that public investment has significant but small effects (less than 0.10) on *permanent* growth rate.

The above results can be interpreted as follows. First, for the states in 1997-2004, state taxes used to finance other types of public expenditure (that are left out of the model including education and environment and housing) will enhance per capita GSP growth, relative to other types of public spending included in the model. Thus, increasing one percent of state tax relative to output to finance education and environment and housing will lead the state to experience per capita GSP growth at about .09 percent.

On the spending side, holding state tax revenue constant, spending on highways operation, health and hospital operation, and welfare results in state per capita GSP growth. The effects of these spending are about .02, .03, and .04 for highways operation, health and hospital operation, and welfare, respectively. The positive effects of these spending on growth, however, are at the expense of funding education and environment and housing since these types of government consumption are financed by the same public resource—state tax revenue.

Second, for the states in 1997-2004, both levels of public capital investment and the administrative procedures are significant to state economic growth. The results in the management model indicate that for every one percent increase in state capital spending rate, if a state invests this amount of public money with a highly systematic management

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procedure, the state will experience per capita growth at about .10 percent (.05 +.05). On the other hand, if a state invests its infrastructure by the same amount of public money with a low systematic management procedure, the state will experience per capita GSP growth at about .05 percent. The significance of capital management procedure at an .01 level suggests that capital management practice is a necessary variable in the state growth model to explain the relationship between government capital spending and state economic growth.

As shown in the Table 17, fiscal policies including taxing and spending have positive and significant effects on state per capita GSP growth. In this model, the coefficient b of private capital investment shows significant but negative sign (-.08), while the coefficient b of public capital investment shows a significant but positive sign (.45). These results imply that private investment has a diminishing return property to state per capita growth rate, while public investment has constant return property to state per capita GSP growth. Thus, for the states in the period of 1997-2004, the policy makers should increase public investment to support private producers to enhance state growth, rather than using public money (i.e., business tax incentives) to promote private investment. The cross product term public capital stock and state capital management procedure is not significant in this model. This result suggests that state capital management does not enhance the impact of state public capital stock on growth. In other words, the relationship between public capital stock and growth is not explained by state capital procedures.

Table 18 presents regression results when public capital stocks were disaggregated into three types: education, highway, and correction. As indicated in the

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table, state educational capital stock and state correction capital stock have insignificant effects on per capita GSP changes, while state highway capital stock has significant effect on per capita GSP growth (coefficient b for highway stock is .25). The results that public education stock is not significant to state growth is not consistent with the results of Garcia-Mila and McGuire's (1992) and Storm and Feiock's (1999) studies which indicate that educational spending is significant to state growth.

TABLE 18

Regression Results: Disaggregated Public Capital Stock

	Unstandardized Coefficients B	Standard Error	Standardized Coefficients Beta	t Score	Significant Value
Dependent variable: Logarithmic Change of 3-year Per Capita GSP					
Constant	3.382	.478		7.082	.000
Y-TAX	-.101	.031	-1.171	-3.278	.001
Y-HIGHWAY OPERATION	-.025	.008	-.636	-3.007	.003
Y-WELFARE	-.052	.022	-.788	-2.414	.017
Y-PRIVATE STOCK	.064	.06	.341	1.055	.294
Y-PUBLIC STOCK (AGGREGATE PUBLIC STOCK MINUS SCHOOL, HIGHWAY, CORRECTION STOCKS)	-.288	.056	-2.742	-5.153	.000
Y-HEALTH, HOSPITAL OPERATION	-.034	.015	-.587	-2.29	.024
HEALTH AND HOSPITAL OPERATION	.028	.009	.19	2.999	.003
TAX	.053	.024	.159	2.244	.027
HIGHWAYS OPERATION	.017	.004	.221	3.959	.000
WELFARE	.039	.012	.214	3.145	.002
PRIVATE STOCK	-.072	.03	-.131	-2.433	.016
SCHOOL STOCK	.007	.016	.038	.458	.648
HIGHWAY STOCK	.25	.122	.183	2.046	.043
CORRECTION STOCK	.02	.015	.08	1.393	.166
Unstandardized Residual	-.739	.07	-.67	-10.523	.000
Y1999	-.048	.006	-.66	-8.206	.000
Y2000	-.044	.005	-.6	-8.129	.000
Y2001	-.037	.005	-.51	-7.567	.000
Adjusted R Square	0.793				
F State	12.125				
Durbin Watson	0.865				

Note. Individual State Fixed Effects were included in the model, but the coefficients are not reported in this table.

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As indicated in Table 4 in Chapter 4, Garcia-Mila and McGuire's (1992) analysis yields significant coefficient of .072 for educational spending (both for operation and capital investment) for the study period from 1969 to 1983. Storm and Feiock's (1999) analysis yields significant coefficient b of .107 for higher education expenditure variable, for the study period from 1990 to 1993. The different findings for public education stock between the present and previous studies could be explained in three ways. First, the measurements of education investment are different in the three studies. While Garcia-Mila and McGuire (1992) measure education investment by using education spending (both for operation and capital spending in primary, secondary, and higher education), whereas Storm and Feiock (1999) use *per capita* education spending for operation and investment in higher education. The present study uses per capita capital stock of education (both for primary and secondary and for higher education).

The different measurements reflect the different definitions of state education investment used by the previous and the present studies. That is, while the two previous studies refer to marginal levels of annual state education spending, the present study refers to the *accumulated investment* (that is accounted for depreciation for the past investment) of the education stocks for the concept of education investment. It is possible that the different indicators (annual public outlays versus accumulated public stocks) yield different results for a state growth model.

Another explanation could be model specification's differences. The model in this study controls for unit roots in Xs and Y and the cointegration between Xs and Y, the two previous studies do not. This difference in model specification implies that when unit root (or auto trend) in the education capital stock data and the cointegration between

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education stock and per capita GSP is controlled (by using first-ordered difference of y and adding the error correction terms,(i.e., $y_{t-2} - k_{gov,t-2}$) and cointegration residuals), the effect of education stock by state governments are negligible.

A third reason is as shown in Table 4 of Chapter 4. Since the three studies use data from different periods, it is possible that educational investment in the late 1990s was not significant to state growth, compared to educational investment in the period from the 1960s to the beginning of 1990s. It is possible that all states in the late 1990s achieved the sustainable level of education capital stocks relative to the country's school-aged population growth rates and the demands for school facilities. It is also possible that the moderate changes in educational capital stock (for the study sample, on average, the change in school stock is 10 percent within three-year cycle) do not dramatically alter state production function. In short, the difference in the time frames used by the three studies may help explain the different results for the roles of educational investment on state growth rates.

The result that state highway stock is significant to state growth is consistent with the result of Munnell's study (1990). As shown in Table 4 of Chapter 4, Munnell (1990) specifies model such that the state gross GSP is a dependent variable, while gross highway capital stock is an independent variable. This specification is similar to the present study's specification in terms of using GSP as a dependent variable and highway capital stock as the independent variable. In addition, Munnell (1990) uses the perpetual inventory method to apportion the U.S. state highway capital stock for fifty states. This study uses the same method as Munnell's to apportion aggregate public capitals stocks and highway stock (see Appendix A for public capital stock apportion). Thus, it is

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possible that since the two studies use the same indicator (highway stock apportioned by the perpetual inventory method) for the concept of state highway investment, the results from the two studies are consistent.

Correctional capital stock is insignificant at the 0.01 and 0.05 level. The result implies that state correctional facilities do not have significant impact on state growth, when unit roots in the data set and cointegration between *Xs* and *Y* are held constant. This result does not support the public concern that government investment in correctional facilities inhibits growth. However, although the coefficient of state correction stock is not significant, it exhibits positive sign, which means that correction facilities are positively associated with state growth. When considering that correctional facilities bring an increase in job numbers, population, and private investment into some remote areas making their economies more vibrant, the positive coefficient of correction facilities seems to be reasonable.

In another separate model, the cross product terms education capital stock and capital management; highway capital stock and capital management; and correction capita stock and capital management are included in the model presented in Table 18. The regression results indicate that the three cross-product terms are not significant to state growth. Further, the coefficients of other variables are not changed, even though the three cross products were added to the model. These results substantiate the main findings (reported in Table 17) that capital management does not have a significant impact on the relationship between state capital stock and growth for the states in the period of 1997-2004.

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Table 19 presents the estimated results when the cross-product term, public capital stock and spending variation (as measured by CV), was included in the error-correction model. The results indicate that the timing of spending is not significant to state per capita GSP change. This finding implies that investment timing does not enhance economic growth *through the channel of public capital stock.* Further, the coefficient b of spending variation exhibits positive sign, which is an unexpected direction for the effect of spending variation on growth. The positive coefficient b of spending variation indicates that the high variation, the positive per capita GSP changes.

This direction is in contrast to the theory suggesting that informed decisions in capital spending should yield less variation in public capital spending, which, in turn, enhances economic performance. The less variation is the result of debt financing where investment costs are spread through the infrastructure's useful life—and thus, stabilizing tax rates (Mikesell, 1999). Nevertheless, the results from this model substantiate the findings from the capital stock and management models presented in the last section (Table 17) in that the state systematic administrative processes do not explain state growth *through the state public capital stock variable* in the period from 1997 to 2004.

For sensitivity analysis, Table 20 presents the estimated results when the cross-product term, public capital stock and spending variation (*as measured by CV)* was replaced by another cross product term, public capital stock and spending variation (*as measured by RMSE/Mean).* Like the results presented in Table 19, the results in this table indicate that the timing of spending is not significant to state per capita GSP growth and that the sign of the coefficient b of this variable is positive. This sensitivity analysis indicates that capital spending stability does not affect the impact of state capital stock on

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TABLE 19

Regression Results: Public Capital Investment Timing (Measured by Coefficient of Variation—CV)

	Unstandardized Coefficients B	Standard Error	Standardized Coefficients Beta	t Score	Significant Value
Dependent variable: Logarithmic Change of 3-year Per Capita GSP					
Constant	3.525	.457		7.715	.000
Y-TAX	-.099	.029	-1.144	-3.368	.001
Y-HIGHWAY OPERATION	-.024	.008	-.614	-2.970	.004
Y-WELFARE	-.061	.020	-.924	-3.015	.003
Y-PRIVATE STOCK	.091	.059	.487	1.543	.125
Y-PUBLIC STOCK (AGGREGATE PUBLIC STOCK MINUS SCHOOL, HIGHWAY, CORRECTION STOCKS)	-.335	.057	-3.191	-5.882	.000
Y-HEALTH, HOSPITAL OPERATION	-.032	.014	-.566	-2.308	.023
HEALTH AND HOSPITAL OPERATION	.030	.009	.206	3.346	.001
TAX	.048	.023	.143	2.093	.038
HIGHWAYS OPERATION	.018	.004	.224	4.166	.000
WELFARE	.042	.012	.231	3.544	.001
PRIVATE STOCK	-.079	.029	-.143	-2.754	.007
PUBLIC STOCK	.467	.242	.406	1.932	.056
PUBLIC STOCK*COEFFICIENT VARIATION	.021	1.181	.003	.018	.986
Unstandardized Residual	-.802	.068	-.727	-11.802	.000
Y1999	-.043	.005	-.594	-7.928	.000
Y2000	-.039	.005	-.530	-8.386	.000
Y2001	-.033	.004	-.457	-8.421	.000
Adjusted R Square	0.807				
F State	13.299				
Durbin Watson	2.239				

Note. Individual State Fixed Effects were included in the model, but the coefficients are not reported in this table.

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TABLE 20

Regression Results: Public Capital Investment Timing (Measured by RMSE/Mean)

	Unstandardized Coefficients B	Standard Error	Standardized Coefficients Beta	t Score	Significant Value
Dependent variable: Logarithmic Change of 3-year Per Capita GSP					
Constant	3.462	.458		7.564	.000
Y-TAX	-.096	.029	-1.116	-3.294	.001
Y-HIGHWAY OPERATION	-.023	.008	-.598	-2.952	.004
Y-WELFARE	-.058	.020	-.871	-2.839	.005
Y-PRIVATE STOCK	.094	.059	.505	1.609	.110
Y-PUBLIC STOCK (AGGREGATE PUBLIC STOCK MINUS SCHOOL, HIGHWAY, CORRECTION STOCKS)	-.342	.056	-3.258	-6.102	.000
Y-HEALTH, HOSPITAL OPERATION	-.033	.014	-.580	-2.374	.019
HEALTH AND HOSPITAL OPERATION	.029	.009	.198	3.223	.002
TAX	.047	.023	.139	2.054	.042
HIGHWAYS OPERATION	.018	.004	.226	4.221	.000
WELFARE	.041	.012	.225	3.477	.001
PRIVATE STOCK	-.087	.029	-.158	-2.978	.003
PUBLIC STOCK	3.207	2.424	2.785	1.323	.188
PUBLIC STOCK*RMSE/MEAN	.120	.106	2.369	1.130	.260
Unstandardized Residual	-.803	.067	-.728	-11.931	.000
Y1999	-.044	.005	-.611	-8.410	.000
Y2000	-.040	.005	-.546	-8.575	.000
Y2001	-.034	.004	-.465	-8.541	.000
Adjusted R Square	0.809				
F State	13.451				
Durbin Watson	2.242				

Note. Individual State Fixed Effects were included in the model, but the coefficients are not reported in this table.

growth. These results, however, warrant further study with better model specification since the results from the sensitivity analysis confirm that state capital stock is not an

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appropriate indicator to use as a mediating variable to examine the relationship between capital spending stability and growth. In another regression, the cross product term capital stock and capital management was included as *the additional variable* of the model in Table 19. This estimation did not yield significantly different results from those reported in Table 19. Further, the coefficient of the additional variable, the cross product term public capital stock and state capital management, is not significant to state growth in this model. These findings substantiate the main findings reported in Table 17 that state capital management does not explain state per capita GSP through state capital stock in the period of 1997-2004.

Regression Diagnostics

This section presents the regression diagnostics for the selected model. Table 21 displays the standardized and unstandardized coefficients, standard errors, t scores, and significant values of the selected model. There are four assumptions in the Ordinary Least Square method: no multicollinearity, no heteroskedasticity, no autocorrelation, and no selection bias. Autocorrelation is already addressed in the cointegration analysis section. The rest of the assumptions will be discussed in turn.

Multicollinearity

Multicollinearity is the interaction of independent variables. An R^2 near 1 violates the assumption of no perfect colinearity. While R^2 increases the standard error

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TABLE 21

The Selected Model

	Unstandardized Coefficients B	Standard Error	Standardized Coefficients Beta	t Score	Significant Value
Constant	3.687	.551	-	6.690	.000
$y_{t-2} - t_{t-2}$	-.113	.032	-1.309	-3.551	.001
$y_{t-2} - c_{t-2}$	-.038	.017	-.639	-2.237	.027
$y_{t-2} - r_{t-2}$	-.018	.009	-.451	-1.996	.048
$y_{t-2} - w_{t-2}$	-.071	.022	-1.069	-3.224	.002
$y_{t-2} - h_{t-2}$	-.030	.015	-.524	-1.936	.055
$y_{t-2} - k_{t-2}$	-.006	.063	-.033	-.098	.922
Δt (STATE TAX)	.100	.025	.297	4.034	.000
Δr (HIGHWAY OPERATION)	.015	.005	.187	3.145	.002
Δw (WELFARE)	.039	.013	.219	3.043	.003
Δh (HEALTH AND HOSPITAL OPERATION)	.028	.010	.192	2.830	.005
Δk (PRIVATE STOCK)	-.011	.030	-.019	-.351	.726
Δc (STATE CAPITAL OUTLAY)	.048	.013	.260	3.833	.000
$\Delta c * High$ (STATE CAPITAL OUTLAY*HIGH MANAGEMENT)[a]	.045	.017	.154	2.620	.010
Year 1999	-.033	.005	-.460	-6.195	.000
Year 2000	-.037	.005	-.502	-7.350	.000
Year 2001	-.034	.004	-.471	-7.778	.000
Unstandardized Residual (from cointegration model)	-.592	.067	-.535	-8.865	.000
Dependent variable: Logarithmic Change of 3-year Per Capita GSP					
Adjusted R Square	0.766				
F State	10.648				
Durbin Watson	1.994				

Note. Individual State Fixed Effects were included in the model, but the coefficients are not reported in this table. See Appendix C for individual state fixed effects.

[a] The cross product term Δ C*LOW is a base case.

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of the beta coefficients, it makes assessments of the unique role of each independent variable difficult. Bivariate analysis was initially conducted before multivariate analysis, and its results are presented in Pearson's Correlation matrix (Table 5-9). As discussed in the bivariate section, there is not a high correlation among independent variables in the selected model.

A more rigorous analysis is to regress each of the independent variables on all of the other independent variables used in the regression equation. If multicollinearity is a problem, R^2 would be high. Along with this method, one needs to acquire a Tolerance value and Variance Inflation Factor (VIF). Tolerance is $1 - R^2$ for the regression of that independent variable on all other independent variables, ignoring the dependent variable. The Tolerance value indicates the proportion of a variable's variance not explained by other independent variables in the equation. VIF is the reciprocal of Tolerance. Therefore, the model will be less likely to have a multicollinearity problem if VIF is low or Tolerance is high. As a rule of thumb, VIF should be less than 4 for strict criteria but can be up to 10 (Ott & Longnecker, 2001), and R^2 for each variable should be less than R^2 of the estimating model (Kennedy, 1998) (which is equivalent to .85 for the selected model). High standard errors can be used to detect multicollineraity since they indicate that correlations among variables make assessment unstable.

Table 22 presents multicollinearity statistics including R^2, VIF, and standard errors. R^2 in column 2 was derived by regressing each independent variable against the rest of the independent variables—including the interested variables, the set of lagged Y-lagged-lagged X (error correction terms), individual state fixed effects, time trends, and residuals from the cointegration model. Column 3 and 4 of the table present VIF

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statistics and standard errors, respectively, which were derived at the time of the regression analysis for the whole model. Column 2 of the table indicates that the variables in the model are not correlated since all R^2 are smaller than R^2 from the regression (.85). VIF statistics in column 3 indicate that multicollinearity among these variables is acceptable since all are less than 10. Standard errors in the last column point toward the stability of the estimation.

TABLE 22

Multicollinearity Statistics

Variable	R^2	VIF for Estimating Model	Standard Error
Tax	.78	4.50	.02
Health and Hospital	.74	3.84	.01
Highway	.66	2.93	.01
Welfare	.77	4.31	.01
Private Stock	.59	2.50	.03
Capital Outlay	.73	3.83	.01
Capital Outlay* High	.65	2.86	.01

Heteroskedasticity

Heteroskedasticity occurs when the variance of residual error is not constant for all values of the independent variables. One common way to inspect heteroskedasticity is to observe the residual plot on the Y axis against the predicted values on the X axis. When the homoskedasticity assumption is violated, t tests for the OLS estimators cannot be justified (Berry, 1993). However, moderate violations of homoskedasticity have only minor impacts on regression estimation (Fox, 2005, p. 516).

To circumvent heteroskedasticity in the multivariate analysis step, data were standardized in terms of the per capita and spending ratio to GSP, and outliers were removed from the sample resulting in 192 out of 200 cases. The dependent variable—

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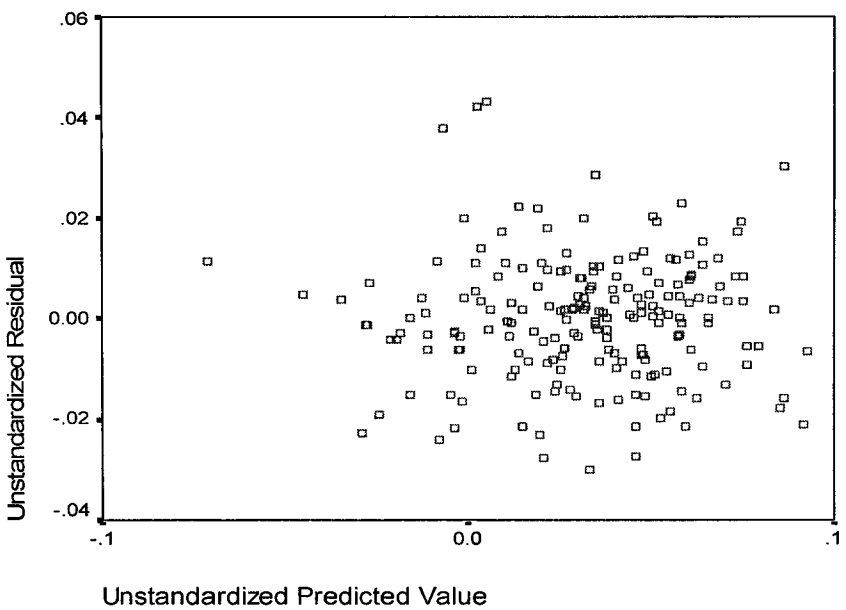
gross state product—was measured in a form of per capita value before logarithm was applied. The independent variables—public capital stocks and federal grants—were measured in terms of per capita before being transformed into the log form. Total tax, highway operational, welfare, and hospital spending were measured in the form of a ratio to total GSP before being transformed into the log form.

Outliers can be a problem causing heteroskedasticity, even when data were standardized and transferred into logarithm form. Outliers are data that lie extraordinarily far away from the regression line. Following the rule of thumb that outliers are points whose standardized residual is greater than 3.3, corresponding to the 0.001 alpha level, the data whose standardized residuals are greater than 3.3 were requested to be removed at the time of estimation. This resulted in 195 total observations instead of 200 observations. Figure 2 depicts the residual plots against predicted values.

FIGURE 2

Residual Plots against Predicted Values



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A homoskedasticity model will display a cloud of dots; whereas, heteroskedasticity will form dots in a funnel shape, indicating greater error as the value in dependent variables increases. Since the dots in Figure 2 do not form a funnel shape, it can be assumed that the model has homoskedasticity.

Normal Distribution

This assumption requires that residual errors be normally distributed for each set of values for the independent variables. The states' tax and spending rates and capital management practice grades may not be normally distributed satisfactorily throughout a set of the dependent values due to the limited numbers in the time-series data. The central limit theorem states that even when data is not normally distributed and when sample size is large, the sampling distribution of b is still normal; and, thus, violating this rule has little impact on the conclusion for the larger sample. However, when the sample size is small, it is necessary to test for normally distributed residual errors. The first way to check whether having limited numbers in data causes serious problems, is to observe the plot of expected values against the observed values. If the data are normally distributed, the dots will form a line at 45 degrees from the X axis. Figure 3 indicates that the samples are quite normally distributed.

Another method is to obtain a histogram of residuals. If the residuals show a roughly normal curve, then data are large enough and are normally distributed. Figure 4 depicts a histogram of standardized residuals derived from the selected model. The

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figure shows that the curve is roughly normal; and thus, the potential flaw in having a limited number of time series data is less likely to mislead the estimation.

FIGURE 3

Plots of Expected Normal Value against Observed Values

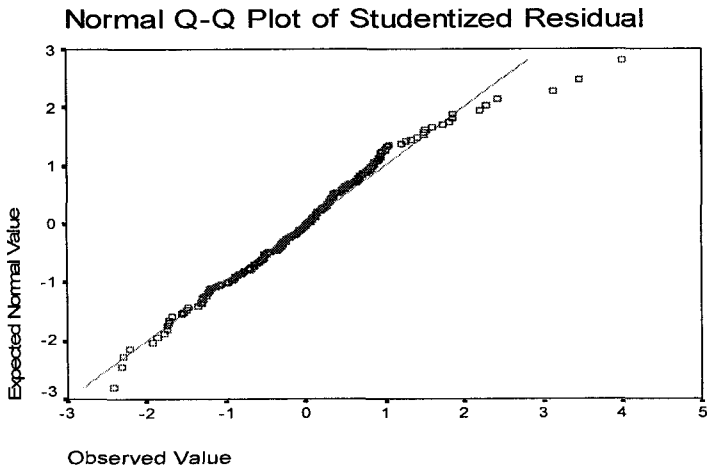
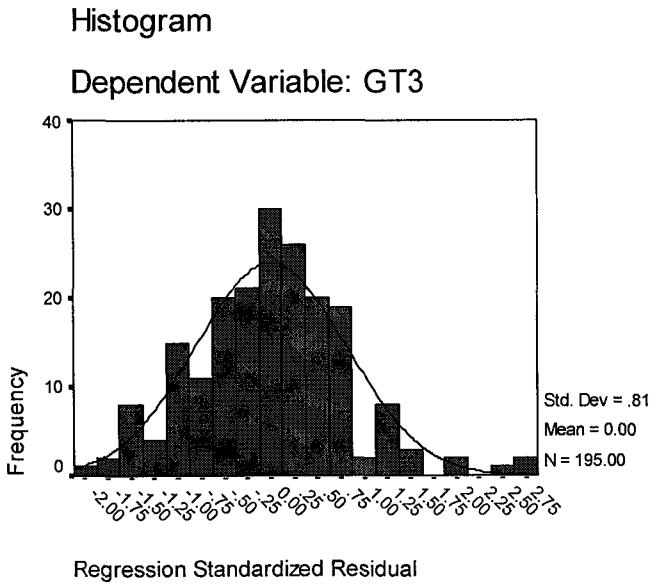


FIGURE 4

Standardized Residual Histogram



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Selection Bias

In panel data, selection bias occurs in three situations: 1) when there are serial correlations in a time series—that is, data in time *t* are explained by data in time *t-1*, and such a time-series is used to form a comparison match for treatment and control groups; 2) when the dependent variable of the model also explains independent variables; and 3) when there is an omitted variable that latently enhances or moderates the relationships between treatment variables and the dependent variable Y. Using fixed-effect estimators (differencing the data over two periods) is one solution to solving the problems in the first situation; although, it is considered less sophisticated relative to using other advanced statistical methods (Burbridge, 1999). Error-correction models were used to take the autocorrelation into account at the time of estimation. The third situation is also avoidable by adding latent variables including state fixed-effects into the model. However, there is a high probability for the second situation—that is, the states that grow faster than the others may choose to adopt a systematic management practice (a high-grade capital management); and if so, the story can be told in reverse.

Table 23 depicts the relationships between high-grade management and public stocks and between high-grade management and growth rate from the 200 samples. Column 2 and 3 of the table indicate that there is a relationship between public capital stock change and high-grade management performance. The means from the two groups appear different: the high-grade management states tend to have a higher growth rate in public stock average .78 percent relative to other-grade growth of .54 percent on average.

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TABLE 23

Mean Comparisons of Capital Stock and State GSP Growth Rates

	Public Stock Change		**Three Year Growth**	
	High-Grade Management	*Other- Grade Management*	*High-Grade Management*	*Other- Grade Management*
Mean	0.78%	0.54%	3.02%	3.23%
Maximum	6.06%	8.79%	8.05%	11.65%
Minimum	-5.77%	-7.26%	-4.31%	-6.02%

The above statistics suggests that there may be a self-selection problem in the model—that is, the states that have high rates of capital stock growth may choose to adopt systematic capital management, compared to other states that have low growth rates of capital stock. However, since Table 15 which displays Pearson's correlation analysis results indicates that there is no significant relationship between high and low grade capital management and capital stock growth rates, the self-selection problem should not be a problem for the samples. Nevertheless, further investigation was conducted to see if the high-grade capital management is determined by capital stock growth.

As shown in the fourth and the fifth column of Table 23, the means for GSP growth rates are slightly different—that is, the states that grow faster than the others tend not to receive high management grades. This situation tells the opposite story from those in the public stock case. The states that received low management grades tend to grow slightly faster that those that receive grades A to B+. Judging from the table, the story is less likely to be told in reverse since the means for growth rate from the two groups do

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not support the argument. Another statistical test was conducted to see if the assumption would hold.

Table 24 presents the results of Heckman's two-step analysis. In the first analysis, high-grade management was specified as the dependent variable (high-grade management; yes = 1) where the potential independent variables are public capital stock change, capital spending change, total number of population, total nominal GSP (to represent an economy's size), and state total general direct expenditure (to represent a state's budget size).[14] The results in the first step indicate that high-grade management is explained by state economy size but not by change in capital spending, change in capital stock, total population, or budget size. Thus, the high-grade capital management is not explained by capital stock growth in this sample. The expected value of the error in the first analysis was calculated in order to derive an Inverse Mill's ratio.[15] This Inverse Mill's ratio was then included in the second-stage of analysis as an extra independent variable. If the Inverse Mill's ratio is significant in the second analysis, then it can be concluded that there is a selection bias in the sample. However, the Inverse Mill's ratio is not found to be significant at the conventional 0.05 level; and, thus, it can be concluded that there is no inverse relationship from growth rate to high-grade management.

---

[14] There is no empirical evidence in the literature that addresses what cause states to adopt a systematic capital budget. For separate capital budget, which has a paralleled concept to the systematic capital budget, Sekwat (1997) found that higher total population relates to the probability that municipal governments will adopt a separate capital budget.

[15] The two-step analysis was conducted by the estimating software STATA—the inverse mill's ratio was also calculated by the software.

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TABLE 24

Heckman's Two-step Analysis

Heckman selection model -- two-step estimates
(regression model with sample selection)

Number of observation =	198
Censored observation =	144
Uncensored observation =	54
Wald chi2(12) =	14.560
Probability > chi2 =	.336

Variable	Coefficient	Standard Error	z	P>z	95% Confidential Level	
Independent variable: Probability that Y = 1						
Constant	-16.981	5.414	-3.140	.002	-27.590	-6.4
Change in Capital Stock	7.972	4.134	1.930	.560	-.131	16.1
Population	-.814	.572	-1.420	.155	-1.936	.308
Total Nominal GSP	1.451	.563	2.570	.010	.346	2.57
Total General Direct Expenditure	-.503	.463	-1.090	.277	-1.411	.404
Capital Outlay	-.672	.608	-1.110	.244	-1.865	.520

Variable	Coefficient	Standard Error	z	P>z	95% Confidential Level	
Independent variable: Change in Per Capita GSP						
Constant	-.005	.058	-.090	.928	-.120	.109
Tax	.050	.186	.270	.787	-.315	.415
Capital Outlay	-.066	.069	-.960	.337	-.202	.069
Hospital Exp.	-.013	.029	-.470	.638	-.072	.044
Highways Exp.	-.020	.023	-.780	.383	-.065	.025
Welfare Exp.	-.052	.071	.740	.459	-.086	.192
Private stock	.116	.155	.750	.452	-.187	.421
West	-.053	.033	-1.610	.107	-.119	.011
South	-.014	.024	-.610	.544	-.063	.030
Midwest	-.031	.026	-1.170	.241	-.083	.020
Year 1999	-.042	.025	-1.670	.095	-.092	.007
Year 2000	-.043	.023	-1.830	.067	-.090	.003
Year 2001	-.016	.025	-.630	.529	-.066	.034
Inverse Mill's Ratio (Lamda)	.079	.056	1.410	.160	-.031	.189
Rho	1.000					
Sigma	.079					
Lamda	.079	.056				

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Conclusions and Implications

The empirical results in this study suggest the effects of state fiscal policies on state growth as follows:

$$\Delta \ln y_{t3-t1,i} = 3.7 + .10\ \Delta \ln \text{Tax} + .03\ \Delta \ln \text{Health and Hospital Operation} + .02\ \Delta \ln \text{Highway Operation} + .04\ \Delta \ln \text{Welfare} + .05\ \Delta \ln \text{Capital Outlay} + .05\ \Delta \ln \text{Capital Outlay} * \text{High-grade Capital Management} + \text{Individual State Fixed Effects} - \text{Time Trends} - \text{Cointegrations} - \text{Unit Roots in Fiscal Policies}$$

The equation indicates that capital spending rate—combined with high-grade capital budget and management—has a significant and positive effect on growth (total value for coefficient b of capital outlay and cross product term is about .10) across states and time. This means that over a three-year cycle, a percent increase in public capital spending rate to GSP decided by a high-grade capital management process is associated with .10 percent (.05+.05) increase in state per capita GSP. The equation further implies that the effect of capital spending on growth is likely to be doubled when states invest through a high-performance budget and management process. That is, change in per capita GSP is a result of .05*change in capital spending rate ***and*** .05 * change in capital spending rate that is decided through the high-grade capital management process. Thus, government investment in public infrastructure is more productive when the investment is decided and executed through a highly systematic capital management process.

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From 1999 to 2004, on average, the state GSP value is about $174,260 million (per state and per year). Thus, one percent of the state GSP, on average, is equal to $1.7 billion (174,260,000,000*.01) per state and per year. The $ 1.7 million is a state's one percent marginal change in public investment relative to state annual capital spending rate to GSP in the last three years. This value is based on the assumption that every observation is the sample has GSP equal to $ 174,260 million across time series. Thus, if the state invests in its infrastructure with this amount of money with a highly systematic capital management process, the state will experience .10 percent growth on its per capita GSP.

On average, annual per capita state GSP is about $28,900 for the study's period ranging from 1999 to 2004. Thus, if the state increases one percent in its *capital investment rate to GSP* with a highly systematic capital process, its per capita gross state product would increase by about .10 percent, which is equivalent to $29 (28,900 x .001) increase per person. On average, the state total population number in 1999-2004 is 5,718,153 per state per year. Thus, one percent increase in public capital spending rate to GSP, which is equivalent to $1.7 billion, will result in a $165 million dollar increase in total state GSP (29*5,718,153= 165,254,622). On the other hand, if the state uses $ 1.7 billion to invest with a low systematic process, it will receive only .05 percent increase for its per capita GSP. This increase is equivalent to $14 per person (28,900 * .005) or $83 million increase as a whole (14*5,718,153=82,627,311).

In actuality, the states in the period ranging form 1999 to 2004 did not invest as high as $1.7 billion dollar per year. On average, annual state capital spending during the period (1999 to 2004) is about $1.6 million ($ 1,582,964) . Since the one percent

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increase in state public capital spending is equivalent to $ 305 per person ($1.7 billion/ 5,718,153), the $1.6 million capital investment by the states that adopt a highly systematic capital process results in a $150,511 increase in state GSP in the next three year ((1,582,964/305)*29). On the other hand, the $1.5 million capital investment by the states that conduct non-systematic capital process results in a $ 72,660 increase in state GSP in the next three year ((1,582,964/305)*14).

Overall, the effect of state capital management programs on state economic growth is significant, but moderate, controlling for states' unique characteristics and cointegration in time series data. When considering that this small effect of the management practice is in line with those of other fiscal policy variables, including public capital spending, the small effect of public capital management programs seems to be reasonable. The finding that public investment has a significant but small effect on regional growth is common in the recent regional economic development literature (see Holtz-Eakin & Schwartz, 1995; Lobo & Rantisi, 1999). These findings suggest that states' unique characteristics and other exogenous variables (i.e., time trends and exponential growth trends in the data themselves) have larger impacts than state fiscal policies including state capital management programs and public investment.

Thus, for economic development purpose, it may be impossible for state governments to use only government policies to dramatically enhance growth. However, for government's capital management mission, the small but significant impact of public management process on growth might not be negligible, given that public infrastructure investment is a responsibility of state governments, regardless of economic development purposes. Thus, if the tax dollars spent on such mission can maximize benefits to the tax

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payers, strategic public investment that encourages different interest groups to pursue their personal benefits wisely and systematically might be worthwhile.

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CHAPTER 6 ILLINOIS CASE STUDY

As presented in Chapter 4, Conceptual Framework, the systematic capital budget and management process is expected to provide better policy outputs in terms of resource allocation, spending levels, and fiscal management performance. The policy outputs will then alter state economic production functions by providing a more productive infrastructure system that supports economic agents (entrepreneurs and residential labors) in the private production function. For this reason, the management process thus indirectly enhances state economic growth through a better infrastructure system that results from the strategic management practices.

The regression results in Chapter 5 indicate that a relatively high systematic capital process is a significant factor that indirectly enhances the relationship between public capital spending and state per capita economic growth. Without the management variable, the relationship between capital spending and economic growth could not be found. This empirical result implies that for an economic growth policy study, addressing the question, "How to spend?" may be a more pertinent approach than addressing the question, "How much to spend?"

Although this empirical result provides evidence for the effect of the capital management process, it does not explain "In what way do the systematic practices contribute to better policy output?" Such an explanation is necessary since it complements the empirical results by describing how the systematic process helps decision-makers decide infrastructure policy. Thus, this chapter uses Illinois' capital budget and management experience to examine four questions: 1) To what extent are the

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capital management practices in the State of Illinois comparable to those recommended by the literature?; 2) What are the benefits of the systematic practices as perceived by those who conduct capital budget preparation and formulation?; 3) What are the factors that influence the state capital budgeters to adopt and commit to the normative practices?; 4) What are the factors that hinder the state public budgeters from adoption of the normative practices?

The purpose of conducting the case study is twofold. The first, as already mentioned, is to examine the benefits of adopting and committing to a systematic process. The results could further clarify the relationship between management process and infrastructure outputs that in turn enhance economic growth.

The second purpose is to discover the reasons that make the executive staff conduct some capital management practices in ways that differ from the normative recommendation. This question arose from the perception that the career civil servants in the central budget office have a significant influence on the state's capital budgeting process. If specific factors explain why systematic practices are or are not used, then the theory in the Multiple Rationalities Budget Model (MRB) by Thurmaier and Willoughby (2001a) could be extended. Their theory states that the budget analysts in the central budget office use multiple rationalities in policy recommendations. It turns out that the study results suggest that the MRB theory could be valid and induce that in Illinois the senior bureaucrats in the central budget office use relatively more rationalities than general budget analysts who work in the state's agencies and do not participate in the Governor's office.

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The chapter is organized as follows. The first section presents the research design, including a description of the unit of analysis, sample design, and analytical approach. The second section presents the study results. The last section concludes the analysis and suggests theoretical and practical implications of the study.

Research Design

Unit of Analysis and Rationale for a Single-Case Study

The study unit of analysis is the Illinois capital budget preparation and formulation process as implemented by the executive branch in the period from 1997 to 2006. This period was selected for three reasons: 1) the period corresponds with those in the empirical study, thus providing an explanation of "through what ways a state like Illinois experienced the benefits of adopting the systematic capital practices recommended by the normative literature" ; 2) it is the period where the key informants have clear memories about the process; using past data too far removed from the present is more of an historical study than a case study that focuses on contemporary phenomena; and 3) it is the period when the key informants from the central budget office were the major participants in the state capital budget process.

The research uses *a single-case study* approach to understand the perceptions of the budget bureaucrats toward the benefits of systematic capital practices, and to explain why some systematic practices were or were not adopted in the period 1997–2006. As suggested by Yin (1994), "the case study is the preferred strategy when 'how' and 'why' question are being proposed, when the investigator has little control over the interesting

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event, and when the focus is on contemporary phenomenon within some real-life context" (p. 1). Yin (1994) argues that the case study is appropriately used "to explain the causal links in real-life phenomena that are too complex for survey or experimental strategies" (p. 15). As he puts it, when simply asking what the outcomes of the policy implementation are, a researcher can use economic data to show the frequency of the outcome achieved by those who adopt the policy without having to do a case study. However, if the researcher wishes to explain why the policy is effective or why it had not worked; the case study must be conducted because the answer to such questions involve a much more complex situation than the numeric variables.

As Yin (1994) argues, the single case study is analogous to a single experiment where the existing theory is well-established, to determine whether the existing theory's proposition is correct or whether some alternative set of explanations might be more relevant. Here, the purpose of using a single case study is to extend and examine the MRB theory, which states that career budget bureaucrats in the state central budget office use multiple rationalities in their budget policy recommendations.

The case study focuses on the policies, practices, and perceived benefits of the State of Illinois' capital budget process. The scope of the study is limited to the capital budget preparation and formulation process conducted under the state's executive branch.

Samples

The participants in this study were the state's budget officials who are (or were) responsible for capital budget preparation and formulation. Individuals both from the

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state level, namely the central budget office, and the agency level are included. Including participants from these two levels ensures that the whole process is examined—from the capital budget preparation and formulation stages, the practices implemented by both the Governor's Office of Management and Budget (GOMB) and the state agency staff. Also, most studies, including the MRB model, suggest that a comparison of budgeters who play different roles within one government will provide a better understanding of the decision strategies and patterns of budgeters' influence on the state fiscal policy process.

A total of ten state officials who used to be or are involved with capital budget preparation and formulation were interviewed during March and April 2006. Among the ten participants, four were from the state central budget office, namely the Governor's Office of Management and Budget—GOMB. These interviewees worked at the management level in different time frames during the period 1997–2004. Six of the ten were from state agencies, including two from the Illinois Department of Transportation (IDOT), and one person from each of the following agencies: Illinois State Board of Education (ISBE), Illinois Board of Higher Education (IBHE), Illinois Department of Corrections (IDOC), and the Capital Development Board (CDB).

These organizations were chosen according to the focus of the previous economic growth studies and the present empirical study in ascertaining whether education, highways, and corrections facilities have a significant impact on state growth (see Aschauer, 1990; Garcia-Mila & McGuire, 1992; Hook et al. 2004; Storm and Feiock, 1994). The interviewees from these agencies were working as capital budget analysts at the time that the case study was conducted. All of them have worked in these agencies for at least five years and some have more than ten-years of experience with government

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budgets in other state agencies before moving into their present agencies. Thus, these participants have extensive experience with capital budgets. These interviewees were identified by the agency administrators or the directors as the agencies' "expert" in capital budget preparation.

By nature, qualitative research focuses on eliciting the experience of a small group of participants who directly involves with the phenomenon of interest. The Illinois case study focuses on eliciting the experience of a small number of the state's officials who directly participate in the state's capital budget preparation and formulation processes, in depth. Since the study participants were not randomly selected, the study results cannot be generalized. However, the explanation for the benefits of the systematic practices and the factors influencing the state capital process might offer a useful explanation for other similar settings, especially for states with a capital budget process similar to that of Illinois.

Instrumentation

To understand the capital budgeting process, especially the unwritten practices, in-depth interviews were conducted. Each interview was conducted in a one-hour session in a place selected by the interviewees. The questions were open-ended to elicit the perceptions, insights, and experiences as viewed by the respondents. The primary interview questions were:

- How does your organization identify needed capital projects?
- To what extent and in what ways are capital projects tied to the organization's strategic plan?

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- How does your organization prioritize projects?
- How does your organization identify capital projects for years beyond the current year for which the budget is being developed?
- How does the state identify the total level at which to finance projects?
- What practices does the state use to improve or maintain its bond rating?

Some questions, including "what are the benefits of the systematic practices?" and "why are some practices not conducted?" were asked when the interviewees indicated whether they conducted such practices.

Previous Budget Theory

Thurmaier and Willoughby (2001a) extend Kingdon's (1995) agenda-setting model to explain that in fiscal policy formulation, state budget analysts play a significant role in specifying budget policy alternatives, in the same way the chief executive does. They propose that the public budgeting policy process comprises not only the macro process in which the main participants include the chief executive, the politicians, the media, and the public, but also includes the micro process in which the main participants are an invisible cluster of actors, such as career bureaucrats. They use in-depth interviewing data from ten states to extend the budgeting process by asserting that the macro and the micro processes occur at the same time, parallel each other, and are connected by the state budget analysts.

In the macro process, as described by Kingdon (1995), three streams—including problem, solution, and politics—flow independently and separately within a policy

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community. The problem stream involves problems of concern to and perceived by the public. The politics stream involves the visible decision-makers, including the president, the political appointees, and the prominent members of Congress. The swing of public mood that focuses on a particular policy area at a specific time creates an opportunity for a new set of problems and solutions to be given attention. Changes in the composition of the Congress and the president due to an election can affect the public mood, which acts to constrain political decisions by limiting the problems and solutions that can be addressed by the decision-makers. The solution stream comprises the policy alternatives identified by the specialists, including academics, researchers, and the career bureaucrats who are experts in specific policy areas. The alternatives identified by the experts are floating in "the policy primeval soup," (Kingdon, 1995, p.20) waiting for the new administration to be selected. The window of opportunity opens when the three streams come together; the problem is recognized by the public, the decision-makers in the political stream are receptive to and support the alternatives floating in the policy primeval soup, and the specific alternative meets the criteria that it is technically feasible and politically possible. The actor couples the solution with the problem and moves the government agenda toward a decision.

In the micro process, Thurmaier and Willoughby (2001a) assert that the budget analysts in the central budget office act as policy actors who "couple" the policy alternatives with the problem when the "budgetary window of opportunity" opens. In the macro model, the political stream comprises a visible cluster of actors including the chief executive, the politically appointed officials, and the elected officials. The solution stream comprises the proposals submitted by the program or agency directors that parallel

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the policy alternatives floating in the policy primeval soup. These policy alternatives will survive in the policy primeval soup if they are viewed as technically feasible and politically plausible. The public mood, which constrains the political agenda selected by the actors in the political stream, also constrains the choices of the budgeter as to which alternative will be given attention.

The heart of Thurmaier and Willoughby's (2001a) Multiple Rationalities Model of Budgeting (MRB) is the role of the state analysts in the central budget office who serve as a "nexus" of macro and micro budget decisions. They observe that the central budget office is the "vortex" where the central budget analysts are well placed to monitor the various decision streams (including political agenda and solution agenda in the political and solution stream) in the budgetary policy process. Standing in the vortex, the budget analysts substantially understand what policy alternatives the political stream is looking for, and how to frame the alternatives proposed by state agency directors in a way that can attract the support and attention of the decision-makers in the political stream. As Thurmaier and Willoughby (2001a) put it, "with one eye on the policy process and one eye on budget process, they evaluate how various solutions fit with the prevailing flow of decisions and preferences of the chief executive" (p. 47).

What criteria do the central budget analysts use to determine whether the policy alternative is feasible and if the budgetary recommendation is defensible? Thurmaier and Willoughby (2001a) found that the central budget analysts they interviewed rationally evaluate their recommendations against five factors: social, political, legal, technical, and economic rationalities. The analysts take "cues" from political leaders and act on behalf of the chief executive to "sift and hone" the alternatives from the policy community to

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determine which alternative will be promoted for consideration by elected officials. The analysts use their personal backgrounds, experiences, understanding of the budget process, relationships with other actors, and prioritization of government activities to frame the "cues" of the budgetary decision agenda to be used in evaluating policy alternatives (Thurmaier & Willoughby, 2001a).

The Thurmaier and Willoughby (2001a) approach lays the foundation for the present study: the budget analysts in state central budget offices use multiple rationalities in their budget recommendations because they perceive both macro-and micro-budget processes at the state level. Based on this perception, the use of multiple rationalities by the state budgeters may be a reason to explain why some strategic capital practices (i.e., CIP) are not adopted in the State of Illinois. Further, Thurmaier and Willoughby's (2001a) explanation regarding the personal factors the state budgeters use to frame the cues of state budget processes (i.e., understanding of a state budget process, relationships with other actors) suggests the focus of the Illinois case study. That is, to explain why Illinois state budgeters use multiple rationalities, these budgeters' frame of reference, especially for the state's capital budget process should be explored. The next section presents the study's intellectual bins developed by using this observation as a theoretical background.

Intellectual Bins

Qualitative analysis is a search for the pattern within data; thus, in order to find the pattern of the data, it is necessary to have "intellectual bins" to identify the key

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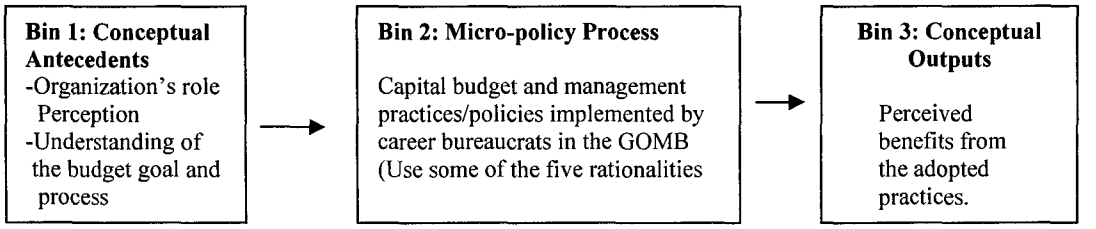
factors and the relationships among them to be studied (Miles & Huberman, 1994). This approach suggests that theory building relies on a few general constructs gleaned from details of the qualitative data, i.e., interview transcripts, so that the researcher can group the data into the bins and use data to refine the bins to derive the new theory. This approach is distinct from a pure data driven process advocated by the post modernist paradigm.

The intellectual bins come from theory or experience and (often) from the general objectives of the study (Miles & Huberman, 1994). For this case study, the intellectual bins were identified based on the main conceptual framework in Chapter 4 and built on the MRB theory described in the previous subsection. Figure 5 presents the intellectual bins for this analysis.

FIGURE 5

The Intellectual Bins of Illinois Capital Budget and Management Process



As depicted by Figure 5, the state budget officials use their perception of the organization's role and understanding of the budget goal and process (Bin 1) to decide which capital budget policies and practices should be used as decision-making tools in the capital budget recommendation (Bin 2). Policies or practices in the second bin reflect

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the rationalities used as a decision tool in implementation. For example, if a budgeter uses cost-benefit analysis, economic rationality is the main decision tool the budgeter uses in policy recommendation. If the budgeter states that he or she not only uses cost-benefit analysis, but also considers General Assembly requests, then this person uses an additional rationality—political rationality. Figure 5 specifically indicates that the bureaucrats' adoption and commitment to the selected practices in Bin 2 are governed by antecedents in Bin 1 and result in perceived benefits in Bin 3. Note that the second and the third bins are parts of the conceptual framework already identified in Chapter Four, while the first bin is taken from MRB theory to build the theory of *capital* budgeting.

The micro-policy process identified by the MRB model in Bin 2 closely parallels the Capital Budget and Management Process identified by the main conceptual framework of the present study. The MRB Theory uses this bin to represent the micro-policy process in which the budget analysts make decisions on behalf of the governor and make budget recommendations that will be passed to the macro process. The framework in this study uses this bin to represent the executive branch's capital budget preparation and formulation process whereby the budget bureaucrats make decisions on behalf of the governor and which capital budget and management policies and practices are used to evaluate policy alternatives.

According to MRB theory, the budget analysts in the central budget office use five rationalities in the second bin to evaluate whether the budget recommendation is "feasible" and "defensible." The five rationalities are briefly described by Thurmaier and Willoughby (2001b) as follows:

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- *Social Rationality*: The principle is that the conflicts of values in a society (or social problems) should be resolved through accommodation and compromise. The goal of using this rationality is to obtain social harmony to be used as a tool to form and develop policy priorities.
- *Political Rationality:* This is necessary when accommodation or compromise is impossible. The principle for this rationale is that the best decision-making comes from a pluralistic viewpoint that is defined based on unified agreement. Negotiating and bargaining are the tools to help reach unified agreement.
- *Legal Rationality:* This rationale is based on the principle that rights, responsibilities, and resources that are available to each member of the society must be clarified and claimed according to the law. Legal rationality codifies established social ends and enforces fundamental rules that govern actions, rights, and responsibilities of members. This rationale is used when political rationality does not work.
- *Economic Rationality:* The principle here is that the benefits should exceed cost in program spending. This rationality is used when the budgeters face economic problem in allocating limited resources to achieve multiple ends desired by numerous groups in society. The tools for this rationality includes program prioritization in which proposals are ranked based on highly prioritized needs on the basis that investing in the projects ranked as top priorities will contribute more benefits than using the same dollars to invest in projects at the low end of priority rank.

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- *Technical Efficiency:* The principle for this rationale is that the production process should have the least cost, at the given amount and quantity of output—that is, the least cost per unit. Management tools such as economic forecasting, cost evaluation, and financial management are used to achieve technical efficiency. The goal of this rationale is to find the best way to maximize output within a single process, at the given amount of input.

According to the MRB framework (Thurmaier & Willoughby, 2001a), the budget analysts who stand at the vortex use their personal backgrounds, including their understanding about the state budget process, experiences, and education, to interpret political and budgetary decision cues to decide which rationalities should be highly weighted in policy recommendation decisions. This theory suggests that the first bin should be incorporated in the conceptual framework that explains budget analysts' understanding of their organization's roles in the state budget process, the whole state budget process itself, and the goal of the state budget. Thus, these factors determine what capital budget practices would be adopted and committed to by the budget analysts. In other words, the factors in the first bin are the antecedents of the capital budget process in the second bin. The rationales for the relationships between the second and the third bins are already explained in Chapter 3.

Analysis Approach

Data collected in the Illinois case study are used to examine the theoretical components represented by the intellectual bins. For this purpose, Miles and Huberman's

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(1994) analysis approaches, including pattern coding and Case Dynamics Matrix, were used. The interviewing conversations that were recorded during the interview sessions were transcribed into the interviewing manuscripts right after each interviewing session ended. The non-verbal languages, such as pauses, sighs, smiling, and tones of voices, were included in the manuscript. Then, following Miles and Huberman's (1994) open-coding approach, any dialogue, words, phases, or non-verbal language that indicate value, including organization role perceptions, individual role perceptions (roles specifically relate to profession or title), understandings about budget process, and perceived benefits, as well as capital management practice elements, were marked in the manuscript.

Understandings about the state budget process involves such insights as how budget policies are decided in micro- and macro-process; who must be involved in the process; what perspectives these people bring into the process, i.e., constituency benefits, public interests; what aspects or issues are the specific concerns of these participants; what is required to enact budget policies, e.g., political consensus, mutual benefits, vote trading, legal requirements (three-fifth or majority voting). These insights show the interviewees' perceptions about the state budget process based on the places where the interviewees are (or were). Next, the pattern coding, which is "a way of grouping the summary into the smaller number of sets, themes, or constructs" (Miles & Huberman, 1994, p. 69) was conducted. The codes that appear to be in the same intellectual bin were simply put together. Finally, the data from pattern coding were summarized and recorded in the cells in the Case Dynamics Matrix.

The Case Dynamics Matrix displays a set of forces for practices, and traces the consequential process and outcome of the process (Miles & Huberman, 1994). As Miles

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and Huberman (1994) describe it, this type of matrix is used for within-case study when the analyst is "constantly trying to link data with explanations, trying to understand why specific things happen as they do—and how people in the case explain why things happen as they do" (p. 148). How can the researcher justify the conclusion that one thing causes another? Miles and Huberman (1994) suggest using the logics of temporal precedence and constant conjunction. The first logic holds that A precedes B, while the second logic holds that when A always B.

The Case Dynamics Matrix for this study has three columns, including antecedents, practices, and perceived benefits. Each row of the matrix shows individual cases from the organizations, including GOMB, IDOT, IDOC, ISBE, and IBHE. Looking across columns in each row, one can understand the antecedents (including the budget analysts' perceptions and understanding of their organization and individual roles in the state budget process, the state budget process, and the goal of the process), the capital practice used by the budget analysts (which is translated into social, political, legal, economic, and technical rationality), and the perceived benefits. Looking across rows, one can compare and contrast the budget analysts' orientations from different organizational levels (agency versus GOMB). At this step, the theme emerged: why people do things the way they do and what were the benefits they perceive. (The matrix, the detailed explanation for the five rationalities' operationalization, and the MRB theory testing are elaborated in the pattern coding section.)

To derive conclusions, the if-then test (Mile & Huberman, 1994) was used to compare row by row. By applying the if-then test, one can see if the causality is evident in the data. That is, if the analysts stand at the agency level (far away from the vortex),

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and perceive their roles as technical experts, then they weight technical rationalities over political rationality. On the other hand, if the analysts stand at the GOMB (at the vortex), and perceive their roles as gatekeepers who couple solutions with problems when political supports arises, then they use five rationalities and use opportunistic behaviors to decide which rationality should be focused on based on feasibility criteria. Ultimately, the if-then testing results confirm the differences of bureaucrats' role perceptions and the understanding and consequences of these factors.

Case Study Results

This section presents the case study's results. To respond to the fisrt research question of the present case study, this section compares and contrasts Illinois's capital budget processes with the normative recommendations. Summary of Illinois' capital budget process is provided.

Capital Planning

Normative Recommendation. Capital planning involves comprehensive planning and strategic planning. The goal is to establish a capital improvement program (CIP). Comprehensive planning involves studying a community's socioeconomic characteristics to identify a broad policy spelling out future land use and the objectives of community expansion and containment over a relatively lengthy period. The strategic policy planning involves setting specific strategies that seek to make the best use of limited resources. Need assessment, cost estimation and evaluation, and prioritization are the major tools

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used in tying strategic planning with capital investment. Need assessment relies on the facility condition assessment and the agency's mission, strategic planning, and programmatic-based activities. Cost estimation should be centralized so that capital investment by each individual agency is accountable. For prioritization, governments should establish clear and objective criteria for project selection to reflect the community priorities and investment target.

Benefits of the Recommended Practices. Capital planning is recommended by the normative literature on the basis that the planning help promote investment efficiency by making capital investment less haphazard through targeting types and locations for capital resources allocation (Steiss, 2001). The comprehensive planning is expected to provide public infrastructure that supports economic development in the community (Gianakis & McCue, 1999). The CIP is to lay a foundation for capital investment in a multi-year time frame so that management can schedule investment timing in a way that corresponds to resource availability and construction phases (Moak & Killian, 1963). Finally, the Philadelphia case study (Adams, 1998) suggests that capital planning is used to justify capital projects proposed by the agency, and hence prevent arbitrary cuts that often occur when political projects with low-ranked priorities are requested to be invested in the first year (Adams, 1998). A Minnesota case study found that capital planning and the CIP document alleviates one-shot and on-the-spot decision-making which is haphazard and politically driven, rather than objective driven (King 1995).

Illinois Capital Planning. Capital planning in Illinois is described below.

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Need Identification: The interviewees from the agency level talked about condition assessment as the first and foremost step in need identification. All the agencies that were studied rely on engineering standards to identify capital project needs objectively. The interviewees from these agencies stated that they or their personnel conduct infrastructure assessment annually to establish an annual capital budget recommendation. The differences among these agencies are the personnel used to implement condition assessment. While IDOT and IDOC have their own professional personnel for this activity, ISBE and IBHE mainly rely on the CDB professional engineering team for the same activity.

IDOT uses a Condition Rating Team to technically assess road, bridge, and highway conditions throughout the state, along with a condition assessment by the nine transportation district managers. The condition rating, accident and usage statistics, pictures of facilities and their conditions, and locations of the facilities are put together and presented at a meeting in the Springfield headquarters' office where a discussion about prioritization is held as the next step. IDOC sends its own in-house engineering team to rate the condition of 26 corrections facilities throughout the state. Along with the condition assessment reports by facility engineering managers, the team compiles its assessment data and brings that data back for discussion with the capital program unit managers for project prioritization as a next step. ISBE relies on the CDB engineering team to inspect and determine whether the facility condition of the proposing school district is eligible for funding. IBHE also relies on the CDB engineering team to determine whether the facility conditions described by higher education institutions really do need capital funding.

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The data indicate that need assessment in the studied agencies is conducted through a two-step process. In the first step, the school districts, the transportation districts, the correction facility's engineering managers, and the higher education institutions compile their needs based on engineering standards. This activity is meant to serve two purposes: 1) to justify capital project needs, and 2) to obtain project cost information that will be needed when proposing the projects to the state agencies. In the second step, the state agencies, including IDOT, IDOC, ISBE, and IBHE, conduct a condition assessment, either by in-house personnel as in the case of IDOT and IDOC or by the CDB team as in the case of ISBE and IBHE. The agencies then combine their assessment results with those reported by the units that they supervise (school districts, transportation districts, corrections facilities, and individual higher education institutions). The interview information suggests that all agencies studied use economic rationale are the first step in deciding whether the project or program is worth public dollars

Strategic Planning and Capital Project Identification: Agencies vary in terms of their use of strategic planning with capital planning. Only IBHE follows the agency's strategic plan known as *Illinois Commitment* and the broad investment plan called *Master Plan* in selecting proposals submitted by the higher education institutions. The interviewee noted that the projects that strongly support goals in *Illinois Commitment* receive high attention from the IBHE. For this agency, supporting the projects responsive to the goals previously identified for higher education institutions throughout the state means that investment is more targeted and the selected projects will be beneficial to the public at large, rather than being limited to serving any single group.

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The above information indicates that the IBHE uses technical and economic rationales in tying strategic planning with capital planning—that is, the agency believes that by making investment more targeted, public dollars spent will be worthwhile (an economic rationality). By working to provide benefits to the public at large, the public dollar will generate benefits to a greater number of people for the same amount of dollars invested in other projects that do not support the agency's goals (a technical efficiency rationale). When asked why the agency cares for strategic planning, the interviewee noted that,

> We are not executing our work in a vacuum. We realize that our recommendation determines whether the project will be considered by the Governor and General Assembly. We are trying to adhere to the principles defined in the Master Plan. This is our responsibility.

Other agencies do not have written strategic plans and do not tie their capital planning to strategic planning. The reasons for not tying strategic planning to capital project identification are varied. ISBE follows the Illinois School Construction Code, which requires that the agency use facility capacity, condition, and enrollment as its criteria to approve project proposals. IDOC bases its capital project identification only on condition assessment results since most of the time emergency needs ruin the plan, if the agency has one.

The IDOT interviewee noted that tying capital projects to strategic planning in IDOT is somewhat limited since capital planning changes every year due to the leadership of the Governor and the General Assembly. For IDOT, following the agency strategic plan that may have different agenda than that of the leadership means that the organization is not being responsive to the political needs,

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> We view ourselves as a technical expert, so we give technical information to the Governor and General Assembly. Based on reaction from these leaders, we need to change planning every year... We don't fight with political experts if our agenda is different than theirs.

> Realizing that governing is a part of the General Assembly, ultimately we let them pick the projects. They (the General Assembly) work through their leadership. They may want things changed or maybe not. We view ourselves as a technical expert, and the political expert tells us what to do.

These data suggest that the interviewees from different agencies use different rationales for their decision not to tie capital needs to the agency's strategic plan. ISBE uses legal rationality in deciding which projects should be funded, while IDOT uses a combination of technical, social, and political rationalities by identifying capital projects based on technical need analysis, the Governor's priorities, and the political agenda.

IDOC is different than other agencies; it does not follow the five rationalities in deciding not to tie its capital plan to its strategic plans. IDOC's capital planning is uncertian relative to those of the rest of the three agencies since its capital plan tends to change as emergency needs arise during the capital budgeting preparation stage. The interviewee from this agency noted:

> Strategic planning doesn't work for us. We have been trying to foresee what facilities may be needed to be improved, but most of the time our plan changes because of emergencies, i.e., waterline breaks, and the emergency needs to be addressed right away...How can you ignore the water line breaking while the agency's main activity is providing accommodation to the prisoners?

Cost Estimation and Alternative Evaluation: In the State of Illinois, CDB is responsible for cost estimation and alternative evaluation for all state-owned facility

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projects that are proposed by 15 agencies, including ISBE, IDOC, and IBHE. The CDB is not responsible for IDOT's transportation projects. IDOT is responsible for estimating and evaluating transportation projects' scopes, costs, and alternatives statewide.

Based on the interviewing data, there are two steps in cost estimation and alternative evaluation process for schools, higher education, and corrections projects. In the first step, the interviewees from the ISBE and IBHE noted that the proposing units (which are school districts and higher education institutions) individually estimate cost and evaluate alternatives to provide cost information in their capital project request proposals. The interviewee from IDOC stated that the agency's engineering team, along with the facility engineers, evaluate costs and alternatives for the projects at the time the team visits the 26 facilities for condition assessment. Interviewing data from the three agencies suggest that the cost estimation conducted in this step tends to be conducted for the purpose of the units' capital proposal preparation, rather than for cost controlling and efficiency promotion.

In the second step, after the three agencies identify capital projects, the interviewee from the CDB noted that the CDB sends the "full team" including engineers and architects to the proposing units to inspect the projects and to estimate cost and scope of the projects. The interviewee stated that the estimating team considers price, quality, and Illinois codes' requirements in estimating project cost, instead of insisting only on paying just for those construction materials that are the cheapest. This information indicates that cost estimation at this step is to promote efficiency--that is, the projects' costs are the least at a given quality standard. When asked if cost- benefit analysis is used for project alternative evaluation, this interviewee noted that he or she is trying to

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conduct cost-benefit analysis for capital renewal projects to compare costs of repair and replacement. However, according to the interviewee, the practice is not considered an effective tool since it is not practical to assign dollar values to some project benefits. The interviewee noted, "Sometimes, it is difficult to quantify the benefits of some projects, such as parks and museums, into dollar values."

IDOT relies on the district's engineering teams to estimate project cost and compare prices and the quality of the materials to be used. The Department of Planning and Programming in IDOT has comprehensive and up-date information for construction, materials, and prices and uses this information to crosscheck with the district managers, when needed. The interviewee noted that the benefits of the projects such as useful life are compared with costs when considering repair and replacement. Another interviewee from this agency noted that if the projects are for infrastructure expansion and economic development purposes, IDOT works with the Department of Commerce and Economic Opportunity (DCEO) to select the best alternatives based on the projects' cost and expected benefits.

When asked about perceived benefits from this practice, the ISBE and IBHE interviewees indicated that cost estimation is an essential practice for the agencies' capital planning since the practice not only helps save the state's capital program cost, but also ensures government accountability in spending public money. The interviewee from IDOC noted that cost estimation and alternative evaluation yield cost information that can be used as a tool to communicate the agency's needs to the upper level.

The interviewee who is the senior official in the central budget office held the view that cost estimation and project scope evaluation are essentially technocratic

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practices in capital planning, and that the GOMB office relies on the CDB to prepare statewide capital budget requests that will then be proposed to the General Assembly. As this interviewee stated,

> Cost estimation, evaluation, and alternative selection are technocratic assignment. Those people (the CDB) are expert in these activities; we are not and we rely on them. That's the purpose of establishing the CDB.

The interviewee from IDOT perceives the same benefits as those from the GOMB office. This interviewee said that the cost estimate and alternative evaluation practice is the fundamental step in capital programming and planning. The interviewee stated,

> This (cost estimation and alternative evaluation) is a technocratic assignment and this is an essential step. Projects must be separated into phases to be proposed according to the cost of each phase. That's why you see prior and new appropriations in the capital budget. It's part of our capital programming and planning assignment.

The two above statements indicate that state agency bureaucrats use their individual role perceptions that relate to their job responsibilities and professions in the state capital budget process to decide whether the practice is their responsibility or should be delegated to other agencies.

Prioritization at the Agency Level: Every agency that was studied conducts prioritization. All agencies have a clear definition for their prioritization criteria. IBHE criteria are prior appropriation; on-going projects; emergency, life and safety; projects that have a high ranking on an individual institution's list; and projects that have a high ranking on IBHE's last year list. The interviewee noted that these criteria come from the

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Master Plan, which focuses on strategic investment including efficiency and effectiveness.

> If the projects were already funded, it is necessary to recommend the projects until they are completed, so that the past investment will not become a waste. If the projects recommended by the Board last year were not funded, the Board keeps recommending them because these projects are an actual need, so the institutions to accomplish their missions and activities. Unless the institutions change their plans and priority list, we keep recommending the projects until they are funded.

ISBE defines its prioritization criteria as follows: disasters, overcrowding due to population growth and aging buildings, school district consolidation, life and safety, disability act compliance, and unique solutions to facility needs. These criteria indicate that the agency focuses on the essentiality of the investment due to facility condition and usage, rather than programmatic purposes. When asked why the agency does not include programmatic-based criteria, once again the interviewee noted that the agency follows the state's Constitution and does not adopt a practice that is not required by the Illinois School Construction Program law.

IDOC places life and safety as the first criterion, followed by security systems and the facility engineers' decisions on what they might need after these two criteria. IDOT reflects its investment policy by placing maintenance and safety as the first criterion, followed by congestion mitigation, highway system improvement, system expansion, and economic development purposes.

An interesting theme emerged when the interviewees responded to the question of how they rank projects in practice. Except for the ISBE, none of the interviewees indicated that they assigned a numeric score to the projects according to the defined

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criteria. ISBE uses a "priority figure" that ranges from 1 to 6 (6 means the highest need, while 1 mean the lowest need) to rank the projects from the most essential to the least essential. According to the State Constitution (23 ILCS 115), the priority figure is calculated by using the total enrollment, a building's functional age, and facility capacity relative to the number of students enrolled—the interviewee referred to this facility capacity as the number of "un-housed students." Therefore, the priority figures reflect the districts' capital needs relative to their facilities' condition and the number of students served.

Note that the ISBE priority index is not the same as a grant index. The grant index is used to decide how much of the state-supported fund will be awarded to each individual district. The grant index is calculated by the CDB based on the formula provided by the Illinois Constitution. The grant index awards the School Construction fund in an amount that is inversely related to a district's per pupil property wealth. This information indicates that the ISBE uses legal rationality in deciding project essentialities.

The rest of the studied agencies indicated that ranking criteria are used as broad principles in deciding which proposals should be funded first; however, in practice, the decision is made by an interactive process where several staff members with different specialties are involved. Although these agencies agree that prioritization should not be accomplished by one person alone, the agencies do hold different philosophies regarding project selection. While IBHE insists on recommending projects based on the analyzed data regarding facility condition, programmatic needs, and the agency's Master Plan, IDOT is concerned with political needs. IDOC uses technical efficiency reasoning by

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insisting that it recommends projects based on emergency needs that must be funded in the coming year to avoid inflation.

IBHE prioritizes the projects across institutions in a series of meetings where the Board Deputy Director and budget analysts are the main participants. In the meetings, the Board Deputy Director contributes inputs, such as the Governor's priorities and the agency priorities, while the budget analysts contribute technical analyses regarding need assessment information and project benefits. There is evidence to conclude that IBHE uses economic rationality in ranking the proposals since the interviewee from this agency stated, "For every project we recommend, we attach the reasons why it needs to be funded and what are the needs that justify our recommendation."

IDOC prioritizes its needs in a meeting where the capital program unit managers, the project managers, and the agency's engineering team are the main participants. The interview data indicated that IDOC weighs capital needs based on the severity of emergencies. The interviewee gave an example where the window locking system project was more needed than fixing hot showers because an ineffective locking system poses a more severe problem to the organization's activity than inactive hot showers.

IDOT uses an interactive meeting called a "studio meeting" where technical information, including the condition rating, project locations, pictures, and accident statistics are displayed and analyzed, along with information regarding funding capacity received from IDOT's financial department. The meeting participants include the planning and programming directors, the CSR team, the district engineers, and the IDOT planning engineers. Decision-making is a combined effort derived from the objective data, including condition rating and usage statistics, the Governor's policy priorities, and

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the General Assembly's priorities. When asked how the staff knows the Governor's and the General Assembly's agendas, the interviewee noted that the agency's Secretary tells the staff what the Governor's policy priorities are before the capital planning process and review the capital budget after it has been established. For the General Assembly's agenda, the staff use educated guesswork based on what the leaders would like to see in the agency's recommendation.

Compared to IDOC and IBHE, IDOT seems to follows political need more than the two agencies that recommend projects based on technical reasons. This observation is drawn from the statements of the interviewee from IDOT,

> It is a blinding testament of what we think needs to be funded out there, but they (the Governor and General Assembly) may want some other projects, and if they are requested, we then prioritize again and take whatever they do not want out. Sometimes, we mess up our plan and choose to talk with our district managers (about cutting).

The interviewees from IBHE also mentioned objective decision-making—"our decision is important to them (higher education institutions); it means some may not be funded in the year." Meanwhile IDOC mentioned that objective information regarding infrastructure condition is used to justify the depratment's needs, "We bring engineers to explain to them (GOMB) why we need the projects. The waterline breaks, the security system needs to be upgraded, and so on. We got to have the projects!"

Like the above interviewees, both interviewees from ISBE and CDB, who are responsible for the School Construction Program, perceived their individual professional roles and stated that they follow the Illinois Constitution: "Everything we've done here is

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what the Constitution tells us to do," "We don't do things other than what the Constitution tells us to do."

The two interviewees from IDOT mentioned a different orientation than that of the officials from other agencies. Reflecting an increased recognition of political factors, they stated:

> Sometime, there is no reason to say no (to the political requests). Sometimes, our condition-rating index does not help. Districts who say, "Hey look, this road has not looked like the condition you rated yet." This road looks worse than what you get.

and,

> We give them the technical information, and we change planning every year based on the reaction of the public, the General Assembly, the Governor, and our own priorities.

This information indicates that for the three interviewees from IDOC, ISBE, and IBHE, capital planning decisions are influenced by three factors: 1) the interviewees' understanding of the agency's missions, 2) the interviewees' perceptions of the role of the agency, and 3) the interviewees' perceptions of their professional roles in implementing the capital budget recommendations. For IDOT interviewees, capital planning decisions are influenced by three factors: 1) the interviewees' understanding of the state capital budget process (how the budget bill is enacted at the state level, who participates in the process to make decisions about capital budget bills at the state level, what these participants are concerned about, and what has to be done to receive support from these political participants), 2) the interviewees' perceptions of the role of the agency, and 3)

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the interviewees' perceptions of their professional roles in implementing the capital budget recommendations.

The difference between the two groups can be seen in the first factor used by the officials from the two groups to decide capital planning: While IDOT officials use their understandings about the state capital budget process, ISBE, IBHE, and IDOC officials use their understandings of the agencies' missions to decide capital planning. These different factors suggest that IDOT officials have a broader perspective that covers not only the agency's needs but also the political participants' needs for their capital planning decisions, compared to those of the ISBE, IBHE, and IDOC which are limited to only the agency's needs.

This difference may be due to the fact that IDOT is directly exposed to the General Assembly's needs and requests and is responsible for its own financial planning. Meanwhile, the three agencies have the GOMB as a middle agent who coordinates and compromises the agencies' needs with the General Assembly's needs while at the same time fitting these needs with the state's funding capacity. These differences influence the official perspectives, perceptions, and interpretations about capital budget activities and goals—that is, while the officials from the three agencies understand that the state capital budget is to serve the agency's needs according to the agencies' missions, the officials from IDOT understand that the state capital budget is to serve both the agency's and political needs; and, thus, compromise is required to receive support from political officials.

These perceptions and interpretations (that are different between the two groups) determine whether the normative practices will be adopted. The normative practices

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including clear and objective prioritization and objective needs assessment are adopted only if the officials see that the practices work and fit in with the roles.

CIP: There is no statewide CIP in Illinois. The studied agencies, except IDOT, also do not have a CIP. IDOT has a CIP called Multi-year Highway Improvement Program (MYP), which is a list of projects that the department plans to accomplish in the next five years within the resources projected to be available (Illinois Department of Transportation, 2005). To establish the MYP, guidelines and criteria are issued to the department's nine districts to develop, prioritize, and submit the candidate projects by program category for inclusion in the MYP. Structural condition rating index, the types and volume of traffic being served, the functional importance of the route, accident history, geometrics, and public input are considered in developing project selection criteria and assigning district priorities. Then the candidate projects submitted by the nine districts are discussed, reviewed, and prioritized based on the project merits. Project selection at this step is conducted by program category. Once the initial review and prioritization is completed the district by the district program mix is reviewed and additional project tradeoffs may be made.

At the final step, the selected projects are scheduled and listed in the MYP according to individual project's construction phases including engineering, land acquisition, utility adjustment, and construction. Project's construction programming depends on the status of pre-construction activities and availability of resources. MYP is reviewed by the Governor and presented to the General Assembly for review and modification during the appropriation process (Highway Program Planning and Development Process, Illinois Department of Transportation, 2005). The department

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updates its MYP every year. The MYP is mandated by Illinois laws (20 ILCS 2705/2705-200) which requires that IDOT develop and maintain a continuing, comprehensive, and integrated planning process.

The above information indicates that the MYP is developed based on an objective analysis and technical information as the base of the document, which may be adjusted by the Governor as necessary and modified by the General Assembly during the appropriation process. In practice, the interviewee noted that although the annual program is developed based on the projects listed in the first year of the MYP, the annual program may be different than the program listed in the first year of MYP. This is because the General Assembly may modify the program according to the leadership's agendas that tend to change from year to year; and, thus, the annual program reflects the appropriation decisions from the General Assembly. As the interviewee stated,

> No projects are viewed as a bad project. Their (re: the General Assembly and the Governor) agendas may be differ than what we have. We try to hold our plan, but if it needs to put things in and move things out for their bigger agendas than what we have, we don't argue with them. We let them work through their leadership.

The same interviewee also added that overall, the General Assembly's modification does not change the total outlay for capital program but the trend in capital spending. For example, instead of funding project X that is listed as a first priority, project Y in a different location and program category is requested to be funded first. This information indicates that political needs interrupt objective planning in terms of spatial distribution, rather than spending level. If the political project replaced the technical project identified

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by the department is not actually needed or has less merit than the technical projects, investment efficiency problems may occur.

Other agencies face situations similar to IDOT's in that the agencies' investment priorities and agendas are different from those of the governor and the legislators; thus, the original plan cannot be implemented. IDOC states that the department used to have a CIP in the 1970s, but it was discontinued because the plan was not supported by top-level management, including the central budget office and the governor. Another reason for not having the CIP is that funding sources are limited. When asked why the agency does not have a long-term plan, the IBHE interviewee replied, "No official long-range plan because so many needs were not funded as planned. There is always the gap between needs and capacity. For many years in the past, only about half of what we proposed was funded." The interviewee noted that the IBHE understands that the state has limited funding capacity; but, at the same time, such a situation discourages the department from following a strategic plan. ISBE does not have a CIP for the reason that strategic and long-term planning is not applicable to the purpose of the School Construction Program, which is defined by law for the purpose of mitigating the district burden in funding education investment, rather than encouraging economic development.

Except for the ISBE, long-term planning is not committed by state agencies because the staffs understand that long-term strategic planning is not the purpose of the state capital budgeting process. Two interviewees at the agency level noted that the limited funds, the decisions and policy priorities of the governor and General Assembly, and the cutting process are the main factors discouraging the agency from establishing long-term capital planning. As one interviewee stated, "Why bother with the long-term

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plan? Eventually the plan has to be changed for some reasons—the limited funding source, the upper level's decisions, and the cutting."

At the state level, the interviewees from the central budget office noted that the GOMB does not do a CIP for three reasons. First, the central budget staff perception is that long-term planning is not a part of the GOMB's roles and responsibilities in the state capital budget process. The interviewees from the central budget office believe that capital planning should be conducted by state agencies that know better than the GOMB what the residents and their clients want. One interviewee stated, "Capital planning is more done at the agency level. At the state level, we focus more on the amount of money than location. Location is something agencies consider when they recommend the projects, not us." Another interviewee added,

> That (long-term planning) is not our job. Our principal role is to make sure that the program fits in terms of total number of projects and the state funding capacity, regardless of where the projects are, so that we don't have a big debt load.

Secondly, the interviewee noted that the state capital budget process supports city governments' investment planning, rather than dictating to those small governments by using the state's long-term plan to tell them what to do in their jurisdictions. The interviewee explained that the purpose of the state capital budget is to distribute state fund to support the projects or programs initiated by city governments and the Chamber of Commerce. "The planning is local governments' matters, and so we choose to support them through General Assembly members' requests, and that's why we don't have a CIP. That (the CIP) is the thing the Chamber of Commerce partners with the cities." This statement suggests that the interviewee used his or her personal background to conclude

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that the focus of the state public capital process is supporting city governments, rather than interfering with those governments' public investment choices.

Thirdly, the interviewee understands that the state capital budget is not only for infrastructure investment, but it is also a part of state government political processes. The interviewee noted that often the governor uses capital projects to trade for the General Assembly's support for other policies that may not be infrastructure-related projects. The interviewee explained that this practice is common since capital projects are concrete projects and legislators need the projects to win supporting in the next election.

> Capital projects are very important to General Assembly leaders and also important to the governor. The legislators need local projects and the governor needs their supports for other policy. These are how the governor can do things that may have nothing to do with budget! For example, he (the governor) may want gun control reform, and he says, "Here is the road—do you want the road?" And then he gets the vote. This is a part of our (capital) process.

Another interviewee implied that long-term capital planning by the state hinders legislators' initiatives, which are worthy of support since political needs reflect local residents' needs.

> Legislature initiative, pet projects...these are parts of state capital process. The state's role is to support local needs. They (the General Assembly members) all have the same needy issues. Legislators know what their constituents need and the state capital process is to support those needs. Most of the projects identified by these people are not necessarily really bad. The community needs it. I don't find it illegitimate to support these projects. Is this pork? I don't know.

The above data suggest that the CIP is not adopted at the state level for three reasons: 1) the CIP is viewed as being part of the agencies' missions, but not part of the

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GOMB's mission 2) the GOMB should not interfere with local governments decisions by having a CIP that binds these local governments to a long-term plan, and 3) the CIP will hinder legislative initiatives and the political process that is used to reach consensus on the budget bill. These reasons can be interpreted as 1) understanding of the agency's role, 2) understanding of the purpose of the state capital budget, and 3) understanding about the relationship between the state's capital process and political factors. The third observation is consistent with Gianakis and McCue's (1999) observation in that the CIP overshadows political decisions since by nature it focuses on the future of the jurisdiction and values the ends of collective decisions, not the means of the collective decision (as the political process does). According to the two authors, in addition to being a time consuming and complex process, CIP violates the political process. According to Gianakis and McCue, some governments do not adopt the CIP for these reasons.

In summary, the interview data indicate that Illinois does not have a CIP at either state or agency levels for a variety of reasons. The central budget office perception is that long-term capital planning is not its role and that it should not interfere with agencies' and city governments' planning. The state agencies perception is that the top-management does not support long-term plans, citing changes in policy priorities every year or cuts to the proposed funds. The GOMB staff also has the perception that the capital budget process is not only for infrastructure investment, but also a political process played by the governor and General Assembly.

Perceived Benefits of Capital Planning: The interviewees from the studied agencies noted that capital planning, including needs assessment, project scope

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evaluation, and prioritization, is an essential step in establishing a foundation for capital budget recommendations. The interviewees from IDOT noted that capital planning promotes investment efficiency by targeting investment funding based on actual needs. "Condition rating assessment results inform what projects and acquisitions we will need and where capital resources should be located." The interviewee from IDOT also added that the capital planning process is an important step in capital programming: "that's why we have prior and re-appropriation."

IBHE sees the benefits of need assessment and prioritization in that the condition assessment information justifies project recommendations by the agency, while the prioritization ranking communicates the needs to the central budget office. The interviewee from this agency stated, "It is always good when you have information: space survey, facility condition. This information is beneficial to us and to the upper level because it tells us and also tells them what we need and what we are doing to accomplish our statewide goal." The interviewees from the ISBE and IDOC perceive similar benefits of capital planning. The ISBE official noted, "The need assessment tells the General Assembly there is a need out there. There are repair and renovation needs for the school districts and they need help." The IDOC official said, "We bring our engineers to explain to them (the GOMB) why we need the project—roof must be repaired, security system needs to be upgraded. We use assessment information to make sure they know what's really needed to be done."

In short, the interviewees from the agencies perceived the benefits of the capital planning process as an activity that helps increase investment efficiency by targeting investments that help alleviate haphazard spending, and by programming various projects

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to fit available resources. The agencies use the condition assessment information to justify their recommendations, while using prioritization ranking to communicate project importance to the central budget office. Interview data appear to show that the systematic capital planning practice and information may not totally prevent arbitrary cuts, when some other projects from the governor or General Assembly are funded instead of some projects in the plan. However, the statement from the GOMB interviewee conveys the perceived benefits of capital planning in Illinois:

> The technical need assessment, project cost estimation, prioritization...these technocratic assignments establish the process, keep it legitimate. It helps our budget analysts by providing information and guidelines for what they are doing, how they make decisions, and when you do meet politics, you may be totally overruled, but at least make it legitimate. You can say it's never been in here (prioritization list); it's never been assessed as a priority.

Illinois data do not support the previous case study's finding by Adams (1998) that prioritization can prevent arbitrary cuts or additions by elected officials. Illinois data also do not substantiate the previous case study finding by King (1995) that capital planning reduces short-term focused decision-making driven by political motives. That is, in Illinois, political projects are included both at the governor's office before launching the capital budget plan to the General Assembly and at the last minute before the legislative session in spring is ended. As one interviewee stated, "This is a part of our process."

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Capital Budgeting

Normative Recommendation. The capital budget is "a plan of proposed outlays and the means of financing them for the current fiscal period" (Moak & Hillhouse, 1975, p. 74). The normative literature suggests that governments conduct prioritization and maintain prudent fiscal and debt management. The first activity is to match resources with needs, while the second is to promote fiscal stability, maintain and improve the government's bond rating, and maintain an optimal balance between investment and consumption expenditure.

For fiscal and debt management, the normative literature accentuates the following activities. First, governments should conduct multi-year revenue and expenditure forecasting to identify net cash flow, which is total projected revenue less total projected operating expenditures. The net cash flow is then compared with capital investment expenditure required in future years as identified by a CIP. This activity matches capital planning with fiscal planning. Multi-year fiscal forecasting indicates the government's capacity for capital funding, and thus the activity is beneficial in promoting fiscal stability (Aronson & Swartz, 1975).

Second, debt affordability analysis should be conducted before issuing bonds (GFOA, 2001). Debt affordability analysis is calculating the ratio of debt service obligation to total revenues or expenditures. The two common approaches used to judge whether a government's debt obligation is too high are: 1) comparing per capita debt with other similar state governments or the national average, and 2) using a norm such that debt service as a percent of operating expenditures is low if it is 5 percent or less,

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moderate if it is 10 percent, and high if it is more than 15 percent (Robbin & Brown, 2003).

Third, governments should maintain an operating reserve (rainy day fund) to cover an unanticipated revenue shortfall or unexpected expenditures. Fitch (2002) suggests that the appropriate size of the rainy day fund depends on a government's revenues, expenditures, and economy.

Finally, governments should conduct debt disclosure. The basic practice is to comply with the Securities and Exchange Commission Rule 15c2-12, which requires that bond issuing governments must submit annual financial information repositories and provide notice of certain events material to their bonds or notes. Fitch (2002) suggests that "superior debt disclosure" should be conducted—that is, in addition to complying with the Rule, debt disclosure should include not only management's discussion and financial analysis section, but also supplementary information, including economic outlooks, demographic trends, and tax assessments.

Benefits of the Recommended Practices. The previous case studies identify three benefits of a capital budgeting process: 1) an investment policy goal (investment effectiveness) perspective; 2) a mechanism to fund an expensive multi-year capital program without facing an unstable fiscal situation (prudent investment); and 3) preserving the bond rating so that investment cost is low (investment efficiency). First, according to a case study of state capital budget, clear and well-constructed prioritization criteria at the state level help governments focus on their investment purposes. For this case in Minnesota, the state government divided project selection criteria into two

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separate groups, and provided critical versus strategic criteria to prevent the government from committing to unbalanced funding between maintenance and new construction. The government needed repair and replace projects for obsolete facilities and the facilities that consume high maintenance cost; while at the same time, it needed new construction to support new or expanded service programs. The well defined criteria helped the government focuses on both maintenance and programmatic investment (King, 1995).

Second, fiscal planning helps governments fund a large and expensive multi-year capital improvement program without fluctuating tax rates (Forte, 1989). Forte (1989) uses the case study of McKinney City, Texas, to illustrate that bond planning, including debt service analysis, revenue and expenditure forecasting, and a capital reserve fund are the tools the city government used to identify $21 million in revenues to fund a six-year capital improvement program to respond to the city growth.

Third, prudent financial management helps state governments maintain and improve bond ratings (Fitch, 2002; Standard & Poor's, 2001). The case study of Virginia supports this recommendation (Darr, 1998). Darr (1998) asserts that because of debt management policies, including statutory debt limits, rainy day funds, and strategic financing, the State of Virginia has been able to preserve its superior bond rating profile over a 30-year period. The Virginia state government created a fund reserve that was diversified to support the operating budget during recessions and was used to finance capital projects when the interest rates were high. Committing to long-range fiscal planning, the state's fiscal discipline is high by maintaining an optimal balance between consumption and investment.

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Illinois Practices. Capital budget practices in Illinois are described below.

Prioritization at the State Level: Data indicate that prioritization at the state level is a three-step process. The first step occurs in the CDB office where 19 participants including GOMB and CDB capital planning analysts meet and discuss project merits as compared to prioritization criteria. The interviewee described a process that starts when the CDB reviews the proposals and technical evaluation by sending engineers and architects to verify project scope and cost estimates. According to this interviewee, the CDB does not assign numeric scores to projects, but uses the interactive meeting which is "an ongoing process" to evaluate project merits and prioritize the projects based on the criteria. The CDB ranks the projects based on four criteria: life and safety, code compliance, maintenance, and new construction. According to the budget books (FY 2005, 2006, and 2007), this set of criteria is used for all state-owned facility projects supervised by CDB. The interviewee noted that the state-owned facility projects from different departments (i.e., Department of Natural Resources, Department of Correction, and Illinois Higher Board of Education) are ranked across the program areas by using the same set of CDB criteria. The interviewee stated that the completed prioritization list is sent to the General Assembly to consider for changes and additions. This interviewee noted, "Sometimes project ranking depends on the General Assembly assignments." The interviewee added that cost-benefit analysis is not used as a decision making tool to compare similar projects for two reasons: difficulty in defining project benefits and the need to respond to political desires which is viewed as the mission of the planning staff.

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> Cost-benefit analysis for a project can yield both negative and positive results, depending on how you look at the project benefits. For example, do you count the numbers of job increase as a project's benefits?.....I try to do cost benefit analysis for renewal projects such as roof replacement project to see the benefits of gas saving as compared to the replacement cost, but sometimes people (re: the General Assembly) want money to be here instead of there; and we must serve them.

In the second step, the CDB prioritization list is moved to the GOMB. Another interviewee explained that the analysts in the GOMB office use broader criteria to prioritize projects in order to prepare recommendations to the budget director and the governor. When asked what criteria the analysts use, the interviewee referred to the criteria published in the budget book: deferred maintenance, facility condition, agency program needs, future operating cost, local or federal matching funds, long-term comprehensive plan, agency efficiency, statewide strategic priority, public service focused, and debt service impacts. This interviewee noted that when he or she was the budget analyst in the GOMB office, the projects were ranked across the programs by using the same set of criteria. This person added that the merits of the projects compared to the criteria are the main standards used to rank the projects, while at the same time checking back and forth with the total affordability.

Interview data indicated that the next step occurs in the Governor's Office where the selected GOMB budget analysts, the GOMB budget director, the GOMB deputy directors, the governor, and selected staff from the governor's office meet to make decisions. The interviewee acknowledged that prioritization and total outlay identification are considered at the same time in the meeting room. The decision is based on three rationales: technical, political, and social motives. When asked what the issues

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were in the decision-making process in the Governor's Office meeting, the GOMB officials replied,

> Affordability—how much can we afford?; politics—election year—do I (re: the governor) need to make a big slash? Nah, and then we move on to Programmatic—do you need a big program? Yeh, but can we afford that?

Another interviewee added that strategic investment is not an issue at the top level:

> The governor and his staff have no time to agree on what priorities are. You look at what is the big question: How much we can issue (bond); how much authorization do we need? Are we going to do education (which is the governor's campaign) this year or not?

The interviewee who was a senior staff member in GOMB has the perception that the budget analysts in the GOMB office play an important role in laying a foundation for the capital budget, and thus strategic-based and technical prioritization are the roles and responsibilities of the budget analysts in the GOMB office, the CDB specialists, and the state agencies director. "Overall it (the budget document) should be a relatively clean proposal before coming to the Governor's Office and it is done by our analysts and the experts from the CDB."

This information indicates that decision-making at the state level depends on multiple rationalities including technical, social, political, and legal judgments. First, technical rationale is used to identify the state fiscal capacity including total capital outlay and debt capacity.

Second, social rationality is used when the participants considered adding the Governor's campaigns to the Governor's capital budget requests since the governor's

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campaign can be considered as a contract between the voters and the governor. Using the governor's campaign as a judgment criterion is equivalent to using social rationality, since the governor's policy is a compromise among voters.

Third, political rationality is used to consider if the Governor's capital plan will receive political support through voting. As one interviewee noted, sometimes the Governor uses capital projects to trade with his campaign that may not relate to capital budget (i.e., gun control campaign) with the General Assembly members. If new bonds need to be authorized to fund capital program in the coming years, political rationality is used to analyze what to do to receive support for bond authorization. As one GOMB interviewee noted,

> You need people (re: General Assembly) to work with you to receive bond authorization. You need to talk with them (re: General Assembly) and show them how their voting supports relate to the new bond authorization. Can we finish this project first and then your projects, using this newly authorized bond?

The above statement suggests that in addition to technical analysis for debt capacity, issuing new bonds requires political rationality to analyze what to do to receive votes for bond authorization. The above statement suggests that the State of Illinois relies on the "log-rolling" method. Log rolling is "The exchanging of political favors, especially the trading of influence or votes among legislators to achieve passage of projects (or bond authorization) that are of interest to one another" (The American Heritage Dictionary of The English Language, 2000).

Finally, legal rationality is used by the participants as is shown when they considered the three-fifth vote needed to authorize new bonds as required by the State's

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Constitution. Further, the statutory debt limit is complied with when the GOMB official suggests bond amounts based on a technical debt capacity analysis to the Governor.

Another interviewee who used to work in the state central budget office agreed with the notion that it is the responsibility of the budget analysts in the GOMB to prepare a technically-based capital budget recommendation:

> The GOMB works with the agencies and get their needs to plan for state capital program. Once the prioritization list is sent to the office, the budget analysts go through it, clean unnecessary projects, and make sure what's really needed are there. Certainly, the analysts in GOMB took government priorities and figure out what projects should stay and what project should go. But overall, the decisions are based on the projects' merits.

This person stated that the budget analysts in the central budget office try to recommend projects based on their merits before sending recommendations to the director and governor. "We recommend the projects based on criteria you see in the budget book; we use our affordability to define what projects to be funded."

The interview data also indicate that project selection at the top level is more politically driven than technical driven. Project selection in the Governor's Office is on the basis of vote and the governor's campaign, rather than strategic investment. This can be seen when the interviewee stated, "....but if the cut project is going to bring votes to you (the governor), you need to keep it. Nobody agrees that this is in the priority list, but you may need it for the vote." This interviewee sees that at the top-level, the state's capital budget depends on funding capacity and the Governor's priorities.

> It is not a zero-based budget; every year they are not going to forget about anything and come with a zero again. These projects are not like you've never seen them before; you've seen them two-three years ago, but they (the agencies) change the points so that they can be selected.

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Another interviewee noted,

> As I told you, there is a gap (stressed the word) between needs and capacity and so some projects must go and wait for the following year. The governor ultimately makes decisions if he wants some project that has low priority to be funded first, and that's a good thing about being a governor (smile).

Overall, the data indicate that for the senior central budget staff (budget director, senior analysts) who are involved with the governor and are exposed to the state political process, project selection is based more on political rationality than on economic rationality (strategic-based prioritization). Meanwhile, the budget analyst who is not as exposed to the political process uses his or her technical expertise in project recommendation, by going through the project justification and the merit of the project investment, rather than political judgment.

The first notion is consistent with the MRB in that if the budget analysts stand at the vortex, they will have one eye on policy processes and another eye on management processes; thus, those who are exposed to politics will use multiple rationalities for their policy recommendations. The second notion defies the MRB theory by arguing that not all budget analysts in the central budget office use multiple rationalities in recommending capital budget to the Governor. The interview data suggest that the budget analyst who was not at the senior-level and did not participate in the Governor's office, but is responsible for prioritization and preparation of capital budget draft (that will be sent to the Governor's Office) used economic rationality, rather than political rationality. Economic rationality can be seen when the non-senior budget analyst in the GOMB office stated that he or she ranked projects based on their merits as compared against the

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clear and objective prioritization criteria listed in the state budget books. Thus, not all budget analysts in the state central budget office use multiple rationalities in their policy recommendation. Instead, only the senior-staff who are exposed to political processes and work closely with the chief executive use multiple rationalities to a significant degree since these people view political rationality as equally important as technical, social, legal, and economic rationalities.

The second notion, however, is tentative and warrants future examination. This is because in this case study, only one out of four GOMB interviewees was a non-senior budget staff member; while the other three interviewees were senior staff in the central budget office. The small number of non-senior budget analysts in central budget office may make the finding relatively less reliable.

Fiscal Planning: One interviewee explained that budget analysts in the GOMB office conduct revenue and expenditure forecasts and debt affordability analyses to identify the capacity for total outlays. The GOMB identifies total outlays by considering annual debt service payments (on existing debt), re-appropriation (or the new bond sales for ongoing projects that are already approved in a prior year), and affordable expenditures for new programs proposed for the coming fiscal year. The affordable expenditure is derived by subtracting the debt service obligation, re-appropriation, and projected operating expenditure from projected total revenue. An interviewee explained that, "...the budget analyst has a model of debt affordability set out so that we know how much debt service we can afford, and then we translate into bonds." The same interviewee added that future debt service as a percent of total expenditure is considered after the total bond amount is identified to assure that the debt service burden identified

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by new bonds does not impose negative impacts on the state operating budget and the state fiscal status.

When asked if this practice has been common for long time in the GOMB office, the interviewee stated, "They did this as a basic practice in both operating and capital budget process every year when I was working there, and I am sure they are still doing it now." This information indicates that the analysts in the central budget office conduct and use technical rationality to recommend the total capital budget outlay to the budget director and the governor.

At the top level of the decision process, the budget director recommends total capital outlays identified by his budget analysts. In general, the budget director also informs the Governor that the recommended outlays can be increased if the Governor prefers to have a larger capital program, is willing to create the required revenue stream, and thinks that the new bonds will be authorized by the General Assembly. As the interviewee noted:

> Eventually, after the technical work in the OMB, total level is the decision process within the Governor's Office. The budget analysts may say you can add more but you may need new (bond) authorization. The governor knows how he can accomplish it (the bond authorization) and if he wants to go for exceeding bond authorization he knows how he will get authorization. That's where politics comes into play.

The above statement suggests that the budget director uses not only technical rationality, but also political rationality in recommending the total capital budget to the governor. The increased amount may or may not be selected by the governor, depending on the likelihood of receiving support from the voters for bond authorizations.

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Another interviewee noted that the new appropriations are generally small amounts due to debt service obligations incurred by prior-year bond sales, re-appropriation, and debt affordability. According to this interviewee, Illinois governors prefer not to increase the total outlay to fund the expansion of programs. If the governors wish to expand the infrastructure program, new revenue must be identified to support the multi-year program (e.g., Illinois FIRST by Governor George Ryan and Build Illinois by Governor James Thompson). These data indicate that the total level of capital spending in Illinois is defined by technical rationality (debt affordability, revenue, and expenditure forecast) at the foundation and by political rationality (whether the voters will support it and how to gain support from the voters) at the top in the Governor's Office meeting.

Financing Decision: The interviewee explained that appropriation to program areas is generally predetermined by the past bond authorization amounts set for each program area. Interviewee noted that by this method, there is not much new revenue identified for new construction program. The interviewee stated,

> The funding levels by program areas increase according to revenue growth. You always have more pressure, and so you can't increase funding levels more than revenue growth. You get little room every year because the bonds issued 20 years ago expire. You get about 5 percent growth every year.

These data indicate that Illinois infrastructure funding levels by program areas are incremental—that is, the decision is based on past bond authorization and revenue growth. This financing decision affects the state infrastructure investment; since the funding source is limited, it is difficult for the state to finance new construction, and thus,

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as can be seen from the state prioritization criteria, the state gives priority to maintenance over new construction and strategic planning.

To clarify the bond fund structure in Illinois, the state's budget books in Fiscal Year 1986, 2005, 2006, and 2007 were consulted. The bond programs are explained as follows: General Obligation Bond Act (30ILCS 330) authorizes the state to issue direct, general obligations of the state. The Act, effective since Fiscal Year 1986, consolidated separate bond Acts for specific purposes dating back to the 1970s. The Act designates that the full-faith and credit of the state is pledged for timely payment of debt service on all General Obligation (GO) bonds. The projects that are funded by this bond type are usually for infrastructure maintenance, facility renewals, and re-construction purposes.

- *Capital Development:* Construction funds for higher education, corrections, conservation, child care facilities, mental and public health facilities, local governments, and other state capital facilities and purposes.
- *Transportation:* Construction or reconstruction of highways, roads and bridges (Transportation A Bonds) and mass transportation, rail facilities, and aviation (Transportation B Bonds).
- School Construction: Grants to school districts for school improvement projects.
- *Anti-pollution:* Construction of municipal sewage treatment plants, and solid waste disposal facilities.
- *Coal and Energy Development*: Research, development, and demonstration of coal and alternate energy sources, or financial assistance to new electricity generating facilities.

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The Act requires the state to appropriate sufficient funds to pay the interest and principal on bonds from the General Obligation Bond Retirement and Interest (GOBRI) Fund. The GOBRI Fund receives transfers from the Road Fund to pay for Transportation A bonds, from both the School Infrastructure Fund and General Revenue Fund to pay for bonds issued for the School Construction Program, and from the General Revenue Fund to pay for bonds issued for all other purposes. Motor fuel tax is the revenue source for the Road Fund. Cigarette and telecommunication taxes are the revenue source for School Infrastructure Fund. State income taxes are the revenue source for the General Revenue Fund.

Build Illinois programs initiated in 1985 created the Build Illinois Bond, which is a revenue bond pledged by state sales tax revenue. According to the state budget book in Fiscal Year 2005, 2006, and 2007, at the time in which this case study was conducted, Build Illinois bonds are still issued to fund the capital projects that serve infrastructure expansion and economic development purposes. The primary source of repayment on the bond is 3.8 percent allocation of sales tax revenues that are deposited into the Build Illinois Fund (Illinois Capital Budget Book, Fiscal Year 2006 and 2007). The Fiscal Year 2007 Illinois Capital Budget book indicates that in Fiscal Year 2007, the Build Illinois bonds fund the following programs:

- *Infrastructure:* Construction, reconstruction, modernization, and extension of the state infrastructure.
- *Business Development:* Incentives for the location and expansion of businesses in Illinois resulting in increased employment.

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- *Education*: Educational, scientific, technical, and vocational programs and facilities, as well as expansion of health and human services in Illinois.
- *Environment:* Protection, restoration, and conservation of the state's environmental resources.

As explained by an interviewee, the state does not compare cost and benefits to identify how much the proposed capital expenditure should be funded by the pay-as-you-go-method or how much by debt. This is because Illinois' capital financial structure already established program categories as descried above, and these bond fund categories designate what kind of capital projects should fit into each category and how the projects in each category should be funded. In short, these bond categories serve capital planning, financing, and fiscal planning purposes.

Debt Management Practices: For debt level planning, the interviewee explained that the GOMB uses the percent of debt service to general fund receipts to measure the debt obligation ratio. Further, this interviewee added that long-term debt analysis is a common practice in Illinois.

> Long-term debt analysis? Yes, you look long range because you want to keep track. In my days, the longest is 30 years. Why? Your goal is not to have a big jump in debt service. You want to make it (debt service ratio) smooth.

The State of Illinois adopted a statutory debt limit law in FY 2003. PA 93-0839 requires that GO bond debt service in future years not exceed 7 percent of the aggregate appropriations from General Fund and Road Fund for the fiscal year immediately prior to the fiscal year of issuance (CGFA, 2005, 2006). The interviewee noted that the GOMB tries to maintain the debt ratio to be about 4–5 percent as a traditional practice, even

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before PA 93-0839 was enacted. The data from the Committee on Government Forecasting and Accountability—CGFA, (2005) support this statement: from FY 1996 to 2003, the state debt ratio ranged from 4.3 percent to 4.7 percent in 1996 and 2003, respectively. However, the state debt ratio jumped to 6 percent in FY 2004 and is projected to be 6.7 percent in FY 2006. The CGFA uses the outstanding debt data classified into three categories, including pension bonds, general obligation bonds, and state-issued revenue bonds, to show that the increasing amount of debt is due to the pension bond fund rather than capital budget funding (CGFA, 2005). The interview data combined with the evidence from CGFA indicate that career budget analysts in the GOMB office follow both legal and technical rationalities (in the sense that prudent spending will prevent investment inefficiency due to high borrowing cost) in their fiscal planning activities.

For debt disclosure, the Illinois Budget Books in various years indicate that the state complies with PA 89-464 and Rule 15c2-12, which requires that the state conduct full and timely disclosure. The GOMB website, http://www.state.il.us/budget/qfr.asp, indicates that the state communicates its financial status through the GO bond official statement and the state's Quarterly Financial Reports that are available through the Internet and through publications distributed by the GOMB. The information in the Quarterly Financial Reports includes economic outlooks, management discussions, tax assessments, financial position, and revenue and expenditure cash flow.

Illinois adopted a fund balance policy in 1998. According to the Illinois State Treasurer's Office (2006), House Bill 3906 enacted in 1998 established a "rainy day" fund to allow the state to guard against the expense of short-term borrowing and to help

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prevent tax increases. The bill calls for an automatic transfer of money to a special revenue stabilization fund in any fiscal year in which general fund revenues are estimated by the governor to exceed the prior year's general fund revenues by at least 4 percent. The amount of transfer is supposed to be .25 percent of the anticipated general fund revenues. The proposed funds would be capped at $600 million (Illinois State Treasurer's Office, 2006). The media (*U of I News Bureau)* reports that this policy is seen as a good practice by a leading state fiscal expert, J. Fred Giertz, an economist at the University of Illinois Institute of Government and Public Affairs. According to the *U of I News Bureau,* Giertz stated, "The establishment of the rainy day fund has been a goal of fiscal reformers for many years," and he called the approval of the contingency fund "the most noteworthy act by the General Assembly for state budget management" (Reutter, 2000).

Overall, the State of Illinois adopted and is committed to systematic practices in the capital budget process, including long-range fiscal planning, prudent fiscal management, and clear debt policies. These practices are conducted by the state budget bureaucrats who rely on technical expertise in judging and recommending the total capital outlays and debt levels. The senior budget officials (i.e., budget director and deputy directors) base their total outlay recommendation on political and social rationalities, in addition to technical rationality. This can be seen when the budget director informs the Governor that the recommended total outlay can be increased if the Governor is willing to create new revenue streams and thinks that bond authorizations can be received from the General Assembly. Further, interview and government document data (state budget books in various years and CGFA reports in 2005 and 2006)

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indicate that the budget analysts in GOMB use legal rationality by including the statutory debt limit and the Illinois disclosure act in adopting debt management activity.

Prioritization at the state level is less strategically oriented compared to the normative recommendation, in that the state does not express an effort to balance between strategic and maintenance funding. As indicated by the state's prioritization criteria and the interviewees' statements, Illinois focuses on funding maintenance and emergency (life and safety criteria), rather than new construction. The state's incremental funding style (spending levels by program areas are defined by limited revenue growth and previous bond authorization) yields a small amount of new funding, thus confining the state within maintenance and emergency projects, rather than strategic projects.

Project Management

Normative Recommendation. The normative literature (i.e., GPP, 2005; Sermier & Macone, 1993; DuPont & Haris, 1994) recommends that governments should identify a central committee to supervise project construction, monitor project performance, track the use of funds, and report funded project progress to the public and central government.

Expected Benefits. This recommendation is based on the theory that centralized project management increases government accountability, capital program effectiveness, and funding efficiency (Sermier & Macone, 1993).

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Illinois Practices. According to the budget documents and CDB web site, the CDB is responsible for supervising and monitoring construction and budget implementation for state-owned facilities, including prisons, college and university classroom buildings, hospitals, and state parks. The organization tracks and reports the use of funds through the Fund Summary Report, which contains individual projects' accounting information, including project identification, project managers, appropriated funds, released and obligated funds, and expended and unexpended funds. CDB also tracks and reports project construction through the Project Status Report, which contains individual project construction information, including fund summary, project description, construction contract status, and contract amount and payment. The two reports can be accessed by the public through the organization's web site:

http://www.cdb.state.il.us/fiscalinfo.shtml

The Bureau of Construction, which is a division in IDOT, supervises construction and monitors fund usage for transportation projects, along with the district managers. The Bureau manages and pays construction contracts. According to the interviewee, the Bureau and the Office of Planning and Programming coordinate with each other to ensure that both departments agree with the solutions for project construction problems or cost overruns reported by the district managers. As the interviewee from IDOT described it,

> It (project management) is run across divisions in terms of what is going on in the year that construction take place. The districts must report increasing cost and the office (Office of Planning and Programming) would say fine, but you have to trade in with some projects. The district managers manage most of the contracts and design plans, under the supervision of Bureau of Construction. The bureau checks with the office when it reports a cost overrun and discusses solutions.

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For the perceived benefits of the normative practices, an interviewee from ISBE noted that centralized construction management by the CDB helps ensure that school construction meets the state's standard. "The CDB is responsible for school construction and payment.... It is required by Illinois law that the school construction must meet the School Construction Code....This is the CDB's responsibility...it helps school districts detect problems such as poor work qualities."

The interviewee from IDOT noted that centralized supervision and coordination with the Bureau of Construction helps the Office of Planning and Programming keep track of the projects and phase completion. The information is needed for capital planning and MYP preparation in the coming year. "We have a record about what has been done and what hasn't. Information, cost data, construction maps, and fund usage information is matched up with the appropriation plan for the next year."

In short, the people in the capital budget and management process perceived two benefits of the centralized project management: investment effectiveness (by detecting construction problems and assuring that the school construction meets the set standard) and investment effectiveness (by providing the information that helps facilitate capital planning in the next round).

The Government Performance Project—GPP (2005) reports perceptions different from this study's finding. The GPP (2005) reports that, except for IDOT, the state's project management (by the CDB) is weak in detecting project efficiency, cost overruns, and delays, while it is rated only "fair" in tracking and reporting fund usage and quality of work. According to the GPP report card (2006), IDOT is much better than the CDB in terms of detecting cost overruns, project inefficiency, and quality of construction work.

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The GPP (2006) noted that IDOT can correct delays and safety compliance within approximately two to three weeks for poor quality and cost overruns and one to two months for project inefficiency and cost delays.

The two organizations' project management practices are different in terms of internal communication and the frequency of data compilation. That is, while the CDB reports its project management through paperwork, project identification numbers, and cost data, the DOT uses internal and interactive communication between the Office of Planning and Programming and the Bureau of Construction to convey the message about project construction problems and solutions. IDOT also compiles project management information and reports through official documents; however, IDOT officials noted that unofficial communication and face-to-face discussion for solutions are made as soon as problems are detected. The CDB's Fund Summary Report and Project Status Report are updated less frequently, compared to IDOT's internal communication (which can be done more often). This may be one of the reasons why IDOT performance is better than the CDB. The different performance between the two organizations, when combined with the GPP evaluating results, indicates that program effectiveness and funding efficiency can be achieved only when the state government is able to detect and solve problems (i.e., cost overruns, poor work quality, and delays) in program execution as early as possible.

Maintenance

The Normative Practice. Governments should assess the condition of capital stock and tie the information with actual use and future demands.

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The governments should also set aside funds for maintenance purposes.

Expected Benefits. Condition assessment that is conducted on a regular basis is important in order to establish capital planning and CIP based on actual needs. Setting aside funds for maintenance is helpful in avoiding emergency projects, which usually result in higher costs.

Illinois Practices. Every agency studied conducts maintenance planning in parallel with its capital planning and project proposal preparations. As indicated in the capital planning section, IDOT and IDOC use engineering standards to assess facility conditions, while ISBE uses student enrollment numbers, un-housed students, and facility condition. IBHE uses facility age along with the CDB engineering standards for planning. This review is conducted every year; thus, the Illinois condition assessment practice is according to the normative recommendation.

Every year, the state sets aside funds for maintenance purposes in order to reduce emergency needs. An interviewee from the central budget office noted,

> We really worry—can the agencies operate the facilities they are doing? We have a rule or at least attempted to split out the piece of capital funds just for maintenance. We say, look, you need to devote a piece of money for this purpose. There is a purse for this and we devote 10 percent, for example, for repair and renewal. The process says let's do the right thing.

The staff adopts this practice because they perceive that the capital budget and management process has a goal to reduce maintenance needs, and that it is their responsibility to set aside funds for this purpose.

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The interviwees' perceptions of the benefits of the recommended practices are that maintenance information helps the agencies justify their needs and helps top level management understand what the needs are. When asked how the IBHE's 2000 Space Survey helps facilitate the capital budgeting process, the interviewee noted,

> Every time we have good information, it's always helpful for us. For example, when the institutions identify building age, numbers of classrooms, bathrooms, to justify their proposal, I look in the Space Survey to understand what kind of space the universities are talking about.

An interviewee from the ISBE stated, "The School Construction need survey communicates to the General Assembly there is a need out there so that they will approve the bonds." These statements indicate that the benefit of condition assessment is two-fold: First, it supports and facilitates the capital planning process, and second, it justifies project proposals that are sent to top-level management.

The set-aside funds for maintenance purposes help reduce emergency needs, as the interviewee from the IBHE stated,

> Capital renewal dollars are allocated among the universities and community colleges based on institutions' square footage as part of a total. This is our priority for several years. The reason is that every institution can receive benefits from this money in addressing their emergencies. The estimate for the state appropriation for the renewal purpose is conducted by the CDB—it develops the scope of the project for renewal purpose.

The statement implies that IBHE adopts this practice because it perceives that reducing emergency need is a part of the organization's role and responsibility in the capital management process.

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Data from the capital planning section and this section suggest that for Illinois, maintenance planning is an indispensable element of the state agencies' proposal development process. The condition assessment information justifies the agencies' project proposals and communicates the needs to upper level managers and elected officials. The GOMB supports maintenance funding, both in terms of prioritization and setting aside funds for this purpose. For IBHE, the set-aside fund helps relieve the needs for higher education projects, which have to compete with corrections projects at the state level (these two types of facilities are funded by the same bond fund, the Capital Development Fund).

Illinois' experience illustrates two points: First, maintenance funding must be continuously supported by top level management to relieve emergency needs effectively. Second, as indicated by the IBHE case, when the capital renewal fund and regular fund (for programmatic purposes) are separated, the projects that serve different purposes (maintenance versus programmatic purposes) do not compete against each other. This allows the agency to focus on strategic and programmatic planning.

Summary of Illinois' Capital Budget Process

To respond to the first case study inquiry, this section has summarized the Illinois capital budget and management process based on the interview data. The capital budget preparation and formulation process in this state is decentralized in its capital planning and maintenance components, but is more centralized in its budgeting and project management components. Corrections, higher education, school construction, and

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transportation facilities are separately planned. The state does not have statewide long-range capital planning, but rather grants planning and programming responsibilities to the agencies. The interview data suggest that the state does not adopt a statewide CIP because of the GOMB staff view that the state role is to support local governments in deciding their infrastructure environment, rather than interfering with the city governments' decisions on what projects to fund.

The interviewees view the state capital budget process as starting with a technical analysis and ending at the political world. This results in a "tripod budget" in which technical needs, state fiscal capacity, and political needs (including the governor's policy priorities and General Assembly members' requests) are combined. These characteristics, when compared with the normative capital process, indicate that Illinois adopts the normative practices (including objective need assessment, cost estimation and alternative evaluation, prioritization within agencies, long-range fiscal planning, debt affordability analysis, and debt policies), especially by the technical budget analysts at the agency level and central budget office. However, at the top level (i.e., the Governor's Office) political factors strongly influence the process, as suggested by the data that the senior staff in the GOMB try to combine the governor's priorities, technical information, and political needs in their recommendations. Except for the dimension that suggests that the state should have a statewide capital plan, the state executes almost all components recommended by the literature.

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Pattern Coding

This section presents pattern coding to understand 1) the factors associating with the state's non-adoption behaviors of the normative practices, and 2) the perceptions of the state's budgeters regarding the benefits of the normative practices. As concluded in the last section, some normative recommendations are adopted by the Illinois capital budgeting and management staff, while some are not. Thus, this section particularly focuses on analyzing why some practices are adopted and why some are not. The analysis has three major purposes: 1) to help build a state capital budget and management theory that explains why the normative processes are not fully adopted; 2) to determine if the MRB's assumption is evident for Illinois, namely, do the budget analysts who stand at the "vortex" use multiple rationalities including social, political, legal, economic, and technical rationales in policy recommendations; and 3) to extend the MRB by explaining what factors relates to the use of multiple rationales in a state's capital process.

In MRB, Thurmaier and Willoughby (2001a) explain that the budget analysts who stand at the "vortex" see both organizational and technical factors. They use their personal backgrounds, including their understanding of the budget process, understanding of the budgetary cues, relationships with other players, and governmental priorities to interpret organizational and technical cues to formulate decision strategies. The formulated decision strategy is a combination of the five types of rationalities used to recommend policy alternatives to the macro-budget process when the "window of opportunity" opens. Since the multiple rationalities are used, policy recommendations are technically feasible and politically possible.

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For the analysis, Miles and Huberman (1994) suggest that if the researcher is looking for the causes and effects, he or she can start with a "dynamic" issue, which is the factor pushing or demanding another factor. In this study, the factors that may associate with non-adoption behaviors of the strategic capital practices by Illinois budgeters are specified according to the MRB theory: the personal factors including understanding of the state capital process, understanding of the state capital budget goal, and understanding of the state budgetary cues.

However, it may be inappropriate to conclude that these factors are the causes of the adoption or non-adoption behaviors since the perceptions and understandings of the state budgeters regarding the state capital budget process may also be influenced by the state budgeters' capital budget practices. In other words, there may be a two-way relationship between the state budgeters' frames of references and their capital budget practices (both strategic and non-strategic practices). For example, a state's budgeters may not adopt long-range capital planning because they perceive the state's political process dominating the decision-making at the top management level; and thus, long range capital planning may hinder political processes. At the same time, the situation of not having statewide CIP makes the state budgeters view the state's macro-budget policy process as less technical and more political. This situation could happen since human beings tend to use the most updated information they receive to revise their frames of references, while at the same time, they use the updated frames of references to judge the new information they receive. For these reasons, it may be appropriate to refer to the factors that are associated with the non-adoption behaviors as "a factor that is related to non adoption practice", rather than the "causes of the non-adoption behaviors".

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Based on the MRB theory, the personal factors including understanding of the state capital process, understanding of the state capital budget goal, and understanding of the state budgetary cues relate to another factor, the multi-rationalities used in deciding policy within each practice. Another relating factor, the self-role perception (professionally related) of the career budget analysts and the agency's role perception (organization's mission and responsibility), emerged during data collection and analysis; thus, these factors are included as the additional independent factors.

Thurmaier and Willoughby (2001a) call these factors "personal factors" and state that they affect policy recommendations of the state budget analysts through decision-making strategies influenced by these personal factors. Thus, for this study's context, the effects of the identified personal factors are a combination of rationalities used by the budget staff to decide infrastructure policy within each practice.

For example, in an agency's prioritization process, if the interviewee stated that he or she prioritizes projects based on the merits of the projects, then this person uses economic rationality. Using projects' merits as a decision tool in project ranking is considered complying with economic principles even though the agency's criteria are not economically oriented. In such situations, the interviewee still adheres to economic principles, as long as the prioritization decision is made to fulfill prioritization criteria previously defined by policy participants. This is because the clearly defined criteria reflect investment priorities of the agency, which in turn, are regarded as most important to that agency and are expected to yield benefits that are "most wanted" by the agency. Economic rationality means that the dollar invested into the most wanted projects yields the maximum benefits to the investors, relative to being invested into the least wanted

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projects. Even though the benefits may be viewed by people outside of the agency that as not being economically based, if the dollars invested into the projects that are important and most wanted in the agency's frame of reference, the dollars invested in that project are considered economically worthwhile (that is, the utility of the money spent as perceived by the spender).

If the same interviewee did not state other rationalities he or she uses in prioritization process, then it is tentatively assumed that the person did not focus on those rationalities (at least as the first thing he or she could think of in the interview session). Then, to identify the personal factor that governs the interviewee's rationalities for his or her prioritization activity, the researcher looked at the pushing factors, such as self-role perception that usually influence the person' decision-making.

The condition or the control variable for the relationship between personal factors and the rationality combination is the position of the budgeters: Whether the interviewee stands at the "vortex" (central budget office) versus standing far away from the "vortex" (state agency level). If the interviewees stand at the vortex, they will be able to see organizational and technical factors, including the political processes and state fiscal capacity, respectively. This control variable indicates "what the interviewee sees" and moderates the interviewee's interpretation of the budget process.

According to Miles and Huberman (1994), when causes and effects are in rows of the matrix, the analysis by rows in the matrix identifies patterns of the relationship between causes and effects. To find support for the pattern, Miles and Huberman (1994) suggest that the researcher look at the field note and use an "if-then" logic to test whether differences among cases fit the patterns.

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Table 25 presents the case dynamics matrix suggested by Mile and Huberman. As shown in the table, each row represents the case (or the interviewee), while columns represent the dynamic factors in the micro-budget process. The first column represents a part of the statement by the interviewees when asked why they conduct budget practices the way they do.

The second column represents the characteristics of the statements in column one as judged by the researcher: Understandings about capital process and goal, understanding about budgetary cues, technical profession, and agency's role perception.

The third column presents the practices the interviewee follows in the budget process. Letters in parentheses represent five rationalities: social rationalities (S), political rationality (P), legal rationality (L), economic rationality (E), and technical rationality (T). The letters show what rationalities the budgeters used in adopting and committing to the specific practice. The rationalities assigned to each practice are judged by the researcher based on the definition of each of these rationalities given by Thurmaier and Willoughby (2001b). To recapitulate, each rationality is briefly defined and operationalized as follows:

- *Social rationality:* an effort to reach social harmony or agreement. Government priorities or governor's campaigns are considered as social harmony since it is the social contract between the voters and the governor.
- *Political rationality*: an effort to reach agreement by negotiating and bargaining. Political processes in legislative session, vote trading, and political projects are considered as political rationality.

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TABLE 25

Case Dynamics Matrix: Illinois Capital Budget Process

THE ADOPTED NORMATIVE PRACTICES				
Case	Personal Viewpoints	Underlying factors (as seen by researcher)	Adopted Process (Rationality Type)	Normative Practice's Perceived Benefits
Case 1 (GOMB)	"Vote trading is important to the Governor and legislators"; It's our principle to assure we don't have a debt overload"; "(Budget is) Technical work in a political environment"	Professional Role , Understanding of the Process, Understanding of Budget Cues	Long-term fiscal planning (strong T, S, P), Debt analysis (strong T), Statutory Debt limit (L), Total outlay recommendation (T,P, S), Incremental program finance (S, P), Prioritization (P)	Good Financial Management, Preserve Bond Rating (Efficiency)
Case 2 (GOMB)	"Technocratic work at the base, politics on the top"; "Pet projects are a part of our capital process"; "Political support for bonds is the rule"	Understanding of the Process, Understanding of Budgetary cues	Prioritization (P, S,E), Total outlay recommendation (P,S, T), Debt Management (T,L), Capital Planning (E, T, P, S)	Establish Foundation for Capital Plan (Effectiveness)
Case 3 (IDOT)	"Think of it as a Tripod Budget!"	Understanding of Capital Process and Goal	Need Assessment (E-strong), Cost Estimate (T-strong), Prioritization (P,E, S)	Not Found
Case 4 (IDOT)	"Technical experts don't fight with Political experts"; "Realizing that governing is a part of General Assembly"	Organization's Role Perception, Understanding of Process, Professional Role	Prioritization (P,E,S)	Establish Foundation for Capital Plan (Effectiveness)
Case 6 (GOMB)	"Make sure what's really need"	Professional Role	State Prioritization (T-Strong, S)	Needs Justification (Efficiency)
Case 7 (IBHE)	"Our decision is important to them"; "We follow Illinois Commitment and Master Plan"	Professional Role, Agency's mission	Agency Prioritization (E, S)	Needs Justification (Efficiency)
Case 8 (ISBE)	"Do things according to the Constitution!"	Professional Role, Agency's mission	Prioritization (T, L Strong)	Not Found
Case 9 (IDOC)	"Engineering standard justifies our needs"; "We need it for our mission."	Professional Role, Agency's mission	Need Assessment (E), Cost Estimate (T)	Needs Justification (Efficiency)
THE NON-ADOPTED NORMATIVE PRACTICES				
Case	Personal Viewpoints	Underlying factors (as seen by researcher)	Non- Adopted Process (Rationality Type)	Non-adoption's Perceived Benefits
GOMB 1	"State is only a middle man. " "We choose to support them, not telling them what to do." That's not our (GOMB) job!"	Understanding of the State Process, Organization's Role Perception	Statewide CIP	Not applicable
GOMB2	"Nobody thinks that way!" "Maintenance is the state's role"	Understanding about the process and goal.	Economic Development Planning	Politically and Technically Feasible
DOT 2	"Annual capital program is for maintenance!"	Understanding about the Process and Goal.	Economic Development Planning	Not applicable
DOT 1	"Our agendas may be different than their agendas"	Organization's Role Perception	Tying capital budget with strategic planning	Politically Possible
CDB	"Can't assign the dollar values into project benefits"	Impracticable Practice	Cost-Benefit Analysis in Prioritization and Alternative Evaluation	Technically feasible
IBHE	"Project may be both life and safety and programmatic" "use holistic approach"	Impracticable Practice	Assigning numeric score to capital projects' merits by each criterion	Technically feasible

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- *Legal rationality:* a code that establishes social ends and enforces fundamental rules to govern actions, rights, and responsibilities of members. Statutory debt limit and laws are classified as legal rationality.
- *Economic rationality*: an effort to make benefits exceed cost in program spending. Prioritization and capital planning including strategic investment planning and need assessment is classified as a practice based on economic rationality. This is because these practices are to locate capital resources where needs are the greatest and thus benefits received by locating X dollars in the needed projects are higher than the less-needed projects.
- *Technical rationality:* an effort to decrease cost per unit. Capital budget, including long-range revenue and expenditure forecast, debt affordability analysis, debt management policy, and cost estimates and alternative evaluations in the capital planning component are considered a practice based on the technical efficiency effort. The capital budget component is to improve or preserve a state's financial status so that the credit rating is high and borrowing cost is low, hence making investment's cost as low as possible.

The last column represents benefits perceived by the interviewees when they mentioned the practice they adopt (or do not adopt). To avoid intervention by the interviewees, the direct question such as "what are the benefits you perceive from doing this practice?" was not initiated unless the interviewee mentioned some words or phrases that suggested their perception about benefits of the practice first.

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After rows in the matrix were compared and contrasted and the field notes were consulted, the following themes were found:

1) When budget analysts use more than two rationalities ("multi" means more than two), understanding of the process, agency's role perception, and understanding of budgetary cues, as well as profession role, appear to be the antecedents. In contrast, when budget analysts use less or equal to two rationalities, professional role appears to be the only antecedent. This pattern is obvious when considering the same activity, such as prioritization, that is conducted by two different budgets at different levels. The differences between the two groups are that while the first group is at the "vortex," the latter is far away from the "vortex."

2) Not only understanding of the process and budgetary cues, but self-role and the agency's role perception also appear to be factors influencing the types of rationalities (or the decision tools) used by capital budgeters at both agency and state levels. In addition, the agency's role perception appears to be a significant factor explaining why the normative policy (CIP) is not adopted.

3) While interviewees perceived the benefits of the normative practices as efficiency and effectiveness, they also perceived the benefits of not adopting some normative practices as "technically feasible" and "politically possible." This suggests that some normative practices are not adopted because it is not "feasible," in terms of political agreement, federalism, and technical implementation.

The following text elaborates how these themes were developed.

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According to table 6-1, rows 1, 2, 3, and 4 represent the cases of the budget bureaucrats who stand at the "vortex." By the word "vortex," Thurmaier and Willoughby (2001a) mean that when these budgeters stand at the vortex, they are at the nexus between macro-and micro-policy processes; thus, they are well placed to monitor the various decision streams in the policy and budget process. "With one eye on the policy process and one eye on the budget process, they evaluate how various solutions fit with the prevailing flow of decisions and preferences of the chief executive" (Thurmaier and Willoughby, 2001a, p. 47).

As indicated by the organization title, cases 1 and 2 are the senior budget staffs in the GOMB who works closely with the governor, while cases 3 and 4 are management-level staffs who direct planning and programming by closely coordinating with the fiscal departments in IDOT and the IDOT secretary. As mentioned in the previous section, IDOT is independent from the state budget process in terms of having its own capital planning and financing decision process, and being exposed to General Assembly recommendations without having the GOMB lie in the middle. From this perspective, the senior staffs at IDOT are also placed in the "vortex," where they are exposed to both macro- and micro-policy processes. As one interviewee from the GOMB described, "They (IDOT) control their own process without lots of input from BOB (re: GOMB). We are concerned only with the total bond sales and indebtedness. They are an expert in that area (re: transportation)." Another interviewee said,

> We understand our fiscal capacity; we have to be concerned with our financial status and live with it. Then we have some projects that already have political support—we understand them. No project should be viewed as a bad project. And we have technical works here to be concerned with.

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Case 5 is the GOMB budget analyst who does not work closely with the governor (was not in the Governor's Office in decision-making meetings). As presented in row 5, this person prioritizes projects by stating that he or she uses "project merit" and "state priorities," which are considered as technical rationality and social rationality, respectively.

As shown in the table, cases 5 through 8 are the people who are placed far away from the vortex. Except for case 5, cases 6 through 8 work in the state agency where policy priorities and fiscal capacity information are transferred from the GOMB office through the agency directors. These staffs received the fiscal information, governor's priories, and some perceived legislators' needs (as stated by the IBHE interviewee), but since they are not at the nexus, they focus on their agencies' missions and technical professional roles, rather than such issues as "how policy alternatives can be chosen," which is focused at the macro-level. Thus, "being far away from the vortex" means either physically or mentally or both, as illustrated in case 5 (mentally) and 6–8 (physically).

When asked about the activities of the state capital process, people who stand at the vortex mentioned some factors, including understanding of the state capital process, understanding of the budgetary cues, and the agency's role perception, as well as technical professional role (as in cases 1 and 4). The following are the examples of these people's perceptions when asked about the practices the state adopts (without a leading question asking, "Why do they conduct the practice in the way they are doing?").

Legislature initiative, pet projects; it's a part of our capital process.

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The vast majority of the budget is worked out at the technical level, but the top piece is where political issues violate this stuff. You have to involve or the big parameter won't go as he (the governor) decides. The budget analysts asked him, you want education or not? It (re: vote trading) depends on how much the governor wants his policy campaign done.

It (bond issues) depends on the leadership within OMB and politics—who gets the contract, who is the underwriter, and what's the profit?

Whenever you need bond authorization, it requires a three-fifths vote. You need people (re: legislature) working together. You need to know how they can relate to authorization and this is the rule of the process.

It (re: vote trading) is very important to legislators and the governor because this is how he can do things that may be nothing to do with the budget.

It is our job to make sure that it (re: capital program) was affordable right away and it was affordable in the long run" (stated by case 1).

In general, agencies work on the technocratic side, but the budget itself is a very political document and is decided under a very political environment.

When it comes to decision, the governor and legislative leaders may have different agendas than we have. We don't argue with them, realizing that governing is their job.

We view ourselves as a technical expert and the political experts tell us what to do. Their needs are not necessary bad projects. They know what local people want. This is how we (re: IDOT) do things" (stated by case 4).

Think of it (capital budget) as a three-legged stool or tripod. You have financial decisions, political decisions, and technical decisions. These things go together as it is being discussed and decided upon. This is what happens here (re: IDOT).

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As illustrated by the above quotations and the table, the people at the vortex see macro-policy processes—they have an insight into how policy can be enacted, an understanding about what is the process of capital budget and its environment, and interpretation of state budgetary cues in terms of what to do to reach agreement between the legislative and executive branches. Some people, especially case 1 and case 4, express strong technical professional roles; however, they, at the same time, express the understanding about the state budget process, such as "This (Re: vote trading) is a part of the process." As column 4 illustrates, and according to the interview evidence, in addition to technical and economic rationalities, these people use political and social rationalities intensively in recommending policies to the governor.

In contrast to the vortex group, the people who are not at the nexus between macro- and micro-policy processes did not mention understanding of the state capital process or budgetary cues, although they share common understandings about their professional roles, with case 1 and case 4 in the vortex group. When talking about the activities they are doing, these people mentioned only their professional role perceptions and agencies' mission. The following are examples of what they stated:

> We realize that our prioritization is important to the (higher education) institutions because it determines who will be funded next year. The decision (about ranking) is made in the meeting room so that no one person does it alone. We follow our prioritization criteria in the Master Plan.

> We use what we call the living list. If the projects are not funded this year, we keep recommending until they get funded, unless the institution's priorities change, which means that the projects are not their needs.

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> Illinois Commitment provides principles and guidelines, and this is our policy framework for Illinois higher education. We make sure that the project recommended supports Illinois Commitment.

> Everything we have been doing here is according to the Constitution. We don't do things other than what Constitution tells us to do.

> If the projects are not funded, we talk with them (the GOMB). We bring the engineer to explain why we need the projects. If it is not funded, we keep recommending. We need the project to support our department missions.

As illustrated by these examples, people in this group use understanding about their agencies' missions and professional roles in implementing the practices shown in column 4 of the table. Interview data suggest that the tools these people use in their decision-making process include technical needs assessment information (IBHE, ISBE, IDOC), written policy priorities (IBHE), and priority index figures (ISBE).

The last six rows of the table indicate why some normative practices are not adopted. As shown in column 4, the practices that are not adopted include statewide CIP, master planning or economic development planning, cost benefit analysis, and prioritization based on numeric score (by IBHE). In general, the interviewees say that these practices are not a part of the state capital process, are not a part of their agency's roles, and are impracticable. The following are quotations from the interviewees:

> Highways are funded by the federal government—the state doesn't involve much. The next things (re: school, parks, and roads) is mainly decided by local governments (re: city governments). We choose to support them (local governments), rather than telling them what to do. That's why we don't have a CIP. It is federal and local governments—state government is a just a middle man.

> How do you know when the Mitsubishi plant will come?

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> Nobody thinks that way (re: economic development planning in capital budget).

> We have another capital program for economic development purpose. It is called a multi-year capital program. Our annual program does focus on maintenance, on economic development. Our first priority in the annual program is always maintenance.
>
> Long-term capital planning may not work—the government agenda changes from year to year.

> Some project benefits can't be quantified into a dollar value.

> Many projects are life and safety, but at the same time they are programmatic related. How can scores be assigned? We use a holistic approach, but life and safety is always our top priority.

As illustrated by these quotations, the interviewees see that state capital budgeting's goal is not for economic development, and that the state government should not interfere with the city governments. These are the reasons that the state does not have a statewide CIP. These reasons can be characterized as an understanding about the state's capital budget goals and the roles of state government. For cost-benefit analysis, the interviewee from CDB views that assigning a numeric dollar value to a project's benefit is not technically feasible. Meanwhile, the interviewee from IBHE views that assigning numeric scores to ranking criteria is impracticable.

Column 5 of Table 25 displayed benefits of the normative practice as perceived by the interviewees. As already elaborated in the capital practice section, the normative practices promote investment efficiency (least cost at the given benefits) and effectiveness (accomplishing spending goal). These perceptions are expressed not only by the interviewees at the vortex, but also by the interviewees who implement technical

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work and stand far away from the vortex: "Political people rely on technical work." When the benefits of committing and not committing to the normative practice are analyzed (by comparing the top eight rows with the bottom six rows of the last column), the reasons for not adopting normative practices emerged. While the adopted normative practice promotes efficiency and effectiveness, not adopting the normative practice makes the capital budget process more feasible both in terms of political agreement, federalism, and technical implementation.

Conclusions and Implications

This chapter has three main purposes: 1) to obtain an insight into Illinois capital budget and management process, 2) to provide supplementary explanation for the empirical results on the questions, "how are the normative practices beneficial to capital decision-making and spending policy output?", and 3) to assist in the building of a theory of the state capital budget process. The chapter uses one single-case study approach to respond the three questions.

For the first inquiry, the study found that in Illinois, capital planning and maintenance components are decentralized to the agency level, while budgeting and project management are centralized by the central budget office and CDB, respectively. For capital planning, except for the CIP, the state practices are consistent with the normative recommendations including objective needs assessment, adoption cost estimates, and utilization of clear prioritization criteria at the agency level. Illinois capital budgeting is close to the normative recommendation in that the state adopts long-

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term financial planning, debt affordability analysis, and clear debt management policies. However, for these two components, the technical recommendations by the career-budget bureaucrats may be changed at the top-level decision making, depending on the political process and the Governor's agendas.

Illinois' project management is consistent with the normative recommendation in that the activity is implemented by one organization CDB and IDOT (for transportation projects) for statewide construction. Data indicate that the quality of project management not only depends on centralized monitoring, but also on the quality of communication and the degree of coordination between the planning and the construction offices. If the two practices are committed as the IDOT does, delays, cost overrun, and poor work quality tend to be detected and solved as early as possible. Finally, Illinois maintenance is close to the normative recommendation in that agencies conduct condition assessment regularly and set aside funds for maintenance purpose. The state does not adopt the following normative practices: A statewide CIP, statewide comprehensive planning for economic development purpose and cost-benefit analysis for project alternative evaluation.

For the second inquiry, the interview data suggest that the capital planning, maintenance, and project management components promote investment efficiency in that when the resources are allocated where needs are the most, the benefits of the investment dollars can be identified by the interviewees, especially at the agency level. Next, the capital planning component promotes investment effectiveness in that it makes capital spending (which is the part that is not changed by the political process) more targeted, and thus, the investment decisions help relieve emergency needs (which is the goal of

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Illinois capital process). Finally, the interviewees perceived that their activities in long-term fiscal planning and debt management policy yields positive results by preserving their credit ratings to issue the large amount of bonds at the least cost.

For the third inquiry, data and analysis suggest that the MRB theory is applicable for Illinois capital budget and management processes. That is, the state capital budget has the macro- and micro-processes. The two processes are connected by the budgeters who stand at the vortex. Since these people are in the place where they can see both macro-and micro-policy processes, they use political and social rationalities in policy recommendations, in addition to legal, technical, and economic rationalities. The study results extend the MRB theory by specifically explaining what kinds of personal factors the budget analysts use in interpreting what they discern about the policy process. For those who stand at the nexus, understanding of the state capital policy processes and goals seem to be the main factors influencing them to use multiple rationalities (more than two and the additional rationalities are political and social ones). For those who are not at the nexus, professional role perceptions and understanding of their own agency's missions seem to be the main factors influencing them to intensively use technical and economic rationality in policy recommendation.

Finally the study results tend to suggest the reason that explains why some normative recommendations are not adopted by state governments. For Illinois, the normative practices, including CIP and economic development planning, are viewed as irrelevant practices. The state views that it is not the state's mission, instead it is federal and city governments' choices— the U.S. federal structure. Further, in the views of the senior-staffs at the central budget office, the CIP hinders the political process which is

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highly valued in the State of Illinois. This is because the CIP makes the decision-makers focus on the end goal (namely future benefits), rather than the means (namely negotiating, bargaining, and compromising). Strategic planning is viewed as impracticable since government agendas including those of the Governor and the legislature change frequently.

There are three theoretical and practical implications for this study. First, unlike macro-policy-budget processes where the policy actors' coupling behavior (for problems and solutions) is driven by political motivations such as re-election, in micro-budget policy processes, the same behavior by the budgeters at the nexus tends to be driven by mission accomplishment motivations (i.e., try to compromise with different groups to get a budget bill enacted). Second, since the budget bureaucrats who stand at the nexus or vortex perceive the whole picture about the state fiscal capacity, political and policy processes, and the importance of technocratic work, these people tend to use multiple rationalities, relative to those who stand far away from the vortex. Finally, in practical terms, long-term capital planning is implausible if the state government officials perceive that it is not their role and that freedom of city governments is valued.

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CHAPTER 7 CONCLUSION

This chapter presents the conclusion of the dissertation. The first section presents the dissertation's central thesis, theoretical assumptions, analytical approaches, and findings. The second section contains the overall findings of the study, drawn from both the empirical analysis and Illinois case study. Its aim is to provide explanations that correspond with the dissertation's central questions. The third section presents the study's contributions for both theory and practice. Finally, the last section discusses the study's limitations and future research issues.

Study Summary

This dissertation has three main purposes: 1) to understand the impact of the strategic capital budget and management process on state economic growth; 2) to explain how the strategic capital process, which is considered centralized and systematic, can be executed in a state government institution where policy process is fragmented; and 3) to use the state budgeters' experience to explain why the strategic capital practices lead to better infrastructure investment decisions.

The normative literature, including capital budget textbooks (i.e., Mikesell, 1999; Lee et al., 2004; Stiess & Nwagwu, 2001; Vogt, 2004), encyclopedia (Beckett-Camarata, 2003b), and a budgeting officers' association (NASBO, 1999, 1997), recommends a systematic capital budget and management process. Using the Government Performance Project—GPP's (1999, 2001) and Ammar et al.'s (2001) frameworks, the process

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comprises four main components: capital planning, long-range capital budgeting, project management, and maintenance. Capital planning involves establishing a long-term capital improvement program (CIP), which is a list of projects or acquisitions that a community is going to need within the next five- or six-year period, an appropriation plan for the projects and acquisitions, funding sources for the expenditures that will be incurred, and the impacts of the projects and acquisitions on the operating budget. Ideally, the CIP should be based on the community's strategic planning and comprehensive planning (i.e., land use, growth management objectives) to support the community's economic development policy.

The capital budget involves financial and debt management practices, including long-term fiscal planning, debt affordability analysis, and establishing clear debt policy. Project management involves centralized monitoring for project construction and fund usage to detect cost overruns, delays, and poor work quality as early as possible. Finally, maintenance involves setting aside funds for maintenance purposes to reduce emergency needs and regular condition assessment to compare the current condition with actual and future usage.

Using the framework to view the capital budget and management process recommended by the normative literature, the process is characterized as strategic and centralized. Based on the public strategic management model, the normative process is futuristic-oriented, analysis-based, and systematic—the process has a goal of generating informed choices to yield better investment decisions in terms of spending level, resource distribution, and optimal balance between consumption and investment expenditures. The four capital components are considered as a holistic management approach, in which

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all managerial activities—including results-oriented management, external goal management, program goal and service management, internal program management, and internal relations management—are necessary practices. The holistic approach is intended to create effective output, which, in turn, will combine with other socio-economic factors to generate a desired outcome. The process is a means-to-an-end, that is, it first sets a goal and then uses a systematic and holistic management approach as an avenue to achieve the goal. The process does not directly create a desired outcome but creates effective outputs that can affect other factors outside of the program to generate the desired outcome.

Based on a budgetary institution framework, the normative capital process is considered as a centralized management approach in which capital planning, fiscal planning, and debt management policies (e.g., statutory debt limit) encourage the decision makers to internalize the aggregate social cost into their accounts to make decisions for capital investment. When the decision makers commit to statewide capital planning and a community's financial capacity, the aggregated government investment tends to be efficient, effective, and prudent.

Since the normative capital budget and management processes focus on promoting efficient, effective, and prudent investment, the better public infrastructure system, which is the output of the process, will positively alter a community's production function, which in turn will enhance economic growth. The central thesis for this dissertation is that the state's strategic capital budget and management process indirectly enhances economic growth through a channel of better state capital spending. The dissertation's purpose is to provide empirical evidence for the tangible benefits of the

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systematic practices. The evidence may be beneficial in justifying the normative recommendations: Why governments have to adopt the systematic process and what would be the tangible benefits of committing to the process.

The empirical analysis, time-series and cross sectional study, was used to test the central assumption, while the single-case study was used to provide a supplementary explanation: In what ways do normative practices lead to better investment policy? The explanation derived from the second study is based on the State of Illinois's budgeting staffs' attitudes and perceptions toward the advantages and disadvantages of the normative practices, rather than on the countrywide survey results. This approach was selected based on the reasoning that the context of a state budget environment should be considered, along with the perceived benefits, in order to understand how the normative practices are effective in the real government setting.

Empirical results indicate that the increase in the ratio of capital spending to state output is statistically significant in a model of state economic growth (an estimated coefficient b of .05), as measured by growth in per capita gross state product (GSP) . In the same model, the cross product term capital management process (measured by the dummy variable high and low performance) and capital spending rate is statistically significant (an estimated coefficient b of .05). The capital spending variable in the model indicates that a percentage change in state capital spending to state output is associated with a .05 percent increase in per capita state output within a three-year cycle. The cross product term in the model indicates that a percentage change in capital spending with a highly systematic capital management practice is associated with a .05 percent increase in per capita state output within a three-year cycle. These results suggest that a highly

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systematic capital management process indirectly enhances state economic output through capital spending. In other words, the state capital spending would be more productive if it is decided by the strategic process. Thus, for states with a highly systematic capital process, the one percent increase in capital investment will result in .10 percent (.05 capital spending + .05 cross product term capital spending and capital management programs) change in economic output within the three-year cycle.

Note that the magnitude of the effect of public investment is small. The findings that state public investment has small but significant effects on growth are consistent with recent growth studies including those of Holtz-Eakin and Schwartz (1995). In Holtz-Eakin and Schwartz's (1995) analysis, individual state fixed effects and autocorrelations in time series data are held constant; and as a result, the regression results indicate that public investment is significant, but state unique characteristics and autocorrelations in the testing data have much larger effect on state growth than public investment. The present study finds the similar results—that is, while state fiscal policies are significant, their effects are much smaller than autocorrelations in the study's time series data.

Nevertheless, the effects of public investment and investment practices may not be negligible; given that, for every dollar invested in public infrastructure, if the states invest with a strategic management practices, the states may experience GSP growth one time higher than investment with the low systematic practices using the same dollar. Since the state governments are responsible for investing in its infrastructure, strategic capital management may be an alternative for the states to maximize the benefits of the dollars spent in their investment. The moderate increase in output due to the better infrastructure management can be used as a cushion in bad economic times. Further, the

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moderate increase in per capita output per year may mean a better living standard for low income people in both good and bad times.

The case study results indicate that Illinois's capital budget and management process is more decentralized in capital planning and maintenance compared to the normative recommendation, while being centralized in capital budget as recommended by the normative literature. Illinois does not have statewide long-range capital planning or CIP. The studied agencies (IDOT, ISBE, IDOC, and IBHE) conduct technical needs assessment, cost estimation and alternative evaluation, and project prioritization based on clear prioritization criteria. However, except for IDOT, none of these agencies have a CIP. Further, in practice, the interviewees from IDOT noted that the agency does not precisely follow the plan since the top management's agendas (governor's and General Assembly's priorities) change from year to year.

In IBHE, IDOC, and IDOT, project identification for out-years is based on the "living list," which contains the list of projects that were recommended in the last year but were not selected to be funded by the central budget office and General Assembly. The term "living list," designated by the IBHE, is a written criterion for its prioritization; however, this term and its concept are applicable for IDOC and IDOT. There are two reasons that these agencies do not have CIP: 1) the agencies lack top management support in terms of following the plan; and 2) there are not enough funds for the projects recommended.

The state's central budget office conducts technical fiscal planning, including long-range revenue and expenditure forecasts, debt affordability analysis, and establishing and committing to clear debt management policies (debt disclosure, statutory

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debt limit, rainy-day fund policies). However, according to the Government Performance Project (2001) criteria, long-range fiscal planning that is not matched with long-range capital planning does not help the states to target their investment better. This notion is true for Illinois in that although the state is strong in fiscal management, its investment decisions at the state level are not strategically planned due to the lack of long-range capital planning. For prioritization processes, the interviewees, who are central budget office and CDB analysts, stated that they compare the projects' merits against the project selection criteria, although they do not apply cost-benefit analyses for all projects. These practices are considered strongly systematic relative to the normative recommendations. However, the results of these activities, including total outlay recommendations and the rank of the projects for funding, may be changed in the Governor's Office due to politics and the governor's campaign promises.

The state's project management is considered systematic relative to the normative recommendation. The CDB is responsible for monitoring, evaluating, and supervising project construction for state-owned facilities throughout the state, while the Bureau of Construction in IDOT is responsible for the same activities for transportation projects statewide. Compared to IDOT, CDB performance has been less effective since it communicates project implementation information to the planning agencies less frequently than IDOT, and thus it is not able to solve the problems about cost-overruns and poor quality construction work as quickly as IDOT.

The state's maintenance is close to the normative recommendation in that the state sets aside funds for maintenance, as stated by the interviewees from the central management office. Illinois state agencies conduct infrastructure condition inspections

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annually. However, the activity does not serve the purpose of establishing long-range capital planning; instead it serves the purpose of helping the state agencies to recommend projects on *a yearly basis*. Such a practice makes the state's investment style respond to urgent needs rather than long-term planning. Some agencies including ISBE, IBHE, and IDOT compile capital stock information on a regular basis and publish maintenance information which can be useful for central planning at the state level. In Illinois this activity is decentralized to the agencies, instead of centralized by the state organization; thus, some agencies, such as IDOC, do not have written information for its maintenance needs. The state does not have statewide maintenance needs information. According to Government Performance Project's (2001) criteria, such information is necessary for long-term capital planning.

In general, the whole process is characterized as technical-oriented at the agency level (both state agencies and central budget office), but is more politically-oriented at the top management level (within the Governor's Office for prioritization and total capital outlay decisions). This observation is supported by the interviewees: "Capital budget is technical at the base and political at the top."

Overall, the interview results suggest that the state's budgeters at the agency level perceive the benefits of the normative practices (capital planning, project management, and maintenance) in terms of promoting efficiency (i.e., locate projects, where needs are the greatest) and effectiveness (capital projects help the agencies fulfill their public service missions and activities) for capital program spending. Meanwhile, the state's senior staffs perceive the benefit of a technical capital budget (fiscal planning, debt affordability analysis, and debt policies) in that it helps the state invest in a prudent

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manner so that the state is not locked into an unfavorable cash flow due to debt overload. As one interviewee stated,

> We are careful and innovative in our debt issuing—we say, yes we are so poor in cash because we didn't borrow much, so give us a good credit; we know we will be able to pay. Then they (credit rating agencies) gave us good credits.

However, the interviewees discern not only the advantages of the normative practices, but also its disadvantages, especially for the senior staff in the central budget office. The state's senior staff members discern some disadvantages of the normative practice, namely the CIP; that is, the practice does not fit the state's budget environment where political decisions are important and highly valued and where the freedom of local governments to choose what and how to invest should be supported. Further, the CIP and comprehensive planning for economic development purpose are viewed by the senior staff as impracticable both in terms of political and technical processes.

Finally, the emerging theme from the case study suggests that the senior budgeting staff that stands at the "vortex" tends to weigh multiple rationalities (social, political, legal, technical, and economic) in deciding what policies and practices should be adopted to recommend the capital budget to the governor and General Assembly. Unlike the senior budgeting staff, the budget analysts at the agency level, including IDOC and IBHE, tend to focus more on technical and economic rationales (or legal rationale in ISBE's case) than political and social rationales. (Although the IBHE interviewee was aware of the governor's priorities and politics, he or she did not accentuate these rationalities in his or her prioritization). These data suggest that the place where these staff members stand is important to the number of rationalities, since the

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place designates what these budgeters see, which in turn is combined with their personal backgrounds to interpret what they see.

The above observation is heavily supported by the comparison between the interviewees from IDOT and those from the other three agencies about what they see and how they interpret what they see. Since IDOT is responsible for its own capital funding and financial management, and since it receives the requests directly from General Assembly in the preparation stage, IDOT staffs see the capital budgeting process more broadly than those from ISBE, IDOC, and IDOC. Simply put, IDOT interviewees understand that political decisions are highly valued in this state and that political needs must be supported to reach political consensus to enact a budget bill.

For the three agencies, the central budget office acts as the middle person in carrying the technical needs, program priorities, and political needs back and forth between the two levels. This makes the interviewees from these agencies limited to only the micro-policy process, where accomplishing the agencies' missions is viewed as the state capital budget goal. The theme is more salient when it is considered that the interviewees from IDOT and those who are senior staff from the central budget office do the same thing—weighing multiple rationalities in recommending a capital budget. Thus, those who stand at the "vortex," where they are involved in both macro-policy processes (i.e., in the Governor's Office or legislative session) and micro-policy processes (i.e., in the central state agencies, including IDOT and GOMB where the budgeters are responsible for state funding capacity) and are the nexus of the two processes, see that capital bill enactment, political agreement, and the governor's campaigns are the goals of

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the state capital budget process, as much as the technical needs, fiscal capacity, and state agencies' mission to accomplish.

The interview evidence suggest that the interviewees in Illinois use their understanding about the state capital budget process and goals, their agency's role or mission perception, and self-role perception, such as professional responsibilities, to decide what rationalities they should use in capital budget recommendation. Data suggest that the interviewees combine what they see (i.e., organizational structures and traditional practices) with their personal background to reach conclusions about the state capital budget process and goals, their appropriate roles in the process, and to decide what normative practices "fit" their perception about the state capital budget. The normative practices that fit their perception will be adopted, while the ones that do not fit will not be adopted.

The above situation is the specific explanation as to why statewide long-term capital planning is not adopted in Illinois. In the interviewees' perceptions, statewide capital planning is irrelevant, since the state's capital budget goal is to maintain the state's infrastructure, rather than to expand the system for economic development purposes. Further, since they perceive that political agreement is important for the capital budget process, using such long-term planning is devaluing political decisions. This is because such a long-term capital plan requires the decision makers to commit to the aggregated social cost and benefits, instead of their own constituency's cost and benefits. Finally, the senior staffs in the central budget office see that statewide capital planning is not the GOMB's responsibility. "This is not our job—our job is to make sure we have enough resources to fund the program, so that we will not have a debt overload." This

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statement reflects the senior staff's perception about their agency's missions in deciding what normative practices should not be adopted.

The above finding that the state's senior budgeters use multiple rationalities compared to the agency budget staffs confirm the theory in the MRB model, explaining that the state central budgeters use multiple rationalities in budget policy recommendations since they are exposed to both policy and budget preparation processes. The above finding also extends the theory by explaining what specific factors the budgeters use in deciding what rationalities are to be used to decide policy recommendations and how these factors are formulated.

Overall Findings

The results from the empirical analysis and case study are complementary in explaining that the state systematic capital budget management process indirectly enhances the state's economic growth through capital spending policy, and that the process does so by promoting efficiency, effectiveness, and careful fiscal management. The case study suggests that the benefits from the normative practices still can be captured, even though the state capital budget process tends to highly value the political process at the top level. This is because the technical recommendations are perceived as the base for capital investment, and that the political officials rely on them to enact the state capital budget bill. Further, the case study indicates that the technical work is affected by the political process only at the margins instead of at the core of the work,

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although the effects of the political process may interrupt the state agencies' capital requests to some degree.

Contributions

The above findings contribute to capital budget theory and practice in four ways. First, for the public capital budget literature, the empirical findings provide evidence to confirm the benefits of the strategic practices recommended by the normative literature. The findings also clarify through what channel the benefits flow from the process to the state's macro-economy. The case study results provide supplementary explanations in that the strategic practices lead to better infrastructure investment policy by promoting efficiency, effectiveness, and careful financial management in capital spending policy recommendations. These explanations are important in justifying the normative literature's advocacy of the strategic capital process, in which political and technical needs are combined to set centralized investment goals and the holistic management approach is used as the avenue to achieve the goal. The justification about the benefits of the process is essential for the normative literature, especially when the systematic practices are perceived as time-consuming and complex to implement.

Second, the empirical findings extend economic development policy literature by showing that the capital budget and management process is another explanatory variable for state economic growth, in addition to the capital spending level, state economic base, national economy, private investment, population growth, and other fiscal policies. In public policy and management literature, this finding shifts the focus from

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the capital investment level to capital management practice in promoting economic growth. This shift is consistent with the current trend of public administration knowledge in that governments should "do more with less" at a time when governments are facing limited resources and the public is calling for policy and program effectiveness.

Third, the case study findings suggest that the position of the budgeters in the whole policy process (micro- versus macro-process) affects the ways the budgeters interpret the state capital planning process and goals, which, in turn, affect their rationalities in policy recommendations. Different understandings about the process and role perceptions (both for individuals and agencies' missions) result in different weighting for the five rationalities. This suggestion helps clarify the possible reasons why some systematic practices are adopted and some are not in the capital budgeting process. This notion extends state capital budget literature by suggesting that the state budgeters' frame of reference for their state capital budget process and the purpose of the process are important to the normative practice adoption.

Fourth, for practical implications, the empirical results suggest that the strategic capital budget and management practice may be an effective tool for state infrastructure investment and economic development, especially in times of limited resources and uncertain environments. Further, the case study results suggest that coordination, centralized capital planning to integrate the various proposals into one plan, and centralized fiscal planning are essential to achieve strategic investment goals. Meanwhile, some practices, i.e., project identification, should be decentralized to make the capital recommendation reflective of the client's needs at the agency level. This notion suggests that while economic analysis and thorough information are important to the process, high

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coordination and cooperation among government organizations are a primary requirement for the strategic process.

This notion is in contrast to the traditional viewpoint that the strategic capital process focuses only on economic tasks. For example, as indicated by the IBHE case, although the agency does not conduct cost-benefit analysis to assign the numeric score for project ranking (as the ISBE does), the agency's project selection can be considered "systematic and analysis-oriented." This is because the agency communicates and cooperates with the individual higher-education institutions to elicit information about the institutions' programmatic goals and technical needs, which then are used to evaluate the agencies' statewide prioritization criteria previously identified by the *Master Plan.* This Illinois experience suggests the direction for governments' capital budget reform, as to what policies and practices should be focused upon as a primary reform activity. Finally, the experience from the Illinois case study indicates that the staffs' perceptions about the state capital process and goals, especially for those at the senior level, are important to adoption of the strategic practices (as in the CIP case). Thus, for capital management reform, understanding the capital budget process and goal should be fine-tuned between the citizens and the public officials so that the direction of the process is consistent with the public's desires.

Limitations and Future Research

There are some limitations to this study. First, the data are confined within the short period of 1997–2004, which may add a flaw to cross-sectional and time series

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study. The small number of observations may weaken the empirical results, since the low variation among samples makes it difficult for the regression analysis to detect the true effects of capital process on growth. Second, the Government Performance Project's performance grading may not be free from bias and errors; as a result, the measurement may not be reliable. Third, the one single case analysis for the Illinois case study is not strong enough in identifying the perceived benefits of the systematic practice. This is due to the fact that the single case study cannot generalize the findings to other states.

Since the case study indicates that political influence has a strong role in the decision-making process at the top-management level, while the technical work is a foundation for capital budget bills, a future study should add political influence, such as partisan competition and political ideology, to the empirical testing model. This addition will extend the scope of investigation, and thus the predictability level of the model.

Further, future study should be conducted by using the federal and local governments' capital management processes as a unit of analysis, to compare and contrast the significance and practicality of the process at the federal and local levels. This is due to the fact that the three governments play different roles in fiscal policies—that is, while the federal government is responsible for resource distribution and economic stability, local government is responsible for resource allocation. Moreover, the three governments may have different conditions and setting. As Mikesell (1999) postulates, the separate capital budget (whose concept is close to systematic practices) may not be important to the federal government since it can print money and has a monetary policy, and thus it may not need to pursue systematic fiscal management to

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smooth tax rates. In addition, the systematic practices may be implausible at the federal level, as decisions are highly fragmented relative to the local governments.

In contrast to the federal government, city governments have limited resources; they need to spend based on actual needs. Strategic capital management may yield significant impacts for these governments since this type of management focuses on maximizing the benefits of public investment. For example, if a city government ties its CIP with city comprehensive planning that focuses on city growth management and economic development, the city's investment in public utility and roads may produce additional revenue streams to the government, rather than being a burden, since such services attract private producers and skilled labor.

As indicated by some case studies in capital budget literature (i.e., King, 1995; Darr, 1998), the CIP and strategic planning make funding for a multi-year capital improvement program that requires large amount of public resource plausible, while at the same time improving or maintaining governments' fiscal statuses. The additional revenue stream received by the city government may be used to fund additional services or amenities to the residents including parks, libraries, and museums which will help the city be more sustainable. In addition, the systematic capital practice is more appropriate to the local government settings compared to the federal government level, as decisions are less fragmented relative to federal government.

Finally, while the Illinois case study is beneficial in explaining how the state administrative procedure can lead to better investment policy decisions, other research is warranted that address the benefits received from the strategic capital management practices. From a comparative view, the future study may compare the benefits of the

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strategic management practices received by the states whose capital management processes are graded "A" by the Government Performance Project and those benefits received by the states whose capital processes are graded "B" or lower to explain how much the benefits from the high and low strategic practices are significantly different. Such comparisons may substantiate the empirical results in this study which show that the states that conducted highly systematic capital process (A, A-, and B+) experienced higher GSP growth than those that conducted low systematic process (B, B-, C+, C, C-, D+, D, and D-).

As an illustration, a future study might compare the benefits of the strategic practices received by Illinois whose management process is graded B- by the Government Performance Project in 1999-2001 with those received by Missouri whose capital process is graded A by the Government Performance Project in the same period. Since Illinois and Missouri are neighboring states sharing common economic conditions and characteristics, while the two states' capital processes are different, comparing the two states is appropriate. However, for the latest Government Performance Project's capital management evaluation in 2005, at the time in which this study was conducted, comparing the two states may not be appropriate. In 2005, Illinois received a grade of C+ while Missouri received a grade of B-. Judging from this evaluation result, the two states' capital processes may not be significantly different. Since Nebraska is the only state receiving the highest grade (B+) for capital management in the Midwest in 2005, comparing Illinois with Nebraska may be more appropriate than comparing Illinois with Missouri.

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APPENDIX A PRIVATE CAPITAL STOCK APPORTION

Garofalo and Yamarik (2002) provide methods for apportioning the U.S. state private stock:

$$k_{i,j}(t) = [y_{i,j}(t)/Y_i(t)]K_i(t) \tag{1}$$

$$k_j(t) = \sum_{1}^{9} k_{i,j}(t) \tag{2}$$

Where i represent industry (i= 1,....9), j represents the state (j = 1,....50), the lower case letter k refers to the amount for state j and the upper case letter K refers to BEA totals for industry i. The lower case y refers to personal income of industry i by state j, and the upper case letter Y refers to total personal income of industry i in the entire U.S. The total private stock by state is a sum of private stock from nine industries including farming (SIC 81); forestry, fishing and other (SIC 100); mining (SIC 200); construction (SIC 300); manufacturing (SIC 400); transportation (SIC 500); wholesale and retail (SIC 610); finance, insurance, and real estate (SIC 700), and service (SIC 800).

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APPENDIX B PUBLIC CAPITAL STOCK APPORTION

Holtz-Eakin (1993) provides the method for apportioning private stock:

$$K_t = (1-\delta)K_{t-1} + I_t \tag{1}$$

$$K_s = \theta_s K \tag{2}$$

$$K_{2002} = \hat{K}_{2002} = K_{1997} + \sum_{j=0}^{5} (1-\delta)^j I_{2002-j} \tag{3}$$

Where *Kt* is end of year capital stock in year t, δ is the rate of depreciation, and *It* is the real investment during year t. Equation (1) requires the benchmark year *Kt-1* to apportion the first year stock in a time series and use the depreciation rate, δ. The benchmark year stock can be computed by using equation 2, where θ is a fraction of the state fiscal year's total expenditures to the U.S. total expenditure in that same year, *Ks* is the capital stock of state s, *K* is U.S. total public stock. The depreciation rate can be computed by using equation 3. The computation results in a depreciation value of 4.20 percent, which is close to those computed by Holtz-Eakin (4.1 percent).

According to Holtz-Eakin (1993), the same methods can be used to apportion public stock per state by using total state-local capital stock as derived from the first step of apportioning. BEA reports only total U.S. public stock owned by state-local government; and, hence, one must apportion state-local public stocks by state as the first

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step and apportion state-owned public stock by state as the second step. The same methods will be used to apportion highway capital stock (HWY), education stock (EDU), and correction facility stock (COR). To compute each disaggregated public stock in the benchmark year, the fraction that results from dividing total spending for each type of public stock by a state by U.S. total spending for the same type of public will be used to apportion BEA's U.S. total public stock owned by state-local government. The state-local disaggregated stock by each individual state will then be apportioned to derive state-owned stock as the second step conducted in apportioning total state public stock.

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APPENDIX C REGRESSION RESULTS: PUBLIC CAPITAL SPENDING MODEL

TABLE 26

Regression Coefficients of State Fixed Effects and Cointegration Error

Variable	Unstandardized Coefficient Beta	Standard Error	Standardized Coefficient Beta	t Score	Significant Value
Constant	3.687	.551		6.690	.000
Alaska	.063	.038	.284	1.675	.096
Arizona	.154	.034	.698	4.478	.000
Arkansas	-.067	.017	-.302	-3.920	.000
California	.212	.043	.958	4.966	.000
Colorado	.247	.053	1.117	4.669	.000
Connecticut	.216	.052	.978	4.136	.000
Delaware	.354	.054	1.598	6.512	.000
Florida	.103	.026	.466	3.923	.000
Georgia	.177	.038	.693	4.700	.000
Hawaii	-.033	.019	-.149	-1.731	.086
Idaho	.030	.027	.117	1.115	.267
Illinois	.189	.044	.856	4.291	.000
Indiana	.157	.034	.709	4.677	.000
Iowa	.077	.021	.350	3.612	.000
Kansas	.079	.028	.357	2.803	.006
Kentucky	-.011	.021	-.052	-.558	.578
Louisiana	.014	.019	.062	.713	.477
Maine	-.036	.018	-.164	-2.060	.041
Maryland	.130	.026	.589	4.966	.000
Massachusetts	.223	.041	1.009	5.508	.000
Michigan	.125	.029	.566	4.386	.000
Minnesota	.167	.040	.654	4.206	.000
Mississippi	-.139	.025	-.630	-5.620	.000
Missouri	.101	.028	.456	3.554	.001
Montana	-.081	.024	-.366	-3.383	.001
Nebraska	.086	.030	.336	2.869	.005
Nevada	.247	.049	1.114	5.036	.000
New Hampshire	.225	.045	1.018	4.967	.000
New Jersey	.260	.047	1.175	5.547	.000
New Mexico	-.085	.023	-.384	-3.637	.000
New York	.172	.067	.776	2.562	.012
North Carolina	.148	.028	.668	5.316	.000
North Dakota	.001	.030	.005	.040	.969
Ohio	.133	.029	.601	4.612	.000
Oklahoma	-.016	.024	-.072	-.662	.509
Oregon	.103	.022	.402	4.759	.000
Pennsylvania	.125	.030	.567	4.197	.000
Rhode Island	.112	.019	.508	6.027	.000
South Carolina	.008	.015	.038	.558	.578
South Dakota	.134	.030	.604	4.413	.000
Tennessee	.158	.027	.713	5.895	.000
Texas	.192	.043	.865	4.485	.000
Utah	.034	.022	.156	1.582	.116
Vermont	.032	.028	.143	1.141	.256

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TABLE 26 (Continue)

Regression Coefficients of State Fixed Effects and Cointegration Error

Variable	Unstandardized Coefficient Beta	Standard Error	Standardized Coefficient Beta	t Score	Significant Value
Virginia	.188	.033	.847	5.688	.000
Washington	.114	.024	.515	4.843	.000
West Virginia	-.153	.031	-.690	-4.961	.000
Wisconsin	.141	.029	.639	4.810	.000
Wyoming	.159	.034	.718	4.676	.000
Y1999	-.033	.005	-.460	-6.195	.000
Y2000	-.037	.005	-.502	-7.350	.000
Y2001	-.034	.004	-.471	-7.778	.000
$Y_{t-2} - T_{t-2}$	-.113	.032	-1.309	-3.551	.001
$Y_{t-2} - R_{t-2}$	-.018	.009	-.451	-1.996	.048
$Y_{t-2} - W_{t-2}$	-.071	.022	-1.069	-3.224	.002
$Y_{t-2} - K_{t-2}$	-.006	.063	-.033	-.098	.922
$Y_{t-2} - C_{t-2}$	-.038	.017	-.639	-2.237	.027
$Y_{t-2} - H_{t-2}$	-.030	.015	-.524	-1.936	.055
Δh_{t-t-2}	.028	.010	.192	2.830	.005
Δt_{t-t-2}	.100	.025	.297	4.034	.000
Δr_{t-t-2}	.015	.005	.187	3.145	.002
Δw_{t-t-2}	.039	.013	.219	3.043	.003
Δk_{t-t-2}	-.011	.030	-.019	-.351	.726
Δc_{t-t-2}	.048	.013	.260	3.833	.000
Δc_{t-t-2} * *High*	.045	.017	.154	2.620	.010
Unstandardized Residual	-.592	.067	-.535	-8.865	.000
Dependent Variable: State Per Capita GSP Growth Rate (Three-year Cycle)					

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APPENDIX D REGRESSION RESULTS: PUBLIC CAPITAL STOCK MODEL

TABLE 27

Regression Coefficients of State Fixed Effects and Cointegration Error

Variable	Unstandardized Coefficient Beta	Standard Error	Standardized Coefficient Beta	t Score	Significant Value
Constant	3.445	.465		7.411	.000
Alaska	-.270	.066	-1.219	-4.074	.000
Arizona	.257	.036	1.161	7.095	.000
Arkansas	-.084	.015	-.381	-5.646	.000
California	.261	.037	1.177	7.123	.000
Colorado	.404	.054	1.824	7.454	.000
Connecticut	.283	.045	1.277	6.220	.000
Delaware	.412	.050	1.863	8.175	.000
Florida	.187	.028	.845	6.751	.000
Georgia	.291	.039	1.143	7.553	.000
Hawaii	-.252	.040	-1.138	-6.322	.000
Idaho	.017	.024	.067	.709	.479
Illinois	.317	.044	1.434	7.152	.000
Indiana	.203	.031	.917	6.498	.000
Iowa	.071	.020	.320	3.605	.000
Kansas	.106	.026	.480	4.056	.000
Kentucky	-.052	.020	-.237	-2.639	.009
Louisiana	-.018	.019	-.080	-.951	.343
Maine	-.078	.017	-.351	-4.497	.000
Maryland	.163	.024	.738	6.707	.000
Massachusetts	.238	.037	1.076	6.512	.000
Michigan	.172	.026	.777	6.682	.000
Minnesota	.236	.037	.928	6.463	.000
Mississippi	-.208	.023	-.941	-8.934	.000
Missouri	.201	.031	.909	6.576	.000
Montana	-.239	.032	-1.078	-7.492	.000
Nebraska	.124	.028	.485	4.372	.000
Nevada	.371	.049	1.677	7.637	.000
New Hampshire	.307	.043	1.387	7.073	.000
New Jersey	.272	.042	1.227	6.511	.000
New Mexico	-.169	.025	-.762	-6.695	.000
New York	.199	.059	.897	3.349	.001
North Carolina	.224	.028	1.014	8.061	.000
North Dakota	-.114	.033	-.516	-3.460	.001
Ohio	.140	.026	.633	5.309	.000
Oklahoma	-.030	.022	-.134	-1.350	.179
Oregon	.120	.020	.471	6.042	.000
Pennsylvania	.157	.027	.709	5.860	.000
Rhode Island	.020	.024	.091	.843	.401
South Carolina	-.025	.015	-.114	-1.710	.090
South Dakota	.111	.028	.501	3.977	.000

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TABLE 27 (Continue)

Regression Coefficients of State Fixed Effects and Cointegration Error

Variable	Unstandardized Coefficient Beta	Standard Error	Standardized Coefficient Beta	t Score	Significant Value
Tennessee	.235	.027	1.062	8.580	.000
Texas	.337	.045	1.522	7.416	.000
Utah	.041	.020	.187	2.086	.039
Vermont	-.006	.026	-.027	-.228	.820
Virginia	.273	.033	1.235	8.311	.000
Washington	.101	.022	.457	4.704	.000
West Virginia	-.308	.037	-1.393	-8.283	.000
Wisconsin	.163	.027	.734	6.070	.000
Wyoming	.022	.038	.098	.570	.570
Year 1999	-.044	.005	-.605	-8.351	.000
Year 2000	-.040	.005	-.539	-8.546	.000
Year 2001	-.033	.004	-.455	-8.400	.000
$Y_{t-2} - T_{t-2}$	-.095	.029	-1.102	-3.222	.002
$Y_{t-2} - R_{t-2}$	-.023	.008	-.581	-2.815	.006
$Y_{t-2} - W_{t-2}$	-.061	.020	-.913	-2.999	.003
$Y_{t-2} - K_{t-2}$	.092	.059	.494	1.571	.119
$Y_{t-2} - K_{gov_{t-2}}$	-.345	.057	-3.294	-6.037	.000
$Y_{t-2} - H_{t-2}$	-.031	.014	-.540	-2.191	.030
Δh_{t-t-2}	.028	.009	.196	3.138	.002
Δt_{t-t-2}	.047	.023	.139	2.043	.043
Δr_{t-t-2}	.018	.004	.223	4.148	.000
Δw_{t-t-2}	.042	.012	.231	3.564	.001
Δk_{t-t-2}	-.080	.028	-.146	-2.834	.005
$\Delta k_{gov_{t-t-2}}$	.445	.123	.387	3.625	.000
$\Delta k_{gov_{t-t-2}} * High$	.116	.137	.065	.848	.398
Unstandardized Residual	-.803	.067	-.728	-11.905	.000
Dependent Variable: State Per Capita GSP Growth Rate (Three-year Cycle)					

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