# Using Mixed Methods to Explore the Impact of Macro Level Governing Structure on Public Sector Employment

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THESIS

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This thesis is dedicated to my husband, Jie, without whom it would never been accomplished. Thank you for the love and unweaving support. We embarked on a journal with only each other to lean on in the U.S. Along the way, the challenges were huge, the burdens were heavy. The road ahead is still long, and there are tears yet to be shed, laugher yet to be headed, and dreams yet to be reached. I am so fortunate that you love me and support me.

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| | |
|---|---|
| COMP | Interjurisdictional Competition |
| DEN | Fiscal Decentralization |
| MLGS | Macro Level Governing Structure |
| OVERLAP | Jurisdictional Overlap |
| PSE | Public Sector Employment |
| QCA | Qualitative Comparative Analysis |
| SPFRG | Spatial Fragmentation |

## SUMMARY

Utilizing Oates' fiscal federalism theorem, the Tiebout model and Berry's common pool model, this dissertation develops an integrated theoretical framework of state and local government structure. Based on the framework, the author examines the effect of a macro level governing structure on public sector employment using two different methods. An econometric model is used to examine the individual effect of four characteristics of a macro level governing structure on local public employment levels by combining other socioeconomic data of 3,031 counties from 1992 to 2012. These four characteristics are spatial fragmentation, interjurisdictional completion, jurisdictional overlap and fiscal decentralization. The second method was a qualitative comparative analysis which compares different combinations of the four characteristics of a macro level governing structure in relation to public employment at the state level, then utilizes Boolean algebra to investigate the causal conditions using a bottom-up data reduction approach.

The regression analysis finds that an increased level of fiscal decentralization is significantly associated with larger labor input in the production of public services. Additionally, spatial fragmentation reduces the levels of public sector employment, whereas interjurisdictional competition and jurisdictional overlap lead to the growth of local public sector employment levels. The qualitative comparative analysis presents different types of interactions of macro level governing structure characteristics in relation to high and low levels of state government employment.

Several conclusions can be drawn from the results of this dissertation, which have challenged conventional theories. First, local public sector employment may grow faster in a decentralized state than in a centralized one. Second, interjurisdictional competition, in particular, the competition between general-purpose governments is unable to constrain the growth of local public sector employment. In contrast, more labor inputs are required to produce public goods and provide public services provision to satisfy the needs of local community residents. The results of the qualitative comparative analysis reveal causality asymmetry and highlight how different interactions of characteristics of a macro-level governing structure affect different levels of state government employment.

# 1. INTRODUCTION

## 1.1 Statement of Problems

The United States is a federal system which has one federal government, 50 state governments and more than 80,000 individual local government units. The multi-tiered structure of federal, state and local levels is an important feature of the US federal system that is based on philosophies, ideas, theories that citizens are best served by governance at the local level. However, 'best served' can be judged by a number of criteria including efficiency, adequacy, responsiveness and innovation. These criteria to evaluate the quality of service reflect citizens' broad-based expectations on outcomes: lowering the cost of delivering public services, producing the mix and level of goods and services desired by voters in a cost-effective way, reducing the fiscal disparities between regions, promoting economic growth, increasing local government autonomy, encouraging more civic engagement in the decision-making process, as well as building the trust between citizens and governments.

To achieve these broad-based outcomes, we need a viable means of controlling the extent of total governmental activities and increasing the efficient management of resources by public sector employees. In the last several decades, citizens, policymakers, and academics have all become increasingly concerned with the excessive growth of the local public sector reflected in the growing public expenditure or public sector employees. One explanation offered for the growth of the public sector in the public finance literature originates from Brennan and Buchanan's (1980) Leviathan model, in which they argued that local governments may behave like private sector monopolies because they have exclusive rights to provide local government services within their jurisdictions. Rather than seeking to maximize profits, local public officials might seek to

maximize budgets, which provide them with more resources (including both human resource and fiscal resources) to satisfy rent-seeking and bureaucratic slack (Niskanen, 1971). The extent to which a local government can act as a Leviathan-style monopoly, can vary by jurisdictions, depending largely on the types and numbers of competing jurisdictions (Schneider, 1989).

An important implication from Brennan and Buchanan's model is that fiscal decentralization and higher levels of jurisdictional competition can help avoid the excessive growth of governments and limit a jurisdiction's monopoly power. In the 1980s, President Reagan started his strategy of devolution of public activities from the federal government to state and local governments. In many respects, President Reagan viewed the federal government as the *Leviathan*, a monolithic government who seeks to exploit the citizenry through excessive rates of taxation. The purpose of devolution is to "enhance the responsiveness and efficiency of the federal system based on the fiscal federalism theory that state and local governments can do a better job of providing services for citizens" (Watson and Gold, 1997; p.1). Fiscal decentralization brought in more innovation for state and local public sector, and innovation can lead to greater efficiency which can further result in smaller governments and less fiscal output. Hence for the purpose of promoting service-delivery efficiency, fiscal decentralization and competition can be considered as a powerful constraint on Leviathan and the growth of the public sector.

Public employment at the state and local level accounts for a large share of state and local public expenditures. Therefore, public sector employment is another indicator of the historical trend toward revenue increase and more state and local service provision. For a long period of time, overstaffed public sector represent a potential burden for state and local governments. To achieve broad-based outcomes, it is necessary to enhance the efficient service delivery by public

employees and to understand whether fiscal decentralization and competition are useful mechanisms to promote the optimal level of state public sector employment and local public sector employment.

## 1.2 Significance of the Study and Research Goals

In order to understand the impact of the complex multi-tiered structure of the US federal system and how citizens are best served by governance at the local level, this dissertation discusses the macro level governing structure and explores its relationship to public sector employment levels. According to the theoretical argument in the Tiebout model and Oates' fiscal federalism theorem is that increasing the number of local jurisdictions increases intergovernmental competition to improve services and to increase efficiency of local governments. From this perspective, decentralized and fragmented government system reduces government size because it results in more efficient local governments and requires fewer resources (including fewer public employees) to provide public services. However, fiscal decentralization could lead to the increase at the public sector employment through the proliferation of different types of local governments at different levels (Martinez-Vazquez and Yao, 2009). These potential effects suggest that decentralized and fragmented government structure might work as therapy for the problem of oversized government officials for the public sector in the U.S.

It should be noted that these macro level conditions not only characterize the relationship between state and local governments but also the competitive relationships and the allocation of responsibilities among local governments. For example, a decentralized state may have less public employment because it delivers services more efficiently or it may employ fewer employees

because citizen demand fewer services. Alternatively, local governments can employ fewer services because the state takes on more responsibility for local services. The levels of fiscal decentralization vary greatly by states, and how these states interact with local governments also depends on the levels of state and local decentralization. Therefore, state and local relations are an important factor in the operation and service responsibilities of local governments. In addition, the levels of competition among local governments determine whether they would offer the optimal service packages to attract the citizens and employee more public employees to satisfy the demands of local residents.

In the empirical research on these topics, few studies have incorporated different characteristics of the macro level governing structure into a system of equation that explains levels of public sector employment, which is commonly measured as the number of total full-time equivalent public employees relative to the total population. Although many empirical studies have explored the effects of fiscal decentralization and competition on the cost of providing public services in the U.S. context, the vast majority of this research measures efficiency and government size by using government spending or tax revenue relative to income or population. Very few studies have explored the levels of public employment in the U.S. This study, in contrast, looks at the relationship between these mechanisms and levels of public sector employment which is a different but important measure of government size. Given the same level of public service output, more efficient states or local governments should be able to provide the services by using fewer resources, including fewer public employees and less spending per public employee. Otherwise, inefficiency could be manifested in over-staffed local governments with an excessive number of agencies and ministers, duplication of functions, and the existence of ghost workers (Rama, 1997). However, the downside of using employment as a measure is that governments can work (and

increasingly do so) by contracting out or through regulation. Spending as a measure of government size does not measure regulation; thus, this is the weakness of using that variable to measure government size.

The objective of the dissertation is twofold. First, fiscal federalism provides an important theoretical background for research on government structure. This dissertation aims to combine the Leviathan hypothesis, Oates' fiscal decentralization theorem, the Tiebout model and Berry's common pool model into one concise framework, and applies this integrated framework for empirical research. Oates' fiscal federalism study realizes the vertical dimension of the public sector structure. In the perspective of Oates (1999), fiscal federalism is the study of "which functions and instruments are best centralized and which are best placed in the sphere of decentralized levels of government". Prior research on this area explored the consequences of fiscal responsibilities being shared by state and local governments (Oates, 1985; Nelson, 1987; Raimondo, 1989). The Tiebout model (1956) best describes jurisdictional competition among various local governments, which is commonly recognized as the horizontal dimension of the public sector structure. The model also recognizes that local governments compete with each other for wealthy residents by offering the best tax or service packages in a horizontal and fragmented setting. Berry's common pool model is also included because it recognizes the importance of the growth of special districts at the local public sector, the vertical relationship between special districts and general-purpose governments, as well as the impact of the institutional change on government size. The establishment of the framework is used to understand how the macro governing structures vary by types of local governments and its impact on local public employment.

The second goal of the dissertation is to examine fiscal federalism theories to explain how the characteristics of a macro level governing structure (MLGS) affect the level of public sector employment (PSE). Two methods are used to test the hypotheses regarding to the relationship between MLGS and PSE. The first method is to explore the total, vertical and horizontal dimensions of the macro level governing structure and their impacts on the public sector employment at the county level using regression analysis. The regression analysis is based on the newly established macro governing structure framework. It integrates fiscal federalism and government competition literature that provide important insights about state and local government structure. Regression analysis is a powerful method to investigate the relationship between variables and use variables to test theories or hypotheses derived from theory. To supplement the results of the regression analysis, the second test is conducted at the state level and provides results from the qualitative comparative analysis (QCA). The QCA method compares different combinations of characteristics of macro level governing structure in relation to the levels of public sector employment, and then utilizes Boolean algebra to investigate the causal conditions; thus, the solutions or the outcomes are evaluated based on combinatorial logic. The two methods are used to explore the complexities of a macro level governing structure and its relationship with public sector employment. Therefore, the analysis in this dissertation is much more comprehensive than what has been presented in previous studies that only focused on one feature of macro level governing structure, such as either fiscal decentralization or local government fragmentation.

## 1.3 Research Questions, Investigative Approach and Methodology

This dissertation first includes regression analysis to examine the effect of state fiscal decentralization and local government fragmentation on public sector employment at the county

level. The specific research question is as follows: What are the effects of the total, vertical, and horizontal dimensions of macro level governing structures on local government employment? The research presented here develops a conceptual framework and tests an empirical model of public sector employment at the local level by merging several key macro level governing characteristics to explain the levels of public sector employment in 3,031 county areas from the 1990s to the 2010s. This type of analysis aggregates the features of local governments within each county area as the unit of analysis. Inter-jurisdictional competition, spatial fragmentation, jurisdictional overlap and fiscal decentralization are identified as four characteristics of a macro level governing structure. These conditions have been extensively examined in previous research on fiscal federalism and governance or some other related subjects that investigate the impacts of such conditions on local government interactions or competitions and behaviors (Yeung, 2009; Hendrick, et al., 2011).

Multiple regression method specifications (e.g., OLS, fixed effects and 2SLS) are applied to estimate the relationship between features of macro level governing structure and levels of local public sector employment because each of them has particular strengths. Two instrumental variables are used in the two-stage least square analysis to reduce the estimation bias caused by the potential endogeneity between the fiscal decentralization variable and the dependent variable. Consistent results are found by using different estimation methods, which suggest that an increase in public services and goods by decentralized governance is associated with larger labor input in the production of these services. The results also show that the total dimension of local government fragmentation reduces the levels of public sector employment but that both the vertical and horizontal dimensions lead to the growth of public employment at the county level.

To further understand the macro level governing structure at the state level and to supplement the results of the regression analyses, this dissertation uses the qualitative comparative analysis (QCA) model. The majority of the raw data were obtained from the Bureau of Census and the Census of Government (state and local government section) for 1992, 1997, 2002, 2007, and 2012 at the county level. All county level data of the four MLGS variables and the PSE variable are aggregated into the state level for 46 states and obtained the median values for these variables at the state level. The QCA approach finds that multiple configurations of MLGS could explain the growth and decline in public sector employment levels. Both the regression model and the QCA model uncover the relation between MLGS and PSE. The results from the QCA model not only overlap the regression results on a number of key points but also offer new insights that causal paths leading to public sector employment levels are different. The results of the QCA model suggest the asymmetrical causality which means that MLGS configurations leading to high levels of public sector employment are different from those leading to low levels of public sector employment.

## 1.4 Organization and Overview

The rest of the research was organized as follows. Chapter 2 outlined the theoretical approaches and frameworks for macro level governing structures. Chapter 3 presented literature review on fiscal federalism and public employment. Chapter 4 introduced the conceptual model and the operationalization of the dependent variables and independent variables, and then conducts statistical analysis with a discussion of the estimation results. Chapter 5 introduced the benefits of the qualitative comparative analysis model, discussed its methodology and presents results of the

qualitative comparative analysis. Chapter 6 summarized research findings, and provides research implications, discussed several research limitations and proposed directions for future research.

# 2. THEORETICAL PERSPECTIVE AND FRAMEWORK

## 2.1 An Overview of Fiscal Federalism

A variety of meanings of federalism generate a substantial literature in the fields of legal studies, political science and economics. In the field of legal studies, federalism describes "a constitutional system of governance where two or more units of government have the authority to govern the same territory and the same people" (Musso, 1988; p.349). In the area of political science, federalism is about studies in fiscal institutions, and intergovernmental policy formulation and implementation. Economists considers it as fiscal federalism and apply economic theories to describe the division of government functions, and analyze the impact of different fiscal governing structures on revenues and expenditures within a multilevel system of governance. Fiscal federalism also applies fiscal instruments, such as intergovernmental grants and taxation, to the allocations of funds between different levels of governments.

Fiscal federalism has its roots in economic theory; as such it puts more emphasis on the value of effectiveness and efficiency. It also generally assumes that government agents are self-interested and rational actors and views "welfare" from the perspective of individuals. Thus, fiscal federalism theory is in sharp contrast to the traditional public administration which focuses on a strong administrative state. Rather, as an economic theory, fiscal federalism theory builds on the "normative theory of market failure in determining the conditions under which government action is justified" (Musso, 1988; p.351). This assumes that if the market operates well, the decentralized interaction of individuals and firms within the market will lead to an efficient allocation or distribution of public goods or resource.

The traditional theory of fiscal federalism provides a normative framework for the assignment of functions to different levels of governments, and recommends several fiscal instruments for conducting these functions (Musgrave, 1959; Oates, 1972). From this perspective, central governments have basic responsibilities for the macroeconomic performance, such as full employment, and for the income redistribution regarding to the purpose of equity. Government intervention becomes necessary when government action is used to correct market failures, such as imperfect competition, government monopoly, information asymmetry, externalities, bounded rationality and common resources. Some scholars (Musgrave, 1959; Oates, 1972) argued that the public sector has three primary economic functions: stabilization, allocation and redistribution. In the stabilization function, governments can influence the economy by using monetary or fiscal policy. The allocative function is used to correct market failures, avoid allocative inefficiency and provide public goods. Finally, the redistributive function entails government policy to achieve horizontal or vertical equity for the goals of income distribution. In addition to these, central governments must provide some common public goods or services like national defense to the entire population of the country.

Fiscal federalism as the "study of multilevel finance" highlights the issue of competition and raises questions about the relative advantages of decentralization and fragmentation. It explicitly contributes to the questions or issues about the appropriate structural design of government powers and responsibilities or fiscal relationship between different levels of governments. In this paper, fiscal federalism is assumed to exert a constraining effect on public employment growth depending on the extent that taxing and spending decisions are made on a state and local decentralized basis, and depending on the number and types of local governmental units competing with a given territory.

### 2.1.1 Oates and the "Decentralization Theorem"

Brennan and Buchanan (1980) looked for mechanisms to limit the behaviors of a monolithic central government. Oates' (1972) fiscal federalism provides a possible mechanism to limit the power of a monolithic central government. Fiscal federalism is concerned with "understanding which functions and instruments are best centralized and which is best placed in the sphere of decentralized levels of government" (Oates, 1999). To be more precise, Oates' fiscal federalism can be referred to as "a fiscal decentralized public-sector structure where responsibilities over expenditures, revenues and regulatory policies are not monopolized by central government but are decentralized to lower levels of governments" (Hendrick et al., 2011). Oates recognized the importance of the vertical dimension (centralized versus decentralized continuum) of public sector structures and supported decentralized provision of public goods and services to promote the efficiency of service delivery.

Oates (1972; 1977) argued for highly decentralized provision of public goods and services in his "decentralization theorem". One important insight from the decentralization theorem is the relative advantages of decentralized provision of public goods and services can help improve allocative efficiency by providing a better fit between local preferences and the service package provided by local governments. Under the condition of fiscal decentralization, local governments can be more responsive to the needs and preferences of local residents. Oates' "fiscal decentralization theorem" also predicts that the government size should be smaller when the public sector is more decentralized. When we use public sector employment to measure government size, the level of public sector employment should vary inversely with the extent of the fiscal decentralization. Moreover, efficiency-enhancing properties of fiscal decentralization originate

from the idea of the Tiebout-style competition, which inherent in the fragmented structure of local public sector. Fiscal decentralization leads to the competition between local governments and innovation; thus, greater efficiency in the overall government size in terms of fiscal output and labor output. These potential effects from fiscal decentralization imply that fiscal decentralization causes slower growth in total public sector employment and may be considered as a therapy for the problem of overstaffed public sector.

### 2.1.2 Tiebout Model and "Competition"

The Tiebout model (1956) best described jurisdictional competition within the same geographical area, which is commonly recognized as the horizontal dimension (fragmented versus consolidation continuum) of local public sector structure. Local governments mimic private market and compete for residents by providing the most optimal service or tax packages that exhibit both allocative efficiency and productive efficiency. The Tiebout model describes a highly fragmented system at the local level and supports residential mobility and interjurisdictional competition. A highly fragmented system is also associated with more competition between local governments, and competition among local governments might limit the size of the local government.

There is little systematic examination on the relationship between fiscal federalism and government size when it is measured by public sector employment. According to the Tiebout model and Oates' fiscal decentralization theory, fiscal decentralization acts as a stimulus to intergovernmental competition, and competition between government acts as a constrain on total government size. To better understand their relationships, we need frameworks to map the possible

paths. The macro level institutional governance framework and the common-pool model can provide some starting points.

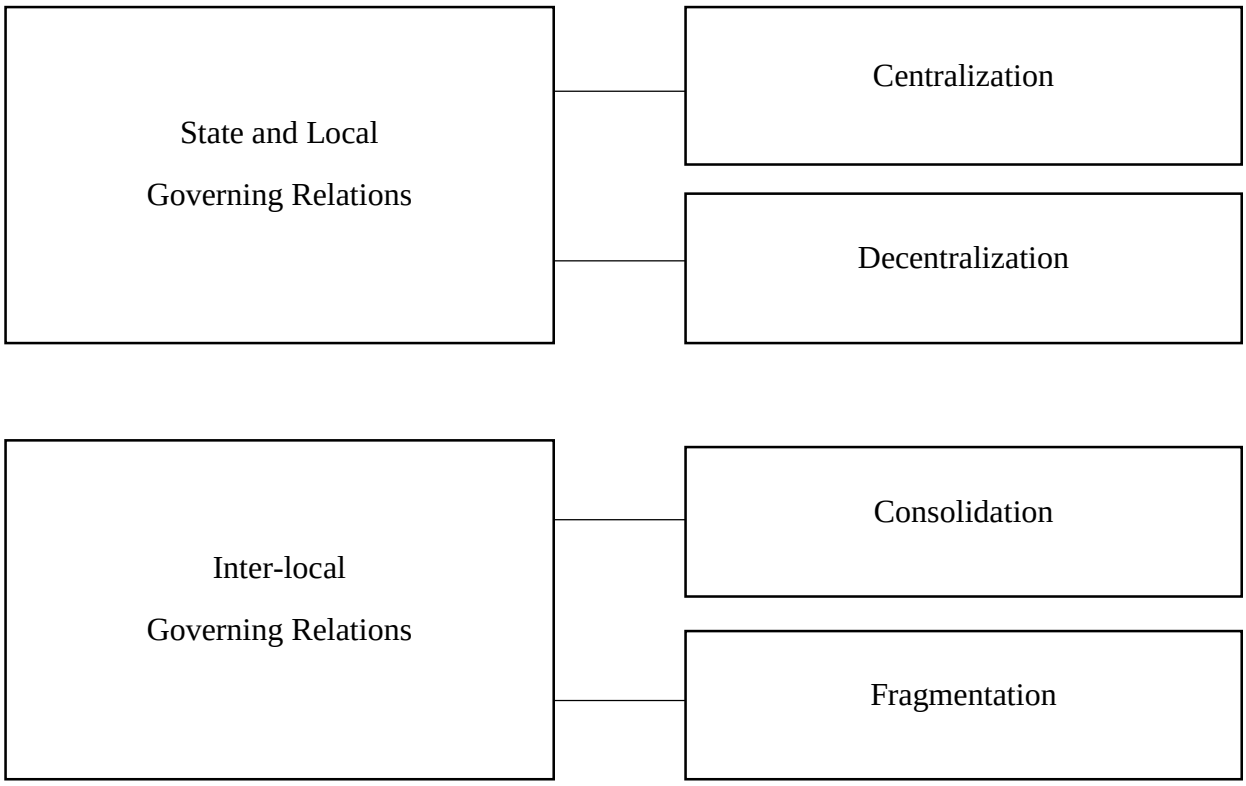


Figure 1. The macro level institutional governance framework

## 2.2 Macro Level Institutional Governance Framework

The macro level framework was initially developed by Hendrick et al. (2011) to understand how the macro level governing structure affects financial decisions, such as what service to provide, how to fund the service (Hendrick et al., 2011) as well as how governments interact with each other to solve financial problems. The macro level framework can be considered as a tool to explore the governing structure especially the state local governing relations in states or inter-local governing relations within the same geographical areas. Hendrick (2011) applied this framework to assess the effect of state-local governing relations in Illinois and inter-local governing relations in the Chicago metropolitan region, but her application has limitations because there is no variation in these conditions among the governments in her example. Figure.1 shows that there are two dimensions or continuums under each kind of government governing relations in Hendrick's framework on macro level institutional governance.

### 2.2.1 State and Local Relations

The state and local governing relations have been summarized by Stephens (1974) as a continuum of state control versus local autonomy. This relation also refers to centralized versus decentralized provision and production of public goods and services by Hendrick (2011). That is, state and local relations can be either centralized or decentralized, based on how much discretion or authority states give to local governments over their structure, functions, finance, fiscal responsibility of delivering service and goods, as well as other financial decision-making power to solve their own problems (Hendrick, 2011; p.98). As indicated in figure 1, there are two dimensions or continuums under state and local governing relations. One continuum of state and local governing relations show state and local relations are centralized, in which state imposes

constraints on local fiscal policies or limit local discretion for revenues, spending and other fiscal responsibilities (Stephens and Wilkstrom, 2000; Hendrick, 2011). The centralized state and local relations continuum assumes that states have greater service responsibilities towards local residents and greater fiscal responsibilities for financing local governments. On the other continuum, state and local governing relations are decentralized, in which states give local governments more discretion towards service functions, personnel autonomy, structures, as well as more service responsibilities for delivering and financing local services and projects.

In a decentralized state-local relation, state governments have a hands-off approach and allow local governments to have responsibilities over their provision of public services and goods. Local governments usually can have more privileges or discretion towards the provision and production of public goods and services. Local governments have greater flexibility in adapting services or fiscal policy to changes in local conditions and can make appropriate changes to solve their financial problems. Because local governments know the preferences and needs of local residents better when the fiscal power is decentralized, their service efficiency may be enhanced by containing the increase in the public sector employment.

### 2.2.2 Fragmentation and Competition

Similar to the centralized versus decentralized state and local government relation, the inter-local government relation can be either fragmented or consolidated regarding the number or types of local jurisdictions. Just as important as the state and local governing relations, the structure of the inter-local governing relation as another important contextual factor helps “understand the financial pressures and options local governments face in controlling their financial condition and to explain their choice of fiscal policies and practices” (Hendrick, 2011; p.100). The continuum of

decentralized versus centralized governing structure often applies to different tiers of governments, such as the federal government, state governments, and local governments. The continuum of fragmented versus consolidated governing structure is often applied to the total number of local governments or local governments at the same level within the same geographical region by public finance scholars (Boyne, 1992; Hendrick, 2011).

Since there are many local governments in a fragmented system, one might argue that there are more variations in fiscal conditions within a fragmented system than a consolidated system. A fragmented system is usually more complicated than a consolidated one. That's because local fragmentation is "the term attributed to the proliferation of government units that may exist within a given region" (Dolan, 1990). Thus, local fragmentation may take several forms: (1) the proliferation of different types of local government units within a given region; (2) the existence of special-purpose governments (school districts and special districts); (3) the overlapping of cities, counties and special purpose government service functions and responsibilities within the given region.

The benefits of fragmented system are still subject to debate. Small local governments within a fragmented system are unable to realize "economies of scale" in production, which may increase their per unit price of goods and services (Hendrick, et al, 2011; Oakerson, 1999). The numerous numbers of local governments in a fragmented system are more likely to result in duplication of public services delivery than those in a consolidated system because they do not share the administration or other productions (Hendrick, et al, 2011). In contrast, local

governments in a consolidated system can share administration or service delivery, which reduce the production cost and give the system better "economy of scale" (Foster, 1997; Boyne, 2003).

The case for fragmented government is well articulated on the seminal work "A Pure Theory of Local Expenditure" by Tiebout (1956) that local governments mimic private market in which local residents and business shop for the best revenue and service packages to satisfy their preferences (Oates, 1972; Schwab and Oates, 1991). The various numbers of local governments, the mobility of local residents and businesses, and their full knowledge of the service and revenue packages combined to create a competitive private market (Stein, 1987; Tiebout, 1956). The core idea inherited in the Tiebout model on the fragmented government structure is that it could stimulate sufficient competition among local governments and this competition compels public employees in these local governments to provide a more responsive and efficient public output (Bish and Ostrom, 1979; Ostrom, Tiebout and Warren, 1961).

## 2.3 The Common Pool Model: Jurisdictional Overlap

In addition to Hendrck's macro level institutional governance framework which describes the interaction between local governments, and the structural relations between state and local governments, Berry's common pool model recognizes one important characteristic of the local public sector structure-jurisdictional overlap, which refers to the situation in which the same territory is governed by multiple independent jurisdictions (Berry, 2009). He argued that the Tiebout model and Oates' fiscal federalism theory had primarily focused on horizontal competition or competition among non-overlapping jurisdictions for an efficient outcome. The competition between the same types of local governments is a type of horizontal competition; for example, counties compete with each other, and municipalities compete with each other.

Berry's common pool model indicates that jurisdictional overlap may undermine efficient outcomes from the inter-jurisdictional (horizontal) competition. It becomes necessary to determine whether the proliferation of special districts can be considered as a cause for the increase in public employment, or whether it does not affect total public employment. By integrating Berry's model into the macro level institutional governance framework, this paper explores a comprehensive analysis of the local public sector structure and investigates its effect on government size when measured by public employment.

## 2.4 An Integrated Framework

This study adopts Hendrick's (2011) macro level institutional governance framework as the basis for the public sector structure and integrates Berry's conception of jurisdictional overlap from the common pool model into the framework. Figure 2 presents the integrated framework which combines four characteristics of a macro level governing structure in the state and local public sector.

It is important to recognize that relationships vary both between and within states. If the state is decentralized and represents innovation, that innovation will be structured vertically around the existing state and local relations as well as both horizontally and vertically around the relationship between local governments within the state. Vertically, a state can elect to create numerous empowered local governments (an act of decentralization), or it can retain control and power (an act of centralization). Thus, in some systems, states grant broad discretionary authority to local governments. When a state chooses to decentralize or grants more authority to local

governments, the provision of local services and responsibilities might be provided by a multitude of local governments, which refers to the fragmentation of local governments.

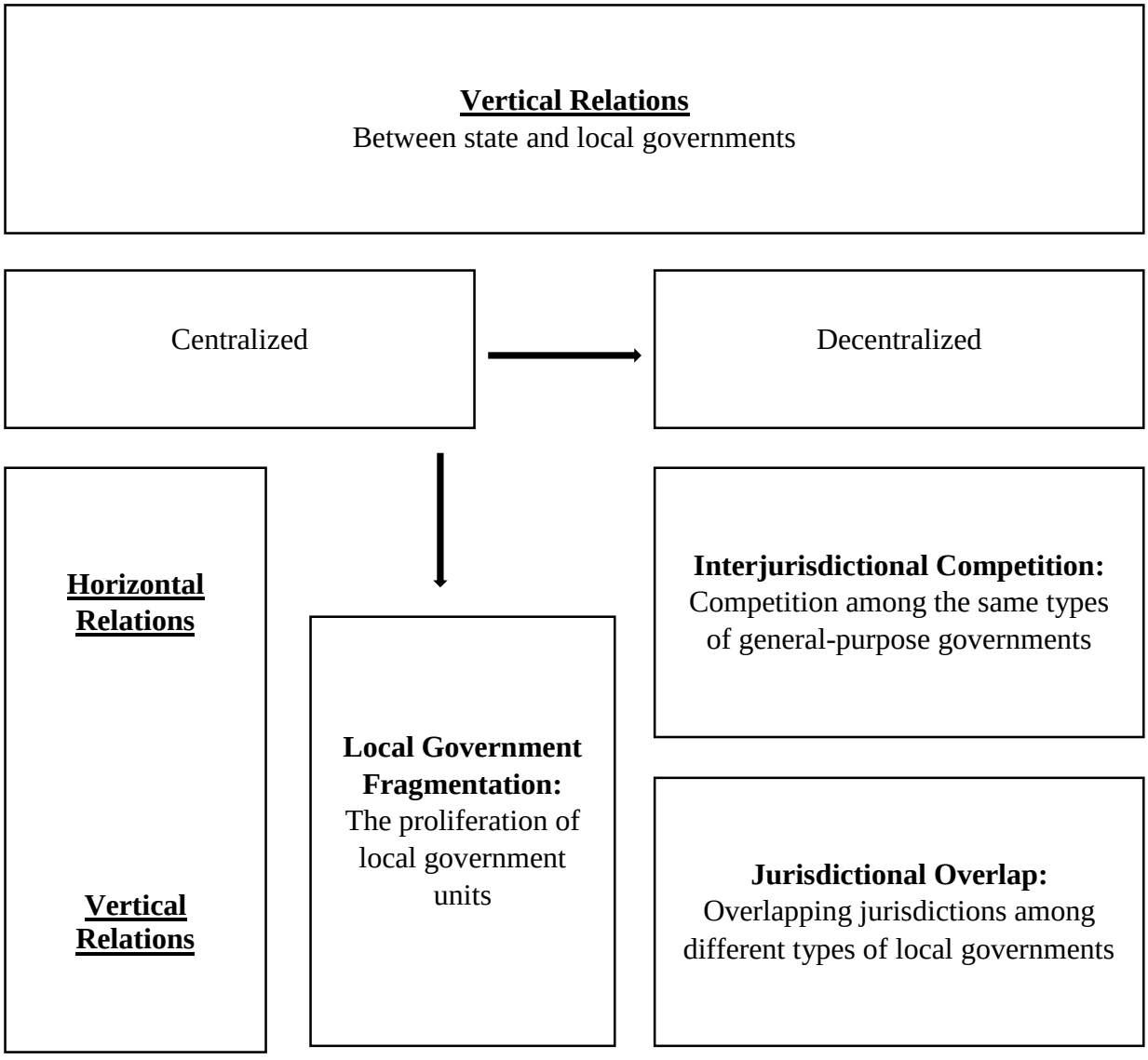


Figure 2. An integrated framework of the public sector.

Local government fragmentation is characterized by the proliferation of local governments units, and services such as police, fire, and recreation will be provided by a large number of different types of local units (Wagner and Weber, 1975). The levels of spatial fragmentation vary within the state depending on the level of competition between local governments and the number of units within the given territory. This level of government fragmentation involves both vertical relations between general-purpose governments and special districts and horizontal relations between general purpose governments within the state; it also captures the intergovernmental interactions at the local public sector. In this dissertation, the total dimension of spatial fragmentation measures the distribution of authority between general-purpose governments and special-purpose governments within the county areas.

The extent of local fragmentation is structured at the horizontal level, which has competition among the same types of local governments and at the local vertical level with different types of local governments overlapping within the state. Previous empirical studies indicate the importance of categorizing local governments into general-purpose governments and special-purpose governments. These studies have also recognized that general-purpose governments are responsible for an array of services but that special-purpose governments are the sole suppliers of a specific service in the market. Thus, this dissertation measures the horizontal level of local government competition as the number of general-purpose governments per capita, and measures the vertical level of local government overlap as the ratio of general-purpose governments to special districts.

Put together, these levels of inter-jurisdictional and inter-governmental interactions result in a complex macro level governing structure for the public sector throughout state and local

governments in the U.S. The integrated framework provides a solid model in which different types of local governments can be systematically analyzed and measured. The next section reviews empirical research on fiscal federalism and public sector employment.

# 3. EMPIRICAL RESEARCH ON FISCAL FEDERALISM AND PUBLIC SECTOR EMPLOYMENT

## 3.1 Public Sector Employment in the Prior Literature

Public finance literature examines the impact of fiscal decentralization on the size of the public sector in terms of overall expenditure and/or revenues. Although many empirical studies have explored various factors influencing public employment, our knowledge about the impact of fiscal decentralization and fragmentation on the size of government is far from settled. Table I shows a summary of empirical studies and major findings. In the U.S., few previous studies have examined the relationship between fiscal decentralization/fragmentation and government size when it is measured by public employment. Table 1 shows a list of empirical studies and major findings.

### 3.1.1 Fiscal Decentralization and Public Sector Employment

Some classic arguments from scholars such as Musgrave (1959) and Brennan and Buchanan (1980) in the discussion of the relation between decentralization and the size of government support the view that a smaller size of government is related to the degree of decentralization. Musgrave's (1959) early argument addresses a smaller budget under a decentralized public sector because of sorting. In other words, a smaller budget means that there is comparatively little in the way of financial assistance from the rich to the poor. Brennan and Buchanan's (1980) Leviathan hypothesis provides another classic argument on the relation between decentralization and government size. From their perspective, centralized provision and

**TABLE I**

A SUMMARY OF EMPIRICAL STUDIES OF PUBLIC SECTOR EMPLOYMENT

| Author (Year) | Sample and Units | Causes | Dependent Variables | Findings | Key Words |
|---|---|---|---|---|---|
| Berry, Grogger and West (2012) | US counties | Population change; age composition of the county population; household size; income growth; intergovernmental aid; the share of spending by special districts; Tiebout competition (measured by the total number of municipalities in the county); union (measured by the legal environment for public sector collective bargaining in each state) | The log number of Full-time equivalent public employees as measure of the growth of local governments; education public employees, and non-education public employees | The share of spending by special districts has a positive association with pse, and the number of municipalities also has a positive effect, population, and composition of population are significant factors. | Fragmentation; population composition |
| Martinz-Vazques and Yao (2009) | OECD and Non-OECD countries | Fiscal Decentralization (subnational share of public expenditures or revenues); Economic development (GDP per capita); population density; Openness; Urbanization | Public sector employment as a percentage of total population and public sector employment as a percentage of labor force | Public sector employment level increases with the higher degree of fiscal decentralization of a country. | Decentralization |
| Rajaraman and Saha (2008) | Indian subnational states | The size of the state (measured relative to population or GSP) | General government employees per 100 populations | Government employees decrease with the size of the state. | The size of the state |
| Fernandez, Smith, Wenger (2005) | US local governments (cities and counties) from 1997-2002 | Private sector contracting (measured by number of contracts with private for-profit providers, number of contracts with private non-profit providers, number of services provided through other local governments); state revenues, property tax revenues (as measures of fiscal stress), full-time hourly pay, and part-time hourly pay. | Changes in number of full-time employees, and number of part-time employees over years | An increase in contracting with private non-profit providers has no impact on full-time and part-time employees. Increase in property tax revenue is associated with increase full-time employees, but increase in intergovernmental transfer is associated with increase in part-time employment; hourly pay increase with both full-time and part-time workers. | Hourly pay and fiscal stress; but contracting out is not important factor |
| Marques-Sevillano and Rossello-Villallonga (2004) | Spanish regions from 1990-1999 | Economic factors (per capita GDP, **decentralization**, number of jurisdictional units; dependency rate of population); political factors (unemployment rate; political coincidence: whether the ruling parties in the regional and central are the same; political orientation of the ruling parties at the regional government) | Regional and central governments employees; the aggregated number per 100 employed at the regional level | Higher level of decentralization present lower levels of aggregated public employment over total employment; GDP per capita is a significant factor, because is associated with more demands for public service such as education and health; political variables also explain the increase in the number of public employees | Decentralization and political factors |

| | | | | | |
|---|---|---|---|---|---|
| Gimperlson and Treisman (2002) | Russian Regions from 1993 to 1998 | Larger federal transfers | public employees per 100 employed, and public employees in health, sports, social protection, in education and art per 100 employed | Larger federal transfer is associated with the number of public employees per 1000 regional residents | Intergovernmental transfer |
| Alesina, Danninger and Rostagno (2001) | Italian provinces in 1995 | Regional redistribution | Government employees including national and local employees per 100 employed populations at the provincial governments | Public sector employment has been used as subsidy from rich to poor regions in Italy | Income inequality |
| Alesina, Baqir, and Easterly (2000) | US cities with a population over 25,000 | Poverty rate in population and families; Gini coefficient for income inequality; index of ethnic fractionalization; unemployment rate, per capita income, population composition | City government employee per population, and per working population | City employment is higher in cities where income inequality and ethnic fragmentation are higher. | Income inequality and ethnic fragmentation |
| Rodrik (2000) | Countries | Per capita income; exposure to external risk; and urbanization | General government employees and public sector employees per 100 populations | Public sector employment increase with exposure to external risk | Per capita income |
| Rama (1997) | 90 countries in 1970s, 1980s and 1990s | Per capita income, exposure to external risk, and urbanization | General government employment and public employment of total labor force | General government employees increase with per capita income, and exposure to external risks and urbanization | Urbanization |
| Schiavo-Campo, de Tommaso, and Mukherjee (1997) | 80-100 countries in the early 1990s | Per capita income and wages | Government employees per 100 populations | Government employees as a percentage of population is positively associated with per capita income and negatively with wages. | Wages |
| Kraay and van Rijckeghem (1995) | 34 developing countries and 21 OECD countries from 1972 to 1992 | Urbanization, Level of Education, the relaxation of resource constraints (the revenue to GDP ratio and foreign financing in the case of developing countries and GDP per capita) | General government employees per 1000 population of OECD countries, and central government employees for developing countries | Urbanization, and level of education have positive association with government employment | Urbanization and level of education |

production of public services introduced Leviathan behaviors, which sought to maximize revenues and exploit the citizenry through excessive rates of taxation. Under a decentralized system of taxing and spending decisions, they proposed that competition between government units attracts citizens and other mobile resources, thus constraining the size and growth of the Leviathan government.

From the perspective of economic efficiency, several arguments suggest that the size of the public sector increases with the degree of fiscal decentralization. The first argument is from Oates (1985) who stated that greater decentralization may lead to an increase in administration costs because of the loss of certain economies of scale with the degree of decentralization. Prud'homme (1995) also argued that the poor quality of bureaucrats at the local level may weaken the management of local expenditure, thus increasing the supply cost of public service. Wallis and Oates (1988), from the perspectives of political participation, argued that the public sector would become larger when local bureaucrats have more control over public decisions because they wanted to empower the public sector with a wider range of functions and responsibilities.

The most recent and relevant empirical studies about the impact of fiscal decentralization on public sector employment is a cross-country analysis by Martinez-Vazquez and Yao (2009) who found that public sector employment increases with the degree of fiscal decentralization. Their result implies that decentralized governance can increase welfare and improve services to citizens, but this increase requires larger labor inputs in the production of those services. They also found that total public sector employment increases with the county's international economic openness. The implication from their result is that a decentralization policy in a country may have different impacts on public sector employment depending on the country's institutional environment and

the level of economic development (Martinez-Vazquez and Yao, 2009). Building on this empirical result, fiscally decentralized state and local relations are likely to result in higher levels of public sector employment because more labor outputs are needed to provide services to many decentralized local governments.

Only two previous studies have empirically explored the relationship between decentralization and public sector employment in a single country over time, Marques-Sevillano and Rossello-Villallogna (2004) in the case of Spain, and Rajaraman and Saha (2008) in the case of India. By using a panel data of Spanish regions from 1990 to 1999, Marques-Sevillano and Rossello-Villallogna (2004) found that decentralization has a significant but negative effect on public sector employment. This means that higher levels of decentralization are associated with lower levels of aggregated public employment in the regional governments in Spain. Rajaraman and Saha (2008) investigated a total of 21 Indian states for the years 2001 and 2002, and found that horizontal splintering of a federation into smaller subnational regions leads to a larger civil service. This empirical result implies that fragmentation leads to higher levels of public sector employment.

In addition, Berry, Grogger, and West (2012) investigated the growth of local governments in the United States, and found that the share of spending by special districts and the number of municipalities in a county as a measure of Tiebout competition both have positive associations with increases in public employment. The addition of new government functions and the growth of special districts contribute to the growth of local public employment over time. In Berry et al's (2012) study on the growth of local governments in the United States, the age composition of the county population, household size, the number of municipalities in a county, and the share of

spending by special districts all have relationships with public sector employment. Having a larger population under age 18 and over age 65 increased the number of public employees. The conclusion drawn from the study is that Tiebout competition leads to more public employees.

### 3.1.2 Other Theoretical or Empirical Findings

Some other theoretical or empirical research related to public sector employment has been conducted by a number of scholars. For example, Wagner's law provides the most conventional perspective of public employment. It argues that the economic development creates demands for new types of government services, and is the major driver of government growth (see Biehl 1998; Duveral and Henrekson, 2011). Alesina, Baquir and Easterly (2000) presented a theoretical model in which politicians use public employment as redistributive means to circumvent oppositions to explicit tax-transfer schemes. Their theoretical model presents an explanation towards the distribution of employment within countries. They also provided evidence that larger public employment is associated with more ethnically fragmented cities, implying that public employment may be considered a redistributive device to assist ethnically defined interest groups in American cities. Similarly, Robinson and Verdier (2002) argued that public employment was a political strategy used by politicians to make compromising commitments to voters and resolve situations of income inequality and low productivity. Gelb, Knight and Sabot (1991) theorized that public employment was subject to political pressures for employment and that this type of rent-seeking behavior gave rise to a wasteful diversion of resources into the public sector beyond the derived demand for resources (Martinez-Vazquez and Yao, 2009).

Empirical research that explains public employment in the United States is somewhat

sparse compared with research explaining other aspects of government finance. Several empirical studies that use public employees as a dependent variable are identified in the analyses (not confined to studies in the U.S.) and find a variety of factors explaining or relating to the levels of public employment. Table II summarizes a list of factors and their relationships to public employment in prior literature.

Schiavo-Campo (1998) and Martinez-Vazquez and Yao (2009) find supporting evidence for Wagner's law that public employment grows with economic development when they use per capita income as the variable of economic development. Rodrik (2000) find that countries with great exposure to external risks are more likely to have greater levels of public employment. Urbanization may also stimulate the demands for additional public services that in turn will drive public employment up (Martinez-Vazquez and Yao, 2009; Kraay and van Rijckeghem, 1995). In their research on public sector employment, Alesina, Baquir and Easterly (2000) argue that more ethnically fragmented US cities have larger public employment. Fernandez, Smith, Wenger (2005) measure fiscal stress by local governments' property tax revenues and state aid and argue that fiscal stress is related to public sector employment. Moreover, the level of education affects public employment (Kraay and van Rijckghem, 1995), and the hourly pay is related to the levels of public sector employment (Fernandez, Smith and Wenger, 2005).

**TABLE II**
A SUMMARY OF CAUSES OF PSE AND RELATIONSHIPS

| Causes of PSE | Relationships | Authors and Year |
|---|---|---|
| Fiscal decentralization | Fiscal decentralization may increase local public sector employment | M &Y (2009) & Marques-Sevillano and Rossello-Villallonga (2004) |
| Economic development | Public sector employment grows with economic Development (Wagner's Law) | M&Y (2009): GDP per capita; Schiavo-Campo (1998): per capita income |
| Rent-seeking behaviors | Public sector is subject to political pressures, and rent seeking behaviors give rise to a wasteful diversion of resources into the public sector and above the derived demands for resources (Gelb, Knight, and Sabot, 1991) | M&Y (2009): whether is a unitary country |
| External risk | Countries with great exposure to external risks are more likely to have higher levels of public sector employment (Rodrik, 2000) | Rodrik (2000): the share of the sum of imports and exports of goods and services on GDP; M&Y uses this measure as variable for openness |
| Urbanization | Urbanization may stimulate the demands for additional public services, that in turn will drive public sector employment up (Kraay and van Rijckeghem, 1995) | M&Y (2009): share of urban population in total population |
| Household size | More public employees are required to serve a more physically dispersed population. | Berry et al (2012) |
| The age composition of the county population | Having more pop under 18 and more pop over 65 both increases public sector employment. | Berry et al (2012) |
| The share of spending by special districts | Has a positive association with PSE | Berry et al (2012) |
| The number of municipalities in a county | Tiebout competition leads to more public sector employees | Berry et al (2012) |
| The size of the state | Public employees decrease with the size of state in relative to population or GSP | Rajaraman and Saha (2008) |
| Private sector contracting out | Privatization has a negative impact on public sector employments | Fernandez, Smith, Wenger (2005): no impacts; Dohahue (2002) |
| Income inequality | Public employment is used as a redistributive means; a more unequal income distribution is associated with larger public employment in the US cities | Alesina, Baqir, and Easterly (2000); Alesina, Danninger and Rostagno (2001) |
| Ethnic fragmentation | More ethnically fragmented cities have larger public employment | Alesina, Baqir, and Easterly (2000) |
| Hourly pay | Hourly pay increases for both full-time and part-time workers | Fernandez, Smith, Wenger (2005) |
| Level of education | Education may affect the public sector employment | Kraay and van Rijckeghem (1995) |
| Fiscal stress | Fiscal stress is measured by local governments' property tax revenues and state aids | Fernandez, Smith, Wenger (2005) |

## 3.2 Prior Literature on Fiscal Decentralization and Fragmentation

Most of early decentralization studies had focused on examining the impact of decentralized government systems on government size when the size is measured by expenditures (Oates, 1985; Nelson, 1987; Raimondo, 1989). The results for hypothesis testing are mixed. Oates (1985) did not find supportive evidence in his empirical model. Subsequently, a number of empirical studies support the existence of the Leviathan model. In the later development stage of the fiscal decentralization studies since 1990s, attention had shifted from investigating the existence of Leviathan to exploring if there was a real relationship between the government size and fiscal decentralization in the context of local public sector in the U.S. By reviewing prior literature, there are several major findings.

### 3.2.1 Measurement Issues

Empirical studies have used different terms, such as concentration, fragmentation, political fragmentation, decentralization and local competition, to describe the structure of the public sector. Some scholars use these terms interchangeably; for example, fragmentation defined as the local government's share of total government spending was used by Joulfaian and Marlow (1991) to measure the competitive properties of local and state governments. They also used fragmentation to measure decentralization which was defined as the number of local governments within each state. The problem is that fragmentation and decentralization are actually different technical terms. Conventionally, fragmentation refers to the total number of units in one type of the government system (Boyne, 1992), and decentralization refers to the distribution of expenditures, or revenues across levels of governments (Oates, 1972). Empirical evidence has been found to support that greater fragmentation of the public sector is associated with lower spending when they use the

conventional measure of fragmentation which is the number of units in one type of the governing system (Nelson, 1987; Schneider, 1989; Eberts and Gronberg, 1988). However, if scholars use fragmentation to represent decentralization, this might lead to less accurate conclusion that decentralization has resulted in greater inter-local competition and lowers local spending. For example, Eberts and Gronberg (1988) used the number of local governments within the appropriate jurisdictions which is a conventional measure of fragmentation to measure decentralization. Their findings support the decentralization hypothesis which states "an increase in jurisdictional fragmentation is associated with a decrease in local budget share" (p.6). In this case, the question becomes how to operationalize the measures for local public sector structure.

Researchers have little consensus over the way to measure fiscal decentralization and fragmentation. For example, Oates (1985) measured decentralized as the state government share of total state and local revenues and expenditure, whereas Nelson (1987) measured decentralization as the number of state expenditure mandates imposed on local governments. Although both of them used states as units of analysis, Oates (1985) measured fragmentation as the absolute number of local government in a state and Nelson (1987) measured it as state population divided by the total number of counties in a state. Dolan (1990) developed a fiscal dispersion variable for decentralization, which measured decentralization as the standard deviation of local expenditures per capital across five types of local governments. According to Dolan (1990), traditional measures failed to resolve the conflicting debate on the effect of decentralization. Therefore, it is inappropriate to measure decentralization without standardizing for population.

### 3.2.2 Types of Governments

In a federalist system with many overlapping governments, it is necessary to categorize local governments into general-purpose governments and special-purpose governments. Eberts and Gronberg (1988) measured market structure by the number of local governments within metropolitan regions. In particular, they emphasized that local governments are divided into two classes: general-purpose and special-purpose jurisdictions. Their study (Eberts & Gronberg, 1988) indicated a negative and significant relationship between the number of general-purpose governments and government size when the size is measured by government spending. This result suggested that competition between general-purpose governments constrains local government spending. In contrast, a positive relationship between the number of special-purpose governments and the government size indicates that the overlapping of single-purpose governments stimulates local spending (Eberts and Gronberg, 1988).

Similarly, Zax (1989) found that the fragmentation of general-purpose governments reduces the size of the local public sector, whereas the fragmentation of special-purpose governments increased the size. The review of empirical studies helps us understand the importance of categorizing local governments into general-purpose governments and special-purpose governments, and further recognize that general-purpose governments are responsible for array of services while special-purpose governments are the sole suppliers of specific services in the market.

### 3.2.3 Vertical Dimension of the Local Public Sector

The effect of competition not only occurs at the same level, such as the horizontal level

with the same types of local governments, but also the vertical structure of the local public sector affects the results of empirical test (Hamilton, Miller and Paytas, 2004; Campbell, 2004; Berry, 2008). Hamilton, Miller and Paytas (2004) argue that there is a two dimensional typology of governance in metropolitan regions. It represents a vertical structure surrounding the existing state-local relationship and a horizontal structure around the existing relationships between local governments in the same metropolitan regions.

Campbell (2004) also realized the effects from the vertical competition between counties and municipalities and argued that "failing to control for the vertical relationship between a municipality and a county leads to overestimated parameters" (p.325). Compbell (2004) developed a fiscal decentralization measure as the ratio of municipal expenditures to municipal and county expenditures and used it to test the fragmentation hypothesis and decentralization hypothesis at county level and municipal level respectively.

More evidence of Leviathan was found at the county level than at the municipal level because increased decentralization of expenditure tends to lead to decreasing amounts of municipal expenditures but it has no effects on county expenditures (Compbell, 2004). However, this effect is significantly weakened when they are in the context of a vertical relationship. Increased fragmentation lowers county expenditures, whereas it has no effect on municipal expenditures. In an otherwise complementary relationship, increasing county per capita expenditures leads to increases in municipal per capita expenditures. When Campbell (2004) took the vertical structure into account, the result was different. Without considering the vertical dimension of intergovernmental competition, the horizontal effect was likely to be overestimated.

Institutional changes challenge the dominant horizontal structure of the local public sector (Berry, 2008). In the horizontal structure, similar local governments compete for wealthy residents and their mobile capital. Meanwhile, many non-overlapping and multi-purpose governments are involved in the competitions at this level. However, the fast-growing special-purpose districts lead to fiscal common pool problems at the vertical dimension of the local public sector. Berry's empirical results supported a positive relationship between the number of special-purpose governments and municipalities on the property tax per capita as well as own source revenues per capital at the municipalities and special-purpose governments in 1,386 counties. The result demonstrates the importance of jurisdictional overlapping governments. From Berry's point of view, interplay between horizontal and vertical levels of analysis and their associations with the government spending could provide more insights for local public finance studies.

Building on the Tiebout model and Oates' fiscal federalism, Hendrick, Jimenez and Lal (2011) explored the effect of total, vertical and horizontal dimensions of fragmented and decentralized structure of local governments on local spending at the metropolitan and county levels. They measured fiscal dispersion/decentralization by the Hirschman-Herfindahl Index (HHI) of concentration. Higher values of the HHI represents local governments are more dispersed in a metropolitan area. On the contrary, a low value of the HHI means that spending is concentrated in a few local governments within a metropolitan area. Originally, the HHI is used in the private sector to measure competition in private firms (Hendrick, Jimenez and Lal, 2011; p.480). Lewis (1996) used HHI extensively in his study of suburban development and governing institutions and Miller (2002) uses it to measure the metropolitan power diffusion index.

The empirical study of Hendrick, et al (2011) paid attention on special-purpose and

general-purpose governments' share of responsibilities for total local services in a region at the vertical level, thus they measured vertical fiscal decentralization by the percentage of special/general-purpose spending or revenues in total local spending or revenues. The findings significantly support Campbell (2004) and Berry's (2008) arguments in terms of the importance of vertical structure of the local public sector, the types of local governments and the allocation of fiscal responsibilities. In addition, Hendrick et al., (2011) found that greater number and fiscal responsibilities of counties, special districts, and school districts all have independent effects on total spending of local governments.

# 4. COUNTY LEVEL QUANTITATIVE ANALYSIS

This chapter empirically examines the effect of characteristics of a macro level governing structure on the level of local public employment based on the theoretical framework described in Chapter 2. The first section presents the conceptual model and research hypotheses. The second section introduces the data and empirical strategy. The third section discusses the construct and measures of dependent variables and independent variables. The last section concludes with estimation results.

## 4.1 Conceptual Model and Research Hypotheses

The main research objective of this chapter is to conduct quantitative analysis on the effect of the macro level governing structure on the level of local public employment. Thus the first and most important category is macro level governing structure. As described in chapter 2 about the local governing structure, fiscal decentralization, inter-jurisdictional competition, spatial fragmentation and jurisdictional overlapping are identified as characteristics of a macro level local government structure. These measures capture not only the vertical relations between state and local government relations and jurisdictional overlapping for special-purpose local governments; but also the horizontal relationship between local governments, especially the Tiebout-style competition among general-purpose governments.

Figure 3 presents the conceptual model for the quantitative investigation. In figure 3, the left side presents the five categories of independent variables and their measures. On the right side, the level of public sector employment at the county level is the construct for the dependent measure.

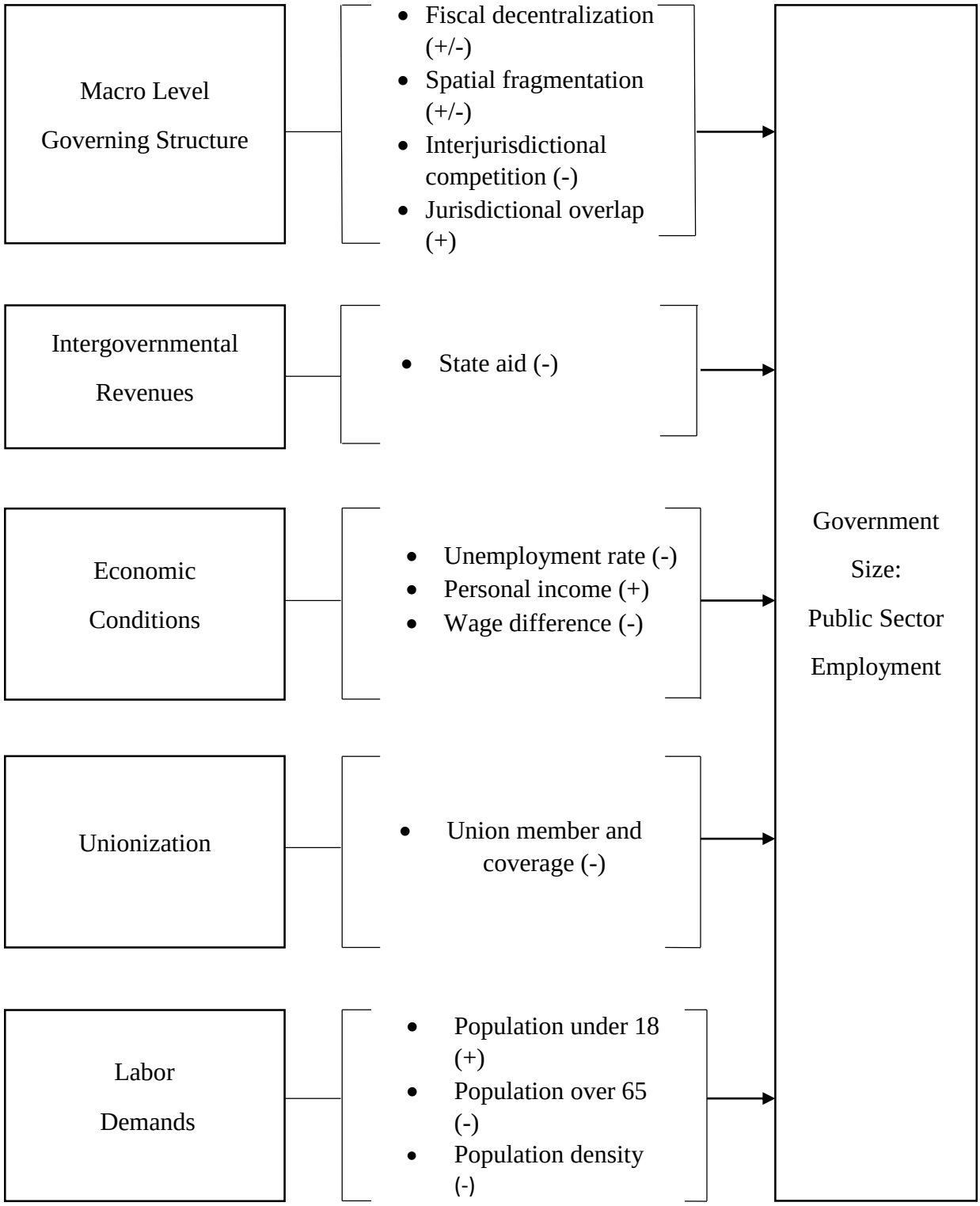


Figure 3. Conceptual model

Given the theoretical framework introduced previously, this analysis explores the relationship between levels of public sector employment and the following four characteristics of a macro governing structure at the county level: 1) the levels of state and local fiscal decentralization; 2) the levels of inter-jurisdictional competition at the horizontal dimension of governing structure; 3) the levels of jurisdictional overlapping at the vertical dimension of governing structure; 4) the levels of spatial fragmentation at the total dimension of governing structure.

One of the challenges for the empirical analysis is to identify the relationship between state fiscal decentralization and levels of local public sector employment in the U.S. According to the theoretical argument in the Tiebout model and previous fiscal federalism theories, on the one hand, a decentralized or fragmented local government structure reduces government size because it results in more efficient local governments and requires fewer resources (including fewer public employees) to provide public services. Therefore, the service efficiency of public employees should be enhanced by containing the increase in public sector employment when fiscal power is decentralized. On the other hand, decentralization may be a cause for the increase in local public sector employment through the proliferation of different types of local governments at different levels. This implies that decentralization increases public sector employment at the local level because local governments are providing services that are provided by state governments in states that are centralized. Furthermore, as illustrated by Martinez-Vazquez and Yao (2009) who discussed the relation between fiscal decentralization and public sector employment across countries, public sector employment increases with the level of fiscal decentralization. Therefore, few empirical studies on this issue have been investigated in the context of local public sector of U.S.

According to the Tiebout model (1956), the horizontal dimension of fragmentation results in greater levels of competition among local governments at the same level or tier. In the horizontal structure of inter-local relations, local governments either are the same type of governments such as all county governments within the state, or are the same types of special-purpose governments such as school districts and special districts within the state. Theoretically, horizontal fragmentation may reduce the size of the public sector because competition drives local expenditure decisions and compels governments to provide services more efficiently. These potential effects may suggest that a fragmented local government structure can serve as therapy for the problem of oversized public officials in local governments. Thus, the hypothesis with regards to the horizontal dimension of local government fragmentation is that the size of the local public sector will be smaller in counties where there are higher levels of inter-jurisdictional competition.

In contrast, competition between overlapping governments that provide similar or duplicative services can result in excessive spending if there is vertical fragmentation among such governments. According to Wagner and Weber (1975), overlapping governments refers to "the independent supply of separate components of public output by different units of government" (p. 661). Boyne (1992) argued that local governments in a multi-tier system with widely dispersed service responsibilities must compete for a share of local tax revenues by convincing voters about "the value of the money" they provided. However, various local governments in the multi-tier system may duplicate services, which result in inefficiency and thus increasing service costs. Berry's common pool model also points out that overlapping governments "overfish" the property tax environment, and his model furthermore indicates that jurisdictional overlap may undermine the efficient outcomes from the inter-jurisdictional competition. Therefore, it is expected that the

size of the local public sector will be larger in counties where there are higher levels of jurisdictional overlap.

The total number of local governments may lead to different effects on the level of the local public sector. Different from the perspective of fiscal federalism scholars, institutional reform advocates claim that fragmented local government structure are less efficient and more costly. One of their arguments is that local governments in a decentralized or fragmented local system tend to be smaller, thus they are unable to realize economies of scale in production, which raises the per unit cost of goods and services they deliver (Oakerson, 1999) and may require more labor outputs. The second reason is that the numerous local governments that co-exist in a local system may have service duplication and inhibit the sharing of administrative and other resources to improve "economies of scope" (Boyne, 1992; Foster, 1997). A third reason is that a large amount of smaller governments in the county will create more inter-jurisdictional externalities or spillover effects in which the actions of one government will lead to benefits or costs to its neighboring counties (Musso, 1988). Goods and services that benefit neighboring counties will be underprovided because all local governments have incentives to become free riders. Consequently, the total supply of capital and labor will be reduced and may be in sufficient for the local needs (Lowery, 2000). Thus, under the assumption of institutional reform advocates, total fragmentation measured by the number of total local governments per square miles or dispersion may increase the size of the local public sector.

Some other factors might affect the size of public employment, according to the literature on both theoretical and empirical studies on public sector employment. The most conventional view of public sector employment is closely related to Wagner's law, which argues that economic

development creates more demand for public employees and public services. In other words, public sector employment grows with the pace of economic development in the county. Three measures are commonly used to observe the influences of economic development on the size of public employment for counties. These measures are the unemployment rate, personal income, and the difference between public sector wages and private sector wages. A higher unemployment rate reduces public employment. Higher personal income in a county area may require more service demands, thus requiring more public employees. The wage differences between the public sector and private sector might provide an employment disincentive when wages for public employees are less attractive than those in the private sector.

Intergovernmental revenue from state governments provides a source of revenue that could either increase or decrease the growth of local public sector employment. If more fiscal and service responsibilities are transferred via intergovernmental grants to local governments, it makes sense to see more public labor input are required at the local level. In contrast, some intergovernmental grants being used for projects or matched funds, which also increases the demands for public employees. Thus, it is expected that intergovernmental transfers increase with the growth of public sector employment.

Unionization in the public sector might be the leading potential explanation for the growth of local public sector (Berry, et al., 2012). Before the 1960s, few public employees were members of or covered by unions, and collective bargaining was virtually nonexistent in the local public sector. Over the last two decades, many states have enacted laws sanctioning collective bargaining for both state and local public employees, and have imposed on local governments a duty to bargain with unionized employees. These laws might facilitate the emergence of unions as a

potential political force at all levels of government (Freeman, 1997). Moreover, unions might affect the demands for public labor because members of a union would lobby for a larger public budget and more resources for political activities to increase public employment. Therefore, higher levels of public employment might be an attractive goal for the unions to achieve.

Population demands for public workers are also included in the conceptual model to reflect the tastes of the local community. According to Poterba (1997), the higher share of the population over age 65 and the higher share of the population under age 18 are associated with higher demand for local public goods and services. Thus, different components of the population are expected to have an impact on the demand for public sector employment. Having a larger share of population under age 18 and over 65 promotes the growth of local public employment. In addition, higher population density may require more labor inputs in service delivery. Simply, more population intensified areas require more service offered by public employees.

## 4.2 Data and Empirical Strategy

To explain the influence of governing structure on the size of local public employment, the author aggregates all local governments at the county level. The unit of analysis is the county, and the county-level measures used in this study represent the aggregation of all local governments in the counties.

### 4.2.1 Data Source

The data on public employment and finance is collected from state and local government section on the Census of Government (COG), which reports data for all types of local governments

at 5-year intervals for the years of 1992, 1997, 2002, 2007 and 2012. All demographic data are collected from the Bureau of Census (the Decennial Census and American Community Survey). Population for state and local governments are collected for years of 1990 and 2000 and from 2000 to 2012[1]; and land area in terms of square miles are collected for years of 1990, 2000 and 2010, and then extrapolated for the years from 1992 to 2010.

Data on the economic base, such as the unemployment rate and personal income[2] per capita at the county level, is from the Census of Employment and Wages in the Bureau of Economic Analysis (BEA) from 1992 to 2012 for years ending in 2 and 7. Wage data on the public sector and the private sector is collected from the Bureau of Labor Statistics (BLS)[3]. All financial and economic data is converted to the 2012 constant dollars using the state and local government deflator.

In addition, data on unionization is collected from Hirsch and Macpherson's (2015) website[4]. All of the data are available at the county level except the unionization data which is based on the state-level[5]. Dataset is aggregated at the county level, in which the county level

[1] Population for age, sex, race and total population are estimated annually from 2000 to 2010 by the U.S. Bureau of Census, American Community Survey for 5 years. The specific file is called 2000-2010 County Characteristics Intercensal Population Estimates.
[2] Personal income data prior 2000 is obtained from BEA Standard Industrial Classification (SIC) systems, whereas personal income data after 2000 is from BEA the North American Industry Classification System of the United States (NAICS).
[3] The wage data on the public sector and the private sector comes from the same data source-Census of Employment and Wages in the website of the Bureau of Labor Statistics, and the wage variable is the average value of wages for the public sector and the private sector. This is the link:
http://www.bls.gov/cew/apps/data_views/data_views.htm#tab=Tables
[4] The union data is collected by Barry T. Hirsch and David A. Macpherson (2015), and obtained from http://www.unionstats.com/.
[5] Hirsch and Macpherson (2015) provide data on union for states and metropolitan regions from 1970s to the present. Because there is no available county-level union data, this dissertation uses state-level union data to replace the county-level union data.

observations represent the total number of all types of local governments at the counties[6]. The advantage of this approach is that there is little concern with shifting responsibilities across types of local governments over time (Berry et al., 2012).

### 4.2.2 Model Specification, Estimation and Testing

Altogether, the panel data consists 3,031 county areas observed at 5-year intervals from 1992 to 2012, for a total of 15,155 observations. The analysis uses the following equation to test the hypotheses based on the county-level dataset from 1992 to 2012 using the 15, 155 observations. The equation 1 is shown as follows:

$$Ln\,(Pse)_{it} = \beta_0 + \beta_1 * Den_{it} + \beta_2 * Comp_{it} + \beta_3 * Overlap_{it} + \beta_4 * Spfrg_{it}$$

$$+\beta_5 * IGR_{it} + \beta_6 * Union_{it} + \beta_7 * Unemp_{it} + \beta_8 * Inc_{it} + \beta_9 * Wage_{it}$$

$$+\beta_{10} * Pop18_{it} + \beta_{11} * Pop65_{it} + \beta_{12} * Popden_{it} + \beta_{13} * Popchange_{it} + \theta + \epsilon_i$$

In this equation, PSE equals the number of full-time equivalent employees in the public sector. The factors of interest are fiscal decentralization (den), inter-jurisdictional completion (comp), overlapping jurisdictions (overlap), and total spatial fragmentation (spfrg). The remaining components control for the conditions that might affect the level of public employment

[6] According to the Census Bureau, some "independent cities" in Virginia for example are treated as county areas for statistical purposes. For the give counties areas comprising the city of New York are substantially consolidated with the city for governmental purposes. The Census Bureau statistics on governments, New York is treated as a single county area with a FIPS county code for New York county. The sole official county in Hawaii is not treated as a separate county government in Census Bureau statistics on governments.

independently of the effects from these macro level governing characteristics. The measurement issue is discussed below. Table III shows the variables, definitions and data sources.

Equation 1 is estimated using three different models: ordinary least squares (OLS), fixed effects (FE) and two-stage least squares (2SLS). OLS is commonly used as the first specification method for the conventional quantitative analysis. In the OLS regression, county and year dummies are not included to control for average differences across years and counties in any observable or unobservable predictors. This means that the disadvantage of a simple OLS regression is that it fails to control for the fixed differences and has the potential to bias the estimates when the residuals are correlated with independent variables (Wooldridge, 2005).

To leverage the panel data structure and overcome the disadvantage of the OLS regression, the fixed effects (FE) model is applied to control for time-invariant factors at the county level and the general economic trend across years. The FE model includes time-series treatments, including year dummies and county dummies. The inclusion of county fixed effects and year fixed effects discards the influence of any omitted variables that are constant within a county over time. Although a fixed effects model cannot completely reduce the omitted variable bias, it can help reduce the threat of omitted variable bias. One more purpose of including both the OLS model and the FE model is to compare their results and determine whether there are significant differences in terms of coefficients and significance levels. The OLS regression and the FE regression are estimated using the same dataset. The OLS regression uses the data as cross-sectional, whereas the FE regression uses the panel data in its structure.

**TABLE III**

VARIABLES, DEFINITIONS AND DATA SOURCES [a]

| Variable name | Constructs | Description | Data sources | Signs |
|---|---|---|---|---|
| Dependent Variables | | | | |
| Pse | Full-time equivalent employees | Number of full-time equivalent employees per population per capita (log) | COG | |
| Independent variables | | | | |
| Spfrg | Spatial fragmentation | The number of all types of local governments per 10,000 square miles | COG | +/- |
| Comp | Inter-jurisdictional competition | Total number of general-purpose governments per 10,000 populations | COG | − |
| Overlap | Jurisdictional overlap | Ratio of special districts to general-purpose governments | COG | + |
| Den | Fiscal decentralization | Local expenditure as a percentage of total state plus local expenditure | COG | +/- |
| Schdist | School districts | Number of school districts | COG | + |
| Stigr | Intergovernmental transfer from state government | Intergovernmental grant from state government per capita (constant dollars) | COG | + |
| Union | Union | Average % of the public employee is a member of a labor union and is covered by the union | Hirsch and Macpherson | + |
| Unemp | Unemployment rate | Unemployment rate | BEA | - |
| Inc | Personal income | Personal income per capita (constant dollars in thousands) | COG | + |
| Wage | Wage differences | The ratio of public sector wage to private sector wage | BLS | − |
| Pop18 | Population under 18 | Percentage of population under 18 in total population | Census Bureau | + |
| Pop65 | Population over 65 | Percentage of population over 65 in total population | Census Bureau | + |
| Popden | Population density | Population per 1,000 square miles | Census Bureau | + |

[a] All dollar values are deflated using state and local government deflator (base year=2012).

The Breusch-Pagan test was performed to detect the heteroskedasticity in the model[7]. Equation 1 is estimated with robust standard errors for all specifications. The Breusch–Godfrey serial correlation LM test is also used to check for autocorrelation in the errors in a regression model[8]. A variation inflation factor (VIF) test is used to check for collinearity[9].

Equation 1 is further estimated using two-stage least squares with instrumental variables for endogenous variable-fiscal decentralization. A potential endogeneity may appear due to the correlation between the degree of fiscal decentralization and the error terms in equation 1 (Martinez-Vazquez, et al, 2009). A bigger concern with regards to the endogeneity is due to the simultaneous equation problem in which fiscal decentralization variable and the dependent variable has reciprocal causation. On one hand, state governments may use the degree of fiscal decentralization to control the size of local public employment; on the other hand, local governments may have strong incentives to increase the degree of fiscal decentralization (e.g. fiscal and service responsibilities decentralized from state government to local governments) to increase the number of public sector employees of local governments. In such circumstance, fiscal decentralization and local public sector employment levels could be jointly determined and consequently the estimator might be biased in the estimates of the impact of fiscal decentralization variable on the dependent variable.

To reduce estimation bias caused by the potential endogeneity, one common solution is to identify instrumental variables for the potential endogenous variables in equation 1 and estimate

[7] In STATA, the Breusch-Pagan test is executed by the command estat hettest
[8] Testing for autocorrelation in a time-series data is common for researchers who are working with time-series data. In STATA, the test is performed by the command estat bgodfrey.
[9] There is no need to worry about multi-collinearity between independent variables when the VIF is lower than 10. The VIF is 1.27, this is no need to worry in this regard.

the model using two-stage least squares (2SLS). Instrumental variables should correlate with the endogenous variables, but not correlate with the dependent variable condition on the endogenous variable.

Ethnic fractionalization and fiscal decentralization level of the 1980s are used as two instrumental variables for the fiscal decentralization variable. The rationale for using them as instrumental variables is that fiscal centralization is negatively related to ethnic fractionalization (Panizza, 1999), but ethnic fractionalization has no significant relationship with public sector employment (Alesina et al, 2000). In most cases, much of the state variations in fiscal decentralization levels is the result of historical events and decisions made by state politicians and residents prior to the 1990s data samples.

In the two-stage least squares analysis, fiscal decentralization is considered as an endogenous variable in the model. In the first stage of the regression equation, the endogenous variable is regressed on all of the exogenous variables in the model including the two instrumental variables. The purpose is to obtain the predicted values for the endogenous variables. In the second stage of the regression equation, the predicated values from the regressions in the first stage become the independent variables at the second stage. The regression of interests is estimated as usual, with the expectation that the endogenous variables would be replaced with the predicted values from the first stage.

The estimation of the endogenous variable using instrumental variables also requires the instruments to be tested for the existence of endogeneity and the validity of instrumental variable. Wooldridge's (1995) robust score test and a robust regression-based test of endogeneity are

performed to observe whether endogenous repressors in the model are exogenous. If the test statistic is significant, the variables being tested are treated as endogenous. Both the p-values for the robust score and robust regression are .000, which show that the test's null hypothesis is rejected. Because two instrumental variables are used for one endogenous variable, the equation is over-identified. An over-identification test is thus performed and the result indicates these instrumental variables are valid.

Finally, influential cases are examined and identified using conventional graphical and statistical diagnostic tests such as scatterplot matrix, z-scores and Cook's Distance[10]. The conventional cut-off points for z-scores are above two standard deviations, and greater than 4/n for Cook's D, where n is the total number of observations (Cook and Weisberg, 1991).

## 4.3 Constructs and Measures for Variables

### 4.3.1 Variable on Local Public Employment Level

The number of public full-time equivalent (FTE) employment per capita is the dependent variable for the measure of the size of local public employment[11]. In the census data on the public sector employment, there are full-time equivalent employees, full-time employees, and part-time employees. Contracted employees of governments are not included in the Census employment data.

[10] Cook's D can be used to assess an observation's influence and the leverage which is a measure of how far an independent variable deviates from its mean.
[11] In the regression analysis, the dependent variable is the logged number of FTE per capita.

The Census data defines public sector full-time employees as those persons whose work hours represent full-time employment with their employing government. Part-time employees are defined as those persons whose work hours are less than 30 hours. Full-time equivalent employees (FTE) represent the number of full-time employees and the number of part-time employees whose reported work hours are equivalent to full-time employees.

By reviewing some existing research on the effect of contracting out on public sector employment, I found that contracting out has little effect and it was not that prevalent because private sector contractors generally offered higher wages than public sector employees in cities or counties (Becker, Chaykin and Silverstein, 1995; NCEP, 1988). Due to the unavailability of contracting out data for all types of local governments from 1990s to 2010s, I was unable to include the contracting out variable in the analysis.

Donahue (2002) examined the trends in the size of public sector workforce and the extent of government outsourcing, and found that the effect of outsourcing on the number of government workforce is small. He stated that, "a greater readiness to rely on private delivery almost surely has had a smaller influence on the size of the public work force than have shifts in the size and composition of government's mission, productivity growth, and simply austerity. Far from cutting to the heart of public employment, privatization seems to have been nibbling around its edges" (p. 275). Greene (2002) also has observed a similar pattern as Donahue did among local governments. One more study by Fernandez et al. (2005) found that an increase in contracting with private sector service providers has no impact on the number of full-time public sector employees. They used a two-period panel data from Census of Government (COG) and International City/County Management Association (ICMA) survey data for 485 local governments including county and

city governments to explore the effect of private sector contracting out on public sector employment.

### 4.3.2 Key Macro Level Governing Structure Variables

There are four key independent variables which represent the total, vertical and horizontal dimensions of macro level governing structure[12]. Inter-jurisdictional competition (horizontal dimension of local fragmentation) is measured by the total number of non-overlapping local governments. This measure only accounts for the effect of competition between general-purpose governments, assuming that municipalities will not compete with special-purpose governments. Jurisdictional overlap (vertical dimension of local fragmentation) is measured by the ratio of special districts to general-purpose governments. This measure captures the effect of overlapping jurisdictions and the vertical dimension of local fragmentation. Spatial fragmentation represents the total dimension of local government fragmentation. Total local governments in this paper include different types of local governments, such as municipalities, towns, special districts and school districts[13]. It is measured as total local governments per square miles. One more key independent variable is state and local fiscal decentralization. This is a state-level measure that controls the effect of state and local governing structure on the size of local public employment, and is measured by local spending as a percentage of total state and local spending[14].

[12] It should be noted here that the limitation of these four measures is that they have small variations across years, although the variations across states are significant.
[13] According to the Census Bureau statistics on government, in addition to independent school district governments, a number of states including Alaska, Arizona, California, Connecticut, Massachusetts, New York, North Carolina, Maryland, New Hampshire, New Jersey, Mississippi, Maine, Tennessee, Rhode Island, Virginia, and Wisconsin have school systems that the Census Bureau treats as dependent agencies of a state, county, city, town or township government. Data for local dependent systems are not included in the counts of local governments.
[14] There are two state-level measures in the analysis: (1) fiscal decentralization; (2) unionization.

### 4.3.3 Other Control Variables

Besides the key macro variables, additional control variables are included in the model to isolate the effect of these key independent variables in the empirical analysis from other factors that also affect the dependent variable. Four population-related variables are included to control for the labor demands from different components of the population. One variable is the percentage of the total population under age 18 in total population, and the other is the percentage of the total population over age 65. Population change is included in the model to capture the effect of county-level population change every five years across counties. Another population related variable is population density, which is measured as the population per square miles.

Based on Wagner's Law, economic development is closely associated with the demand for public sector employment. The following variables are used to measure the economic conditions: (1) per capita personal income; (2) unemployment rate; and (3) the ratio of public employment wages to private sector employment wages. State governmental transfer per capita is also served as a control variable to find whether more intergovernmental transfer from state governments increase the local public sector employment.

To shed light on the role of unions on the size of local public sector employment, one union variable is incorporated into the equation to characterize the evolving legal environment for public sector collective bargaining in the state. Union is measured by the average percentage of public employees who are members of a labor union and/or covered by a union at the state level. In addition, Census of government does not report data on public employment at the metropolitan level, thus the study was not able to include the metropolitan region as one more unit of analysis.

Thus, a dummy variable of metro area is included to indicate whether the county is located within a metropolitan statistical area (MSA)[15]. Table IV presents the descriptive statistics for all variables.

### 4.3.4 Instrumental Variables

Two instrumental variables have been selected to control the endogenous variable. The first one is measured by the state fiscal decentralization at the 1980s. The second one is ethnic fractionalization. The way to measure ethnic fractionalization is presented as follows:

$$Ethnic = 1 - \sum_{i} (Race_i)^2$$

where *race* or *ethnic i* denotes the share of population identified as of race *i* including White, Black, Hispanic[16], American Indian, as well as Asian and Pacific Islander.

[15] Ideally, the type of analysis is conducted at the county level and the metropolitan level. I could compare the results and see if they are consistent. Because there is no PSE data at the metropolitan level, one solution to deal with is to add a dummy variable which is used to indicate whether the county is located in the metropolitan regions.
[16] Hispanic is considered as an ethnic, not a type of race.

**TABLE IV**
DESCRPTIVE STATISTICS

Total number of cases (N)=15,155
Number of counties=3,031
Years: 1992, 1997, 2002, 2007, and 2012

| Variable | Median | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Full-time equivalent public employees per 1,000 populations | 40.00 | 43.64 | 15.81 | 2.62 | 303.03 |
| Number of local governments per 1,000 square miles | 28.23 | 43.08 | 49.74 | 0.10 | 723.52 |
| Number of general-purpose governments per 10,000 populations | 2.52 | 6.88 | 15.25 | 0.00 | 352.76 |
| Ratio of special districts to general purpose governments | 0.93 | 1.63 | 2.15 | 0.00 | 11.50 |
| % of local spending in state and local spending | 54.79 | 53.75 | 7.03 | 20.89 | 65.48 |
| Average % of employees is part of the labor union | 25.10 | 30.31 | 15.79 | 9.15 | 72.35 |
| Personal income per capita ($ in thousand) | 16.47 | 20.51 | 12.33 | 3.00 | 145.03 |
| State intergovernmental revenue per capita | 107.77 | 234.69 | 384.12 | 0.00 | 8302.27 |
| % Unemployment rate | 5.70 | 6.26 | 2.87 | 0.80 | 35.40 |
| % of Population over 65 | 14.83 | 15.21 | 4.24 | 0.60 | 44.50 |
| % of Population under 18 | 24.78 | 24.93 | 3.51 | 0.00 | 44.74 |
| Number of population per square miles (pop in thousand) | 0.04 | 0.14 | 0.45 | 0.00 | 13.73 |
| % Population change | 2.23 | 3.25 | 7.66 | -49.55 | 73.73 |
| The ratio of public sector wage to private sector wage | 1.30 | 1.40 | 0.73 | 0.00 | 51.92 |
| State-level ethnic fragmentation | 0.29 | 0.30 | 0.15 | 0.03 | 0.95 |

## 4.4 Estimation Results for All Counties

Table V provides the results of equation 1 using the log number of full-time equivalent public employees per capital as the dependent variable. Breusch-Pagan diagnostics for heteroskedasticity support the use of robust standard errors. Equation 1 is estimated by using different specification methods, although the regression results do not vary significantly when different estimations are used as shown in table V. The primary consequences of using different estimation methods are some changes in the statistically significant coefficients of the variables, but very few changes occur to the significant levels of the variables. These results indicate that the results are robust. More importantly, the directions of these variables do not change when the 2SLS and FE models with IVs apply to the equation 1. Note that the following results are reported according to the fixed effects regression in table V.

The results with regards to the four governing structure variables demonstrate that they are all statistically significant, although interjurisdictional competition does not have the expected sign of the hypothesis. Contrary to the theoretical statement that jurisdictional competition reduces government size, the number of general-purpose governments per capita has a positive coefficient. The results from all specifications are consistent and show that inter-jurisdictional competition between general-purpose governments increases the levels of public full-time equivalent employees by roughly 1.4 percent. In addition, the magnitude of increases for this variable is the greatest among the three governing variables with positive signs. As a result, the levels of full-time equivalent public employees increase with the degrees of jurisdictional competition between general-purpose governments at the horizontal dimension of the local governing structure.

**TABLE V**

REGRESSION RESULTS FOR ALL COUNTIES [a]

| Number of FTE Employees per capita (ln) | OLS[c] | 2SLS | Fixed Effect[e] (panel) |
|---|---|---|---|
| Number of local governments per square miles | -0.001*** (0.000)[b] | -0.001*** (0.000) | -0.001*** (0.000) |
| Number of general-purpose governments per capita | 0.014*** (0.002) | 0.015*** (0.002) | 0.014*** (0.004) |
| The ratio of special districts to general purpose governments | 0.016*** (0.001) | 0.012*** (0.000) | 0.015*** (0.002) |
| % of local spending in state and local spending[d] | 0.010*** (0.000) | 0.012*** (0.000) | 0.009*** (0.001) |
| % of employees is covered or member of the labor union | -0.001*** (0.000) | -0.001*** (0.000) | -0.002*** (0.000) |
| State IGR per capita (ln) | 0.008*** (0.002) | 0.008*** (0.002) | 0.010*** (0.003) |
| Personal income per capita (ln) | 0.114*** (0.005) | 0.115*** (0.005) | 0.182*** (0.028) |
| Unemployment rate | -0.011*** (0.001) | -0.011*** (0.001) | -0.007*** (0.002) |
| % Over 65 years | 0.007*** (0.001) | 0.006*** (0.001) | 0.008*** (0.002) |
| % Under 18 years | 0.022*** (0.001) | 0.021*** (0.001) | 0.020*** (0.002) |
| Population density | 0.052*** (0.005) | 0.052*** (0.005) | 0.044*** (0.009) |
| % Population change | -0.009*** (0.000) | -0.009*** (0.000) | -0.009*** (0.001) |
| The ratio of public sector wage to private sector wage | 0.013 (0.008) | 0.013 (0.008) | 0.014 (0.014) |
| Metro area | -0.149*** (0.005) | -0.150*** (0.005) | -0.147*** (0.010) |
| Constant | -3.696*** (0.042) | -3.728*** (0.043) | -3.373*** (0.164) |
| Observations | 15155 | 15155 | 15155 |
| R-squared | 0.304 | 0.303 | 0.313 |

[a] Significance levels indicated by ***p<0.01, **p<0.05, *p<0.1; two-tailed tests.

[b] Heteroskedasticity-robust clustered standard errors are shown in parentheses.

[c] OLS regression has no county dummies and year dummies.

[d] Fiscal decentralized is endogenous variable in 2SLS.

[e] Fixed effects has (1) year fixed effects (2) county fixed effects (3) clustered county level.

As expected, jurisdictional overlap, which is measured by the ratio of special districts to general purpose governments, has a significant and positive effect on the demand for public full-time equivalent employees. A one-unit increase in this variable leads to a 1.5 percent increase in the level of public sector employment. This result is in line with the argument raised by Berry (2009) in the common pool model. The overlapping relations between special districts and general-purpose governments result in a common pool problem that causes county areas with a higher number of special districts to have a larger government size. Therefore, the positive sign of the jurisdictional overlap variable indicates that levels of public employment increase with the degree of jurisdictional overlap at the vertical dimension of the local governing structure.

Spatial fragmentation has a negative impact on the dependent variable. The empirical result shows that the level of public employment reduces by approximately 0.1 percent when there is a one-unit increase in the total number of local governments per square mile. The magnitude of significance is small but the result has an important implication. That is, a fragmented or dispersed local government structure at the total dimension of the local governing structure seems to be more efficient in the urban areas and may require less public labor output.

Turing to the fiscal decentralization variable, the positive sign indicates that fiscal decentralization increases the levels of public employment at the county level. Specifically, a one-percent increase in the degree of fiscal decentralization is associated with an increase of approximately 1.0 percent in the levels of public employment. This result provides evidence to show that greater labor input is required to provide services at the local level when fiscal power is decentralized from the state government to local governments.

The coefficients on the control variables generally take the expected signs except the union variable and the wage difference variable. First, the point estimates across the specifications in table V show that a one-percent increase in personal income per capita is correlated with an increase of approximately 0.2 percent in the level of public employment, whereas a one-unit increase in the unemployment rate is associated with a 1.0 percent decline in the demand for public labor. Community wealth increases with the increasing demand for public full-time equivalent employees. In contrast, the demand for public labor would decrease when the unemployment rate increases.

The variable for intergovernmental transfer from state governments also has a significant and positive effect. A one-percent increase in state aid per capita is associated with an increase of approximately 0.01 percent in the levels of public employment. The positive sign of this variable supports the hypothesis, and the result is similar to that of Stein (1987) and Schneider (1989).

The age components of the population have significant impacts on the levels of public sector employment in the county areas. In accordance with the hypotheses on population components, the coefficients for variables related to population show that the log number of public sector full-time equivalent employees is higher when both the percentage of the population under age 18 and the percentage of the population over age 65 are higher. Because the dependent variable includes education employees, it is reasonable to find that more children in the county areas would lead to more public labor demand.

Population density has a positive and significant effect on the levels of local public employment. A one unit increases in this independent variable is associated with 0.04 percent

increase in the dependent variable. This result supports the hypothesis and shows that more population density requires more public employees to provide services and deliver public goods.

With respect to the public and private wage difference variable, the result shows that a one-unit increase in the ratio of public sector wage relative to private sector wages has no significant relationship with the demand for public employees. In other words, the difference between public wages and private wages does not affect the levels of public sector full-time equivalent employees.

The influence from unionization on the demands for labor is different from the expectation. Public sector unions can lobby for larger budgets that in theory increase compensation and promote growth in employment levels (Berry et al, 2012). On the one hand, higher employment may be the goal for the union to pursue to the extent that it translates into more union members and additional resources for political activities. On the other hand, existing employees may want to be better compensated if there are fewer of them. Although there are strong reasons to expect the ability of unions in the growth of public employment, the impact of the role of unions on public sector employment is empirically ambiguous. The finding on union variables in the analysis suggests that a one-unit increase in the percentage of the public labor force covered by the union is associated with a 0.2 percent reduction in the total number of full-time equivalent public employees per capita. The negative impact of union variables on public sector employment levels is similar to the evidence from Berry et al (2012), in which the state collective bargaining policy has a negative effect on the log number of total public sector full-time equivalent employment. This may indicate that the ability of unionization in promoting the growth of public employment levels is limited at the local public sector; and further imply that existing employees prefer more compensation to higher employment levels.

## 4.5 Estimation Results for Population Growing and Declining Counties

This section summarizes and discusses fixed effects results for public sector employment for all counties and separately for growing and declining counties. According to prior literature (e.g., Berry et al, 2012), population change is a significant determinant of local public sector employment. Also, based on the estimation results for all counties, the population related variables have significant impacts on local public employment levels. In particular, population change has a negative and significant impact on the dependent variable in the table V. These results further indicate that compositional changes in population would affect the levels of public employment in counties over long-period of time. Therefore, this research divides counties into population growing ones and population declining ones. Growing counties are defined as those whose population has witnessed growth from 1992 to 2002; whereas declining counties are defined as those whose population has experienced declines at the same time period. This definition ensures that the same counties are included in each category overt time.

Consistent with the results from OLS, FE and 2SLS in table V, each characteristic of the macro level governing structure is an important and significant determinant of local public employment levels. By comparing the coefficients for the four major MLGS variables, it is easy to find that local public employment is less responsive to fiscal decentralization, spatial fragmentation and jurisdictional overlap in growing counties than in declining places. For example, the coefficients of local public employment with regards to spatial fragmentation are -0.001 in growing counties and -0.002 in declining counties. The jurisdictional overlap coefficients of local public employment are 0.014 in growing counties and 0.033 in declining counties. Meanwhile, local public employment is more responsive to inter-jurisdictional competition in population

growing counties than in population declining places. For example, the coefficients of local public employment with regards to interjurisdictional competition are 0.086 in growing counties and 0.007 in declining counties. These result indicate that spatial fragmentation, jurisdictional overlap, and fiscal decentralization have more significant impacts on local public employment levels in population declining counties than growing counties. Specifically, more intense general-purpose government competition has stronger effect in population growing counties.

The age composition of the county population seems to have larger influence on the expansion of local public employment in declining counties than growing places. Having a larger share of population under 18 years old in the population significantly increases local public employment in both growing and declining counties, most likely due to the demand for schooling. However, having a larger share of population over 65 years old in population is significantly and negatively related to local public employment only in declining counties. One explanation is that older population has fiscally resisted spending on elementary education once their children left the schools (Poterba, 1997) in the growing counties. Another possible reason is that population declining counties have a larger share of residents who are over 65 years, compared to that in growing counties.

**Table VI**
FIXED EFFECTS RESULTS FOR ALL COUNTIES,
POPULATION GROWING COUNTIES AND DECLINING COUNTIES [a]

| Number of FTE Employees per capita (ln) | All Counties | Growing Counties | Declining Counties |
|---|---|---|---|
| Number of local governments per square miles | -0.001***[b] (0.000)[c] | -0.000*** (0.000) | -0.002*** (0.000) |
| Number of general-purpose governments per capita | 0.014*** (0.004) | 0.086*** (0.020) | 0.007** (0.003) |
| The ratio of special districts to general purpose governments | 0.015*** (0.002) | 0.014*** (0.002) | 0.033*** (0.006) |
| % of local spending in state and local spending | 0.009*** (0.001) | 0.008*** (0.001) | 0.012*** (0.001) |
| % of employees is covered or member of the labor union | -0.002*** (0.000) | -0.003*** (0.000) | -0.001* (0.001) |
| State IGR per capita (ln) | 0.010*** (0.003) | 0.004 (0.003) | 0.022*** (0.006) |
| Personal income per capita (ln) | 0.182*** (0.028) | 0.148*** (0.030) | 0.176*** (0.048) |
| Unemployment rate | -0.007*** (0.002) | 0.003 (0.002) | -0.009*** (0.003) |
| % Over 65 years | 0.008*** (0.002) | -0.003 (0.002) | 0.013*** (0.003) |
| % Under 18 years | 0.020*** (0.002) | 0.011*** (0.002) | 0.026*** (0.004) |
| Population density | 0.044*** (0.009) | 0.029*** (0.010) | 0.121*** (0.036) |
| % Population change | -0.009*** (0.001) | -0.007*** (0.001) | -0.004*** (0.001) |
| The ratio of public sector wage to private sector wage | 0.014 (0.014) | -0.021 (0.031) | 0.019 (0.015) |
| Metro area | -0.147*** (0.010) | -0.122*** (0.011) | -0.067*** (0.023) |
| Constant | -3.373*** (0.164) | -3.149*** (0.157) | -3.708*** (0.292) |
| Observations | 15155 | 15155 | 15155 |
| R-squared | 0.313 | 0.220 | 0.383 |

[a] Fixed effects have (1) year fixed effects (2) county fixed effects (3) clustered at county.

[b] Significance levels indicated by ***p<0.01, **p<0.05, *p<0.1; two-tailed tests.

[c] Heteroskedasticity-robust clustered standard errors are shown in parentheses.

## 4.6 Discussion

In the United States, the debate over the role of fiscal decentralization and government fragmentation versus the merits of efficiency and effectiveness is likely to continue for some time. There is little reason to believe that public employees and their unions could become more apprehensive about the impact of governing structure on the levels of public employment. It is surprising to see that so little empirical research has been conducted on the effect of macro level governing structure on the levels of public employment, given the salience of this topic and the controversy that continues to exist in the literature.

This paper takes a more comprehensive approach to exploring the relationship between governing structure and public sector employment by modeling the effects of total, vertical and horizontal dimensions of state and local government structure and other factors as jointly impacting full-time equivalent public employees. The conventional wisdom about the effect of a fiscally decentralized structure and local government fragmentation on public employment is partially accurate: as the degree of fiscal decentralization increases, the levels of public sector employment increase. This implies that the process of fiscal decentralization at the state level expands the size of public employment at the local level. The estimation result suggests that the increase in public service and goods by decentralized governance is associated with greater labor input in the production of these services. It is likely that the shift of service responsibilities from higher levels of governments to lower levels of governments result in this outcome. The public goods demanded by community residents at the local level perhaps require more labor-intensive services such as education, health, and protection. On the other hand, the consequence could be

less efficient government management and a higher cost of the labor force when lower levels of local governments do not fully take responsibility for budget decisions.

In addition to the findings on fiscal decentralization, this study also has some important results with regards to local government fragmentation. The finding on overlapping jurisdictions confirms Berry's (2008) argument that the higher number of special districts relative to general-purpose governments would increase the levels of public sector employment as a consequence of the common-pool problem. Berry's common pool model emphasizes that "over-exploited" problem results from the growing number of special districts and the overlap structure of special districts to general-purpose governments. The result supports Berry's argument when the government size is measured by local public sector employment levels.

However, the positive effect of jurisdictional competition on full-time equivalent employees has challenged Brennan and Buchanna's competition hypothesis, the Leviathan theory, and the Tiebout model. The growth of public sector employment is at odds with the conventional theories. Theoretically, the Tiebout-style competition should promote more efficient service delivery among local governments and be considered as powerful constraints on government expansion. There is no evidence to support this theoretical argument. The result contradicts the notion that inter-jurisdictional competition among general-purpose governments has a constraining effect on the growth of local government when the government size is measured by the levels of public employment. In contrast, the result implies that the competition between general-purpose governments (mainly municipalities) would require more labor input in the production of public goods and service.

One more interesting finding is the negative and significant effect of spatial fragmentation on local public employment levels. Spatial fragmentation is measured by the total number of local governments per square miles, thus one possibility is that one large geographical county has one or few governments and only employ few public employees to serve this area. The number of local public employees at this county might be steady or even unchanged over a long period of time. Taking the Loving county in the state of Texas as an example, it has very low level of spatial fragmentation and very high level of local public sector employment. Within 669, 000 square miles, 12 full-time equivalent public employees serve 82 people in such large land area in 2012. In contrast, Arlington county in the state of Virginia only has 26 square miles in land area, but it has 9,239 employees and a population of 203,914 in year of 2012. It is likely that spatial fragmentation is much greater in urban than rural areas and economies of scale makes governments in urban areas more efficient. In particular, the dummy variable for urban area is negative in the coefficient, which indicates that the more all types of local governments in a metropolitan area, the more efficient the local employees. Both the explanations indicate that the total dimension of local government fragmentation could limit the growth of local public employment levels.

# 5. STATE LEVEL QUALITATIVE COMPARATIVE ANALYSIS

## 5.1 Introduction

To supplement the results of the regression analysis, this chapter focuses on the qualitative comparative analysis (QCA) model based on Boolean comparative logic (Ragin, 1989). With this model, the objective of this chapter is to examine the relation between combinations of characteristics of a macro level governing structure (MLGS) and levels of public sector employment (PSE) by using states as the unit of analysis. The focus of the QCA model is to access the complexity of causal conditions in relation to the dependent variable, rather than the individual effect of each causal condition in a linear manner. This analysis places more emphasis on the importance of the "net effects" of causal conditions in research practice, which contrasts strongly with the focus of conventional regression analysis. Controlling the impacts of other independent variables, the regression analysis in the chapter 4 showed that each of macro level governing structure variables has a significant effect on local level of public employment. Regression analysis is limited in capturing the interaction effects among four macro level governing structure characteristics on public sector employment levels. The complicated interaction terms and their effects are often unknown to researchers and practitioners (Ragin, 1989) or are difficult to interpret, but there is no reason to exclude the possibility of combining several factors together and exploring their impacts on outcomes (Oates, 2007). The QCA model is employed in this chapter to overcome these problems. The QCA model enables focused comparisons of a small or intermediate-sized cases, and treats these cases as combinations of characteristics. Moreover, it helps reveal that there are multiple causal paths that lead to high or low levels of public sector employment. Additionally, relying on the process of data minimization, QCA simplifies the causal conditions using a bottom up data reduction approach and finds necessary causal combinations of MLGS characteristics

for outcomes. Therefore, using QCA as a supplemental method, the analysis offers greater validity to the results of the regression model and complements the predicted interaction effects with the results of QCA model.

The QCA model provides several major benefits to the research. First, the QCA model can address the problem of limited diversity because of the relatively small number of observations (N=46). In many instances, 46 states are not sufficient for the quantitative statistical control method. However, the majority of existing QCA research has been applied to research designs involving a small or intermediate-sized N. In other words, the total number of observations in this analysis are sufficient and appropriate for the QCA model of this analysis. Second, the QCA model simplifies the complex data structure by coding the interval-scale measure into 0 or 1, indicating the high or low level of each independent variable and dependent variable.

One more benefit of the QCA analysis is that it qualitatively shows how different types of combinations of causal conditions relate to the dependent variables. After identifying these combinations, the QCA model allows researchers to assess actual cases and compare the interaction terms among causal conditions in those cases. The model also allows more detailed examinations of these cases by exploring the relevance of certain other factors. Moreover, the conventional statistical analysis assumes that the relation between MLGS and PSE is linear. However, it is likely that the causal mechanisms linking these concepts follow a non-linear pattern. If this is the case, the QCA model can provide new insight into the understanding of how different interactions of MLGS are likely to affect the levels of public sector employment.

In this chapter, the first section introduces the measurement of variables and the data sources of the QCA model. The second section regards the QCA methodology, including the creation of a truth table, the coding of binary variables and the application of Boolean logic to develop the consistency scores and to indicate the types of configurations. The next section uses Boolean algebra to interpret the results in the truth table. In this section, the QCA model derives an equation for the configuration of causal conditions in relation to the dependent variable. The last section discusses the results.

## 5.2 Measurement and Data Collection in the QCA Model

For the QCA, the combination of four causal conditions and the dependent variable includes the same variables used in the regression model. Four major characteristics of a macro level governing structure in the integrated framework are identified as the causal conditions: 1) local government spatial fragmentation, which is measured as the number of total local governments per 1, 000 square miles; 2) inter-jurisdictional competition which is measured as the number of general purpose governments per 10,000 population; 3) jurisdictional overlap which is measured as the ratio of special districts to general-purpose governments; and 4) state-level fiscal decentralization which is measured as the percentage of local spending in the total state and local spending. In the integrated framework, these characteristics represent the total, horizontal and vertical dimensions of the state-local public sector (see Figure 3). Additionally, the outcome variable remains the level of public sector employment. The method of measuring this variable is the same as that used in the statistical model, which is the calculation of the total number of full-time equivalent public employees as a percent share of the total population.

The raw data is collected from the Census of Government (COG), which reports data on all types of state and local governments at five-year intervals, for years ending in 2 and 7. Specifically, county-level finance data and public employment data were collected for 1992, 1997, 2002, 2007 and 2012. All county-level data of the four MLGS variables and the public sector employment variable are aggregated into the state level for 46 states and obtained the mean values for the five variables at the state level. This sample size is most appropriate for the QCA model because it allows me to manage in-depth knowledge of each state and variations across states. It is important to note that Connecticut and Rhode Island are not included because counties in the two states are not counted as governments for Census Bureau purposes. Hawaii and Alaska are excluded because they are outliers at the state level of analysis.

## 5.3 QCA Methodology

Once the four variables of MLGS are identified and the data are collected to measure these variables, the first step is to sort all possible combinations of independent variables in relation to the dependent variable that exists in the data. Because the QCA method is based on the logic of combinational causation, it requires that cases should exhibit as many logically possible combinations of causal conditions as possible (Ragin, 1989). With four independent causal conditions, there are a total of 16 possible combinations (or types of configurations) that are represented in table VII. These four causal conditions should explain the outcome of interest, which is the level of public sector employment.

**TABLE VII**

TYPES OF CONFIGURATION OF MACRO LEVEL GOVERNING STRUCTURE CHARACTERISTICS

| Variables | X1 | X2 | X3 | X4 |
|---|---|---|---|---|
| Marco Level Governing Structure Combination Number | Spatial fragmentation (SPFRG or spfrg) | Inter-jurisdictional competition (COMP or comp) | Jurisdictional overlap (OVERLAP or overlap) | Fiscal decentralization (DEN or den) |
| Combination 1 | High | High | High | High |
| Combination 2 | High | Low | High | High |
| Combination 3 | High | High | Low | High |
| Combination 4 | High | Low | Low | High |
| Combination 5 | Low | Low | Low | High |
| Combination 6 | Low | High | High | High |
| Combination 7 | Low | Low | High | High |
| Combination 8 | Low | High | Low | High |
| Combination 9 | High | High | High | Low |
| Combination 10 | High | Low | High | Low |
| Combination 11 | High | High | Low | Low |
| Combination 12 | High | Low | Low | Low |
| Combination 13 | Low | Low | Low | Low |
| Combination 14 | Low | High | High | Low |
| Combination 15 | Low | Low | High | Low |
| Combination 16 | Low | High | Low | Low |

In contrast to the regression analysis, the QCA model requires all variables to be coded as dichotomous, indicating the high or low level of each independent variable and the dependent variable. In the QCA model, the dependent variable and the four causal conditions are scored as 1 for the high level of these variables and as 0 for the low level of these variables. As a result, all of the interval-level measures are dichotomized using a cutoff point that approximates the median value of each variable from the sample observations. Values higher than the median value of each variable are coded as 1, indicating a high level of measures, whereas values lower than the median value of each variable are coded as 0, indicating a low level of measures.

The next step is to construct a table that shows how each case is distributed on each configuration of MLGS variable found in table VII plus the dependent variable. Linking the binary output values in the data set for each of the 46 states with these 16 possible combinations (or types of configurations) presented in table VII. Then table VIII is created and shown state names, their combination numbers, and binary output values for these four causal conditions as various types of combinations, and shown the outcomes represented by a binary output with 1 representing a high level of public sector employment and 0 representing a low level of public sector employment. In table VIII, for example, the row for California shows the value of each of the four binary variables of MLGS for that state and that this combination is consistent with group no. 2 in table VII. Combination 2 is the configuration of high spatial fragmentation, low inter-jurisdictional competition, high jurisdictional overlap, and high fiscal decentralization. California belongs to combination 2 and has a high level of public sector employment. Washington also belongs to combination 2 and has a high level of public sector employment, according to table VIII.

**TABLE VIII**

STATE NAMES, COMBINATION GROUP NUMBERS, AND OUTPUTS

| State names | Combination No. | Conditions | | | | Outcomes |
|---|---|---|---|---|---|---|
| | | SPFRG | COMP | OVERLAP | DEN | PSE |
| ALABAMA | 15 | 0 | 0 | 1 | 0 | 0 |
| ARIZONA | 7 | 0 | 0 | 1 | 1 | 0 |
| ARKANSAS | 15 | 0 | 0 | 1 | 0 | 0 |
| CALIFORNIA | 2 | 1 | 0 | 1 | 1 | 1 |
| COLORADO | 6 | 0 | 1 | 1 | 1 | 1 |
| DELAWARE | 10 | 1 | 0 | 1 | 0 | 0 |
| FLORIDA | 7 | 0 | 0 | 1 | 1 | 0 |
| GEORGIA | 5 | 0 | 0 | 0 | 1 | 1 |
| IDAHO | 14 | 0 | 1 | 1 | 0 | 1 |
| ILLINOIS | 3 | 1 | 1 | 0 | 1 | 0 |
| INDIANA | 3 | 1 | 1 | 0 | 1 | 0 |
| IOWA | 8 | 0 | 1 | 0 | 1 | 1 |
| KANSAS | 3 | 1 | 1 | 0 | 1 | 1 |
| KENTUCKY | 10 | 1 | 0 | 1 | 0 | 0 |
| LOUISIANA | 13 | 0 | 0 | 0 | 0 | 1 |
| MAINE | 11 | 1 | 1 | 0 | 0 | 0 |
| MARYLAND | 10 | 1 | 0 | 1 | 0 | 0 |
| MASSACHUSETTS | 12 | 1 | 0 | 0 | 0 | 0 |
| MICHIGAN | 3 | 1 | 1 | 0 | 1 | 0 |
| MINNESOTA | 3 | 1 | 1 | 0 | 1 | 1 |
| MISSISSIPPI | 15 | 0 | 0 | 1 | 0 | 1 |
| MISSOURI | 1 | 1 | 1 | 1 | 1 | 0 |
| MONTANA | 14 | 0 | 1 | 1 | 0 | 1 |
| NEBRASKA | 1 | 1 | 1 | 1 | 1 | 1 |
| NEVADA | 7 | 0 | 0 | 1 | 1 | 1 |
| NEW HAMPSHIRE | 12 | 1 | 0 | 0 | 0 | 0 |
| NEW JERSEY | 12 | 1 | 0 | 0 | 0 | 1 |
| NEW MEXICO | 15 | 0 | 0 | 1 | 0 | 1 |
| NEW YORK | 3 | 1 | 1 | 0 | 1 | 1 |
| NORTH CAROLINA | 5 | 0 | 0 | 0 | 1 | 0 |
| NORTH DAKOTA | 11 | 1 | 1 | 0 | 0 | 1 |
| OHIO | 3 | 1 | 1 | 0 | 1 | 0 |
| OKLAHOMA | 16 | 0 | 1 | 0 | 0 | 1 |
| OREGON | 14 | 0 | 1 | 1 | 0 | 1 |
| PENNSYLVANIA | 11 | 1 | 1 | 0 | 0 | 0 |
| SOUTH CAROLINA | 13 | 0 | 0 | 0 | 0 | 0 |
| SOUTH DAKOTA | 16 | 0 | 1 | 0 | 0 | 1 |
| TENNESSEE | 7 | 0 | 0 | 1 | 1 | 0 |
| TEXAS | 7 | 0 | 0 | 1 | 1 | 1 |
| UTAH | 14 | 0 | 1 | 1 | 0 | 1 |
| VERMONT | 11 | 1 | 1 | 0 | 0 | 0 |
| VIRGINIA | 5 | 0 | 0 | 0 | 1 | 0 |
| WASHINGTON | 2 | 1 | 0 | 1 | 1 | 1 |
| WEST VIRGINIA | 10 | 1 | 0 | 1 | 0 | 0 |
| WISCONSIN | 11 | 1 | 1 | 0 | 1 | 0 |
| WYOMING | 6 | 0 | 1 | 1 | 1 | 1 |

To apply Boolean logic to the subsequent analysis, the QCA model creates a "synthesis" of the raw data table which is known as the "truth table". This table is defined as a table of configuration in which a given combination of conditions is associated with a given outcome (Rihoux and De Meur, 2008; p.44). Based on the result from table VIII, a truth table is generated and shown in table IX. This table shows how the 46 states are distributed on all combinations of the binary MLGS variables and PSE outcome, and the number of cases (states) with outcomes of high PSE and low PSE.

Table IX allows researchers to determine the causal relationships between the independent and dependent variables using scores of consistency and labels of consistency. The score of consistency shows the proportion of cases (e.g., states) with the outcome of high PSE among the number of cases in the same combination group. The calculating formula for the score of consistency is shown as follows: Score of consistency = Number of cases with high PSE/ (number of cases with high PSE and number of cases with low PSE). For example, combination 2 has 2 cases (e.g., California and Washington) with high PSE, and 0 case with low PSE, the score of consistency is calculated as 2/(2+0)=1, which means that the score of consistency for combination 2 is 1.

In order to conduct Boolean analyses, one column is used to show the label of consistency in table IX. There are four types of labels, including "high PSE", "low PSE", "mixed" and "remainder". All of the combination no. 2, no.6, no.8, no.14, and no.16 have the same score of consistency which is 1, indicating that they all belong to groups with outcomes of high PSE. These cases and these groups are referred as cases and groups with a consistency label of "high PSE", respectively. Combination no. 5, no.10, no.11 and no.12 with consistency scores of 0.33, 0, 0.20,

and 0.33 respectively are ascribed to groups with the consistency label of "low PSE". Combination no. 1, no.3, no.7, no.13, and no.15 are almost evenly distributed on high PSE and low PSE, thus these groups are referred as the ones with a consistency label of "mixed". Finally, 2 of the 16 combinations (e.g., combination 4 and combination 9) have no cases at all, and they are labeled as 'remainder' in the label of consistency column. These combination groups without any cases would not be used for the Boolean analysis to simplify configurations (Ragin, 2008).

After categorizing each combination group into groups with four different labels, QCA utilizes Boolean algebra which is based on combinatorial logic to determine the combinations of causal conditions in relations to the dependent variable and to simplify the causal conditions in order to discover the relevant factors. This means that a combination of causal conditions indicates that a high level or a low level of each characteristic of MLGS needs to be found together for the high or low levels of the outcome in any given case (Ragin, 1989). These actual cases and the combination of MLGS characteristics in those cases are identified to find out whether they are necessary or sufficient causes of the dependent variable or outcomes. These cases in the mixed type of configurations are compared to determine the reasons for the balanced number of cases and their differences in the data set.

**TABLE IX**

TRUTH TABLE [a]

| Group No. | MLGS Conditions | | | | Outcomes | | Scores of Consistency | Labels of Consistency |
|---|---|---|---|---|---|---|---|---|
| | SPFRG | COMP | OVERLAP | DEN | High PSE (N) | Low PSE (N) | | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0.5 | mixed |
| 2 | 1 | 0 | 1 | 1 | 2 | 0 | 1 | high PSE |
| 3 | 1 | 1 | 0 | 1 | 3 | 4 | 0.43 | mixed |
| 4 | 1 | 0 | 0 | 1 | 0 | 0 | remainder | remainder |
| 5 | 0 | 0 | 0 | 1 | 1 | 2 | 0.33 | low PSE |
| 6 | 0 | 1 | 1 | 1 | 2 | 0 | 1 | high PSE |
| 7 | 0 | 0 | 1 | 1 | 2 | 3 | 0.4 | mixed |
| 8 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | high PSE |
| 9 | 1 | 1 | 1 | 0 | 0 | 0 | remainder | remainder |
| 10 | 1 | 0 | 1 | 0 | 0 | 4 | 0 | low PSE |
| 11 | 1 | 1 | 0 | 0 | 1 | 4 | 0.2 | low PSE |
| 12 | 1 | 0 | 0 | 0 | 1 | 2 | 0.33 | low PSE |
| 13 | 0 | 0 | 0 | 0 | 1 | 1 | 0.5 | mixed |
| 14 | 0 | 1 | 1 | 0 | 4 | 0 | 1 | high PSE |
| 15 | 0 | 0 | 1 | 0 | 2 | 2 | 0.5 | mixed |
| 16 | 0 | 1 | 0 | 0 | 2 | 0 | 1 | high PSE |

[a] 1=the presence of high levels of variables, 0=the absence of high levels of variables.

## 5.4 The Analysis of the Truth Table with Boolean Logic

In this section, three sets of analyses are conducted based on the label of consistency in table 9. The first set of Boolean analysis includes 15 cases (states) in the groups with combination no. 5, 10, 11, and 12 to find necessary causal combinations and the minimized configurations of causal conditions for states with PSE = low as part of the data reduction process. In the second set, the Boolean analysis is conducted with 11 cases (states) in the groups with combination no. 2, 6, 8, 14, and 16 to discover necessary causal combinations and the minimized configurations of causal conditions for states with PSE = high as part of the data reduction process. The purposes of these two sets of analyses are to find out necessary and sufficient causal configurations and derive an equation that shows the causal conditions that produce low PSE and high PSE respectively.

In the third set of analysis, 20 cases with "mixed" labels in groups with combination no. 1, 3, 7, 13, and 15 are assessed by examining how these cases are related to six additional variables, including population density, the number of special districts, the number of school districts, economic development, state aid and state land area. For the two combination groups with labels of "remainder" in the consistency column, they display the condition of "limited diversity". When particular combinations of variables have no cases, it means that no inferences may be made about these conditions. Thus, no analysis would be made for these groups with labels of "remainder".

Notice that upper and lower letter is used as symbols for high and low levels of causal variables and outcome variable in this chapter. SPFRG represents a high level of spatial fragmentation; spfrg is a low level of spatial fragmentation. COMP represents a high level of inter-jurisdictional competition while comp represents a low level of inter-jurisdictional competition.

OVERLAP represents a high level of jurisdictional overlap, whereas overlap represents a low level of jurisdictional overlapping. DEN represents a high level of fiscal decentralization, while den is a low level of fiscal decentralization. PSE is a high level of public sector employment but pse is a low level of public sector employment.

The analysis begins with the configurations with low levels of public sector employment. As shown in the truth table 9, four types of configurations of MLGS variables are associated with the outcomes of a low level of public sector employment (labelled as "low PSE" in the label column of table 9). This means that each of these configurations (e.g., combination no.5, no.10, no.11 and no.12) leads to a low level of public sector employment for cases in corresponding groups. And each of them is a necessary causal configuration for the occurrence of the outcome of low PSE. Next, these combinations can be expressed using equations. For example, the following equation A is derived for the outcome of a low level of public sector employment, which includes four types of configurations of causal conditions.

pse (low level of public employment) = spfrg*comp*overlap*DEN+SPFRG*comp*OVERLAP*den+
SPFRG*COMP*overlap*den + SPFRG*comp*overlap*den (Equation A)

To interpret this equation, each set of variables represented by a multiplier (*) is a combination of causal conditions. When summed, each individual combination of causal conditions represents an "either/or" condition that is associated with a low level of public sector employment in equation A. The entire equation is the sum (+) of all possible combinations of causal conditions in relation to the dependent variable. In particular, variables represented by uppercase letters indicate the necessary and high level of a causal condition and variables

represented in lowercase letters indicate the necessary and low level of a causal condition in a combination.

Equation A helps derive a shorter and more concise expression on interactions of causal variables from a long and more complex expression to explain the occurrence of low level of public sector employment. It shows that a high level of spatial fragmentation AND a low level of fiscal decentralization (SPFRG*den) should be present together for the occurrence of a low level of public sector employment for the majority of cases. Among 15 cases within these four types of configurations, 12 cases have the outcomes of low PSE. For those 12 cases with low PSE, 83% of cases have the combination of SPFRG*den as a sufficient part of their configurations. Moreover, 76% of cases in the combination of SPFRG*den*comp*overlap lead to the outcome of a low level of public sector employment.

The second set of analysis includes 11 cases in which the label of consistency is high PSE. These 11 cases are distributed in 5 different groups of MLGS causal conditions; for example, group no. 2, no. 6, no.8, no.14 and no.16. Equation B is derived for the outcome of a high level of public sector employment, which includes 5 types of configurations of causal conditions. Each configuration of causal factors is the necessary but not sufficient combination for the occurrence of a high level of public sector employment.

PSE (high level of public employment) = SPFRG*comp*OVERLAP*DEN+ spfrg*COMP*overlap*DEN +spfrg*COMP*OVERLAP*DEN + spfrg*COMP*OVERLAP*den + spfrg*COMP*overlap*den (Equation B)

Similar analysis is conducted for the second set of groups to discover a shorter expression of combination of causal conditions that are presented for the outcomes to occur in the majority of 11 cases. A shorter expression of causal conditions is found for most of cases with the outcome of high PSE. (spfrg*COMP) appears in 9 of 11 cases (excluding 2 cases in combination group no.2) that produce the same outcome in the equation B. This suggests that 82% of cases within the second set of groups need to have a low level of spatial fragmentation AND a high level of interjurisdictional competition (spfrg*COMP) that has to be present together for the occurrence of a high level of public sector employment. This finding can be read as follows: the outcome of a high level of public sector employment is observed when the combination of a low level of spatial fragmentation AND a high level of interjurisdictional competition is presented in 9 out of 11 cases. These 9 states are Colorado, Idaho, Iowa, Montana, Oklahoma, Oregon, South Dakota, Utah, and Wyoming. Thus, the combination of a low level of spatial fragmentation AND a high level of interjurisdictional competition is necessary for these states to produce high levels of public sector employment. In addition, among these 11 cases within groups of combination no. 2, 6, 8, 14, and 16, all of the cases have the outcomes of high levels of public employment. This suggests that 100% of cases in each of these five types of configurations lead to high PSE. In other words, each of these configurations is a necessary combination for the occurrence of the outcome of a high level of public sector employment.

Using Boolean algebra, equation C is derived by combining the five configurations. Each type of the configuration group is a necessary but not sufficient causal configuration/path linked to the outcomes with a “mixed” label. Five types of configurations of causal conditions have a “mixed” symbol in the consistency column of table 9, indicating that there is a balance between

cases with outcomes of a high level of public sector employment and a low level of public sector employment.

Mixed outcomes=SPFRF*COMP*OVERLAP*DEN + SPFRG*COMP*overlap*DEN + spfrg*comp*OVERLAP*DEN + spfrg*comp*overlap*den + spfrg*comp*OVERLAP*den (Equation C)

The solution for coping with these combinations which produce mixed outcome is to examine and compare the cases of these groups in greater detail. Six variables, including state land area, intergovernmental grants from states to local governments per capita, state population density, the number of special districts and the number of school districts in states and personal income per capita, are added as conditions to the four causal conditions of a macro level governing structure. The same method for coding the MLGS variables is used to code these additional variables into dichotomous ones as 1 or 0 by using the cutoff points that approximate the median scores of these variables from the sample observations. Taking state land area as an illustration, 1 indicates large land area whereas 0 indicates small land area.

Table V shows the binary output values of these variables, cases under investigations in different types of configurational groups. 9 cases are states with the outcomes of high PSE, including Nebraska, Kansas, Minnesota, New York, Nevada, Texas, Louisiana, Mississippi, and New Mexico. The rest of 11 cases, including Missouri, Illinois, Indiana, Ohio, Michigan, Arizona, Florida, Tennessee, Alabama, and Arkansas, are states with the outcomes of low PSE. This analysis finds some similarities among the 20 cases with “mixed outcomes” from five different types of configurational groups in table V. All of the 20 cases display large land size

**TABLE X.**
BINARY OUTPUT FOR ADDITIONAL VARIABLES IN CASES WITH "MIXED OUTCOMES" [a]

| PSE | States | Land area | State aid | Population density | Special districts | Personal income | School districts |
|---|---|---|---|---|---|---|---|
| *Group No. 1* | | | | | | | |
| 1 | Nebraska | 1 | 0 | 0 | 0 | 1 | 1 |
| 0 | Missouri | 1 | 0 | 0 | 0 | 0 | 1 |
| *Group No. 3* | | | | | | | |
| 1 | Kansas | 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | Minnesota | 1 | 1 | 0 | 0 | 1 | 1 |
| 1 | New York | 1 | 1 | 1 | 0 | 1 | 1 |
| 0 | Illinois | 1 | 0 | 1 | 0 | 0 | 1 |
| 0 | Indiana | 1 | 0 | 1 | 0 | 0 | 0 |
| 0 | Ohio | 1 | 1 | 1 | 0 | 0 | 1 |
| 0 | Michigan | 1 | 1 | 1 | 0 | 0 | 1 |
| *Group No. 7* | | | | | | | |
| 1 | Nevada | 1 | 1 | 0 | 0 | 1 | 0 |
| 1 | Texas | 1 | 0 | 0 | 0 | 0 | 1 |
| 0 | Arizona | 1 | 1 | 0 | 0 | 1 | 1 |
| 0 | Florida | 1 | 0 | 1 | 0 | 0 | 0 |
| 0 | Tennessee | 1 | 1 | 1 | 0 | 0 | 0 |
| *Group No. 13* | | | | | | | |
| 1 | Louisiana | 1 | 1 | 1 | 0 | 0 | 0 |
| 0 | South Carolina | 1 | 0 | 1 | 0 | 0 | 0 |
| *Group No. 15* | | | | | | | |
| 1 | Mississippi | 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | New Mexico | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | Alabama | 1 | 0 | 1 | 0 | 0 | 0 |
| 0 | Arkansas | 1 | 0 | 0 | 0 | 0 | 0 |

[a] 1=high public sector employment level, 0=low public sector employment level.

and small number of special districts. The two factors can be recognized as the necessary and common causal conditions for the occurrence of the "mixed" outcome. In such circumstance, the addition of the two factors could not help each of the five groups to distinguish the cases with contrasting outcome. However, they may be the critical factors that leading these cases to have "mixed" outcomes because they are closely connected with the measures of spatial fragmentation and jurisdictional overlap. Spatial fragmentation is measured as the number of local governments per land area, while jurisdictional overlap is measured as the ratio of special districts to general purpose governments. If a jurisdiction with large land area has few special districts, the measures of spatial fragmentation and jurisdictional overlap are largely determined by the number of general-purpose governments which may vary from jurisdictions to jurisdictions. This may explain the mixed outcomes for different jurisdictions.

Among these five types of configurational groups, combination 3 has the largest number of cases with "mixed" outcomes. In combination 3, all of the seven cases are characterized by the combination of a high level of spatial fragmentation, a high level of interjurisdictional competition, a low level of jurisdictional overlap and a high level of state-level fiscal decentralization (SPFRG*COMP*overlap*DEN). However, there are some variables in three additional causal factors, such as per capita income, the population density and state aid, for the seven cases in combination 3. For instance, Minnesota and New York have high personal income per capita, whereas Illinois, Indiana, Ohio and Michigan have low personal income per capita. The addition of personal income per capita informs us that the presence of high level of economic development is a necessary factor for three cases (Kansas, Minnesota, and New York) in the combination 3 to generate the outcome of a high level of public sector employment.

The population density, which is measured as the total population per square miles, is also used to differ the seven cases in combination 3. Greater population density is seen in Illinois, Indiana, Ohio and Michigan with a low level of public sector employment; whereas the population density is smaller in Kansas and Minnesota which have the outcome of a high level of public sector employment. The exception is New York which has a high population density but its outcome is a high level of public sector employment. In this case, New York is different from Illinois, Indiana, Ohio and Michigan because it has higher personal income per capita than that of these four state.

Only two cases are found in each of the following groups: combination 1 and combination 13. In the group of combination 1 with (SPFRG*COMP*OVERLAP*DEN), Nebraska and Missouri display the contrasting outcomes. Nebraska with high personal income has high PSE while Missouri with low personal income has low PSE. The only factor helps distinguish the two states in combination 1 is the personal income per capita as shown in table X. On the contrary, Louisiana and South Carolina are characteristic by the combination 13 with (spfrg*comp*overlap*den). In this combination 13, the level of state aid is a critical factor which distinguishes the outcomes of the two cases. Louisiana with the outcome of a high level of public sector employment has a high level of state aid, whereas South Carolina with a low level of public sector employment has a low level of state aid.

In addition, combination 1 with high level of a combined macro level governing structure show low population density (=0) and large number of school districts (=1). Compared to the combination 1, states in the combination 13 with low level of a combination macro level governing structure have higher population densities and fewer school districts. Two factors such as

population density and number of school districts also aid the type of configuration of MLGS variables to compare these states and their outcomes in public sector employment levels.

## 5.5 Discussion

As a supplemental method to the statistical analysis, the results of the QCA model not only complicate our understanding about the effects of these causal conditions of a macro level governing structure on public sector employment, but also provide new insight in terms of how combinations of causal factors affect the levels of public sector employment. One significant feature of the QCA model, which is different from the regression model, is that it clearly highlights whether multiple interactions of macro level causal conditions shape the outcomes. The QCA analysis revealed four types of configurations of four MLGS variables that lead to low PSE. It is important to highlight that the QCA analysis suggests asymmetrical causality in which configurations leading to high PSE are different from the ones leads to low PSE.

Given these different types of configurations of MLGS variables, the QCA approach reveals functionally equivalent causal paths (configurations) to two different levels of public sector employment. The QCA model has clearly shown that the combination factors lead to high PSE is different from the ones that lead to low PSE. This feature is very different from the conventional regression analysis and suggests the comparative nature of the QCA model. The QCA model regarding the outcome of high PSE indicates that there are five types of configurations of macro level governing structure variables that lead to high PSE. Each of the five MLGS configurations is essential for the occurrence of the outcome of high PSE, suggesting that each of the five types of configurations is a necessary condition for the outcome of high PSE. Among the five

combinations, cases in the combination of a low level of spatial fragmentation, a high level of interjurisdictional competition, a high level of jurisdictional overlap and a low level of fiscal decentralization (spfrg*COMP*OVERLAP*den) are more likely than cases in other four types of configurations to result in the outcome of high PSE. For the majority of cases with the outcomes of high PSE in this set of analysis, a shorter expression of a combination between a level of low spatial fragmentation and a high level of interjurisdictional competition (spfrg*COMP) must be present together for the five types of configurations that lead to the occurrence of outcomes of high PSE.

The QCA model regarding the outcomes of low PSE suggests that four types of configurations of MLGS variables are associated with the outcome of low PSE. Each of the MLGS configurations is a necessary condition for the occurrence of the outcome of low PSE. Among the four configurations, cases in the combination of a high level of spatial fragmentation, a low level of interjurisdictional competition, a high level of jurisdictional overlap and a low level of fiscal decentralization (SPFRG*comp*OVERLAP*den) are more likely than cases in other three types of configurations that lead to the outcome of low PSE. For most of cases in this set of analysis for the outcome of low PSE, a shorter expression of the combination between a high spatial fragmentation and a low fiscal decentralization (SPFRG*den) must be present together for the occurrence of low PSE. The QCA model reveals interesting results in terms of configurations of MLGS variables and expands the understanding of the effect of macro level governing structure variables on the outcome of public sector employment.

The finding in the QCA model is configurational in nature. Two shorter expressions of the combinations of macro level governing structure variables are identified as the sufficient part of

the configurations for the majority of cases with the outcomes of high PSE and low PSE, respectively. As discussed above, the combination of a low spatial fragmentation and a high interjurisdictional competition (spfrg*COMP) accounts more for high PSE while the combination of a high spatial fragmentation and a low fiscal decentralization (SPFRG*den) seems to be more important for cases with outcomes of low PSE. The conventional regression analysis finds that less spatial fragmentation is associated with higher levels of public employment, and more intense competition between general-purpose governments is associated with high levels of public employment. In the regression analysis, the effects of spatial fragmentation and interjurisdictional competition on public employment are independent with each other. However, the QCA model identifies that less spatial fragmentation combined with more intense competition would lead more states to have higher levels of public employment. Thanks to the QCA analysis, the interactions between macro level governing structure variables are revealed. The QCA analysis has greatly deepened our understanding of the macro level governing structure by finding the different types of configurations of MLGS variables.

A common MLGS variable identified by the two sets of QCA models and appeared in both of the shorter expressions of combinations (e.g., spfrg*COMP and SPFRG*den) for the occurrence of the outcomes of high PSE and low PSE is spatial fragmentation. It is measured as the number of all types of local governments per square miles, and represents the total dimension of local government fragmentation. In the above analysis with regards to the shorter expressions of combinations, we find that cases having high levels of spatial fragmentation combined with low levels of fiscal decentralization (SPFRG*den) as a sufficient part of the four configurations are more likely to generate the outcomes of low levels of public sector employment (low PSE), whereas cases having low levels of spatial fragmentation combined with high levels of

interjurisdictional competition (spfrg*COMP) as a sufficient part of the five types of configurations are more likely to generate the outcomes of high levels of public sector employment (high PSE). This result with regards to spatial fragmentation is consistent with the finding in the regression analysis in that spatial fragmentation has a negative effect on public sector employment levels. This means that a higher level of spatial fragmentation is associated with lower levels of public sector employment; or a lower level of spatial fragmentation is associated with higher levels of public sector employment. Linear regression and the QCA model show a similar effect of spatial fragmentation on state and local levels of public sector employment.

More in-depth investigations have been conducted to determine why these states have "mixed" outcomes. Population density, state aid and personal income levels matter in explaining these cases in the contradictory configurations. For example, three states with a high level of public sector employment (Kansas, Minnesota and New York) and four states with a low level of public sector employment (Illinois, Indiana, Ohio and Michigan) are all present in the combination 3. These seven cases within the same combination group have the same combination of macro level governing structure variables but display contrasting outcomes. It is interesting to find that Kansas, Minnesota and New York with a high level of public sector employment have high level of personal income per capita and low population density. In contrast, Illinois, Indiana, Ohio and Michigan with low level of public sector employment have low level of personal income per capita and high population density. This example shows how the addition of other variables help find critical factors that produce the contrasting outcomes for cases within the same combination group. Despite differences, adding other causal factors also help find some similarities among states with different types of configurations. All of the 20 cases with the "mixed" outcomes have large land

area and small number of special districts. In this perspective, it is important to examine these 20 cases with the “mixed” outcome separately and find out differences and similarities for the cases.

# 6. CONCLUSION

## 6.1 Summary of the Research

This dissertation examines fiscal federalism theories to explain how different characteristics of a macro level governing structure affect the level of public sector employment in the U.S. The research combines the Leviathan theory, Oates' fiscal decentralization theorem, the Tiebout model and Berry's common pool model into one concise theoretical framework and applies this integrated framework to empirical research. By integrating fiscal federalism theories into one concise theoretical framework, this framework not only describes the interactions of different types of local governments and the competitive relationships and allocation of responsibilities among local governments but also the structural relations of states and local governments. The research question in this dissertation is the following: what are the impacts of a macro level governing structure on public sector employment at the state and local level in the U.S.? This research question has been explored within a more comprehensive and systematic framework in the dissertation.

First of all, this dissertation contributes to a better theoretical understanding of the complexities of a macro level governing structure. The dissertation adopts Hendrick's (2011) macro level institutional governance framework as the basis for the public sector structure and integrates Berry's conception of jurisdictional overlap in the common pool model. The macro level framework (Hendrick, 2011) was initially used to understand how the macro level governing structure affects financial decisions, such as what service to provide and how to fund the service (Hendrick et al., 2011) as well as how governments interact with each other to solve financial problems. The newly established macro level framework could also be considered as a tool to

explore the governing structure, especially is useful to explore issues related to the state-local governing relations in states or inter-local governing relations within the same geographical areas. Under this newly established framework, there are four major characteristics, including fiscal decentralization, local government fragmentation, interjurisdictional competition, and jurisdictional overlap. They represent the total, horizontal and vertical dimensions of a macro level governing structure at the public sector of the U.S.

Next, the analysis in this dissertation is a combination of qualitative and quantitative, which is much more comprehensive than that found in prior literature. A mixed-methods approach has been used to find out the relation between four characteristics of a macro level governing structure and government size; this is measured by the levels of public sector employment. The first method is to explore the total, vertical and horizontal dimensions of a macro level governing structure and their independent impacts on public sector employment at the county level using the regression analysis. This analysis is based on the established theoretical framework which integrates fiscal federalism and government competition literature that provide important insights about government structure. The second test is conducted at the state level and provides results from the qualitative comparative analysis, which is based on Boolean comparative logic. The qualitative comparative analysis (QCA) model provides an analysis in a non-linear pattern and investigates such relation through multiple interactions of causal conditions in relation to the dependent variables.

Many researchers have explored the impact of fiscal federalism on government size which is measured by expenditure or tax revenue burden relative to income or population. Descriptively, research on fiscal federalism documents the actual effects of different fiscal governing structures

on the provision and production of public goods and services to help derive conclusions about the level (and type of government) at which different functions should be located to be more efficient or equitable. A review of research in this area shows a large body of empirical and theoretical work that examines the effects of different vertical systems of revenue generation, spending, and revenue sharing between levels of government on the spending and revenue burden of all governments in the system (Bahl, 1984; Oates, 1972, 1977; Gramlich, 1997; Sjoquist, 2003). There is also a large body of literature that examines fiscal relationships between governments at the same level (horizontal), including studies of competition and collaboration between governments in metropolitan regions. The work by Charles Tiebout (1956) on the effects of competition between local governments is one of the most well-known of this group, and there is also research on the effects of overlapping local governments on total spending and revenue burden at the local level (Campbell, 2004; Berry, 2008; Turnbull and Djoundourian,1994).

## 6.2 Research Findings and Implications

The quantitative portion of the dissertation specifically investigates the impact of different total, vertical and horizontal governing structures on the levels of local public employment. The empirical model is tested by the ordinary least squares analysis, the fixed effects regression and two stage least square regression with two instrumental variables using panel data that consists of 3,031 counties in the U.S. for five-year intervals from 1992 to 2012. Consistent results are found by using different estimations, and these analyses show that an increased level of state fiscal decentralization is significantly associated with larger labor inputs in the production of public services. Moreover, the total dimension of local government fragmentation reduces the levels of public employment, whereas the vertical and horizontal dimensions of local government

fragmentation lead to the growth of public sector employment at the county level. In addition, the regression model finds that local economic conditions, population density, intergovernmental grants to local governments, unemployment rate and service demand variables are all associated with public employment levels. However, the difference between public wages and private wages or the enactment of laws favorable to public employees has no significant effect on the levels of public sector full-time equivalent employees.

The conventional wisdom about the effect of a fiscally decentralized structure and local government fragmentation on public employment may be partially accurate: as the degree of fiscal decentralization increases, the levels of public sector employment increase. When local governments deliver a higher level state-local services, they need more employees to do this compared to states in which state governments deliver a higher level of state-local services. On the one hand, the shift of service responsibilities from higher levels of governments to lower levels of governments result in this outcome. The public goods demanded by community residents at the local level perhaps require more labor-intensive services such as education, health, and protection. On the other hand, the consequence could be less efficient government management and higher cost of the labor force when lower levels of local governments do not fully take responsibility for budget decisions.

Despite the findings on fiscal decentralization, this study has some important results and implications with regards to local government fragmentation. The finding on overlapping jurisdictions confirms the argument that higher number of special districts relative to general-purpose governments would increase the levels of public sector employment as a consequence of the common pool problem. Berry's common pool model emphasized that "over-exploited"

problem resulted from the growing number of special districts and the overlapping structure of special districts to general-purpose governments. Furthermore, this analysis supports the argument that jurisdictional overlap may undermine efficient outcomes from the inter-jurisdictional competition. The proliferation of special districts affects total public employment and can thus be seen as causes for the increase in public employment.

Obviously, the growth of public employment is at odds with the conventional theories. From this perspective, it is argued that the benefit of local government fragmentation is still subject to debate. Theoretically, the Tiebout-style competition should promote more efficient service delivery among local governments and be considered as a powerful limit on government expansion. Yet, there is little evidence to support this theoretical argument. The result contradicts the notion that inter-jurisdictional competition among general-purpose governments has a constraining effect on the growth of local government when the government size is measured by the levels of public employment. In contrast, the result implies that the competition between general-purpose governments (mainly municipalities) would require more labor input in the production of public goods and service. In other words, the positive effect of jurisdictional competition on local public sector employment levels has challenged Brennan and Buchannan's competition hypothesis, the Leviathan theory, and the Tiebout model.

When linking the competition using the Tiebout model, it appears that more labor inputs are required to produce public goods and provide public services to satisfy the needs of local community residents. More service demands may provide an explanation for higher levels of public employment. Fiscal decentralization, as described by Oates, does not constrain the growth of local public employment. It is obvious that local public sector employment may grow faster in

a decentralized state. When fiscal and service responsibilities are decentralized from states to local governments, the governments must employ more people to serve the local community. Brennan and Buchanan's model and the Leviathan theory imply that fiscal decentralization and intense jurisdictional competition can help avoid the excessive growth of governments and limit a jurisdiction's monopoly power. According to the results of the statistical analysis, fiscal decentralization and competition cannot be considered as a powerful constraint on Leviathan and the expansion of the governments. It is unlikely that fiscal decentralization could bring in innovation or efficiency for public employment levels at the state and local public sector in the U.S.

To supplement the results of the regression analysis, the second test is conducted at the state level and provides results from the Qualitative Comparative Analysis (QCA). The QCA method compares different combinations of characteristics of a macro level governing structure in relation to public sector employment. This approach is also used to explore the complexities of a macro level governing structure and its relationship with public sector employment. It compares different combinations of characteristics of a macro level governing structure in relation to public employment at the state level, then utilizes Boolean algebra to investigate the causal conditions using a data reduction process; thus, the solutions or the outcomes are evaluated based on combinatorial logic.

The results of the QCA model provide more knowledge regarding the interactions of causal conditions in relation to state public employment levels. The entire analysis and the results show that the multiple configurations of characteristics of a macro level governing structure explain the growth of government size. More importantly, the qualitative comparative analysis model

compares and presents different types of configurations of the macro level governing structure variables in relation to high and low levels of public sector employment. For example, five types of configurations of MLGS variables are closely related to the outcome of high PSE while four types of configurations of MLGS are associated with the outcome of low PSE. These causal configurations are difficult to be captured with conventional regression analysis. After comparing these diffident types of causal configurations related to two different outcomes, this analysis finds that the configurations of causal conditions leading to the high level of PSE and the low level of PSE are different. The results in the QCA analyses also point to the influence of the population density, state aids and economic development on the level of public sector employment in states.

Linking the QCA to the conventional statistical analysis, the entire analyses in this research dissertation are much more comprehensive than what has been presented in previous studies that only focus on one feature of a macro level governing structure such as either fiscal decentralization or local government fragmentation and its independent effect on the government size. Both the regression model and the qualitative comparative analysis model uncover the relation between these macro level governing structure characteristics and public sector employment levels.

To a large extent, the distribution of public sector employment is associated with the population density and the service demands of local residents. In the statistical results, population density and service demands have significant and positive effects on levels of public employment. In the comparative analysis, the comparison across states with the opposite outcomes indicate that population density could be a reason for states to have different levels of public sector employment. The results of the statistical analysis provide evidence to support that population-related variables have significant influences on the size of the local public sector. Changes in the age distribution

of the population may also affect the demands for public goods, according to the population component variables in the regression model. Having a larger share of population under 18 years and above 65 years of age significantly increases the local public employment. Population change also significantly affect the public sector employment levels.

From the public management perspective, public government managers can focus less on the public and private wage difference. In the regression model, there is no significant relation between this variable and the dependent variable. Theoretically, private institutions may be attractive to public employees if there is a large difference between the public wage and the private wage. However, we did not find this to be the case in this analysis.

## 6.3 Limitations and Directions for Future Research

Research evidence provided by the quantitative analysis points to certain directions for future research on local governing structure in the United States. More work is needed to understand why inter-jurisdictional competition between general-purpose governments results in a negative effect on public employment, whereas local governmental spatial fragmentation has a positive effect. This study has offered initial ideas but readily acknowledges that the research design and data limit the ability to offer definitive answers to this question. Constrained by the availability of data, this regression model does not explain the impacts of outsourcing which is a serious limitation in this dissertation, future research could include the effects of the outsourcing of public sector employment at the county level, the study of macro level governing structure at other levels of local government such as municipalities, or the effects of a macro level governing structure on public employment by types of service functions. Given that a significant portion of

full-time public employees in education-related positions, future research could focus more on the impact of a macro level governing structure on education and non-education public sector employment[17]. Moreover, a substantial number of counties have experienced population declines in the past several decades (Berry et al., 2012). Thus, future research can explore whether public sector employment expands in counties with population growth or declines. All of these factors can help researchers and policy makers to increase their knowledge regarding the expansion of state and local governments in the U.S.

It is obvious that the results of the qualitative comparative analysis provide more knowledge regarding the interactions of causal conditions in relation to the public employment. The entire analysis and the results show that the multiple interactions of characteristics of the macro level governing structure also explain the growth of government size. One limitation of the qualitative comparative analysis is that certain contradictory configurations have no cases or have a balance of cases. Although the advent of these contradictory configurations does not mean the failure of the research, it may address some issues of the analysis or may provide information regarding the cases. Certain modifications have been made in the qualitative comparative analysis model to facilitate the analysis and reduce complexities; however, future research may determine a better solution to such issues. The issue of limited diversity has occurred in the combinations without cases, and we provide no solutions to these combinations. Future research may want to obtain more knowledge regarding these cases and facilitate the process of "dialogue between ideas and evidence" (Ragin, 1987). Finally, the qualitative comparative analysis in this dissertation has

[17] This research also conducted some analyses on the non-educational full-time equivalent employees at the county level, the results for the four major characteristics of MLGS were similar to those in the fixed effects for all counties.

presented the importance of “net effects” in research practices, and the possibility of assessing relations between variables in a nonlinear manner. Future research can focus on more qualitative analysis and explore the potential of comparative analysis for answering research questions instead of focusing on quantitative analysis.

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# VITA

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## EDUCATION

Ph.D., Public Administration 2016
Department of Public Administration
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M.A., Public Administration with Certificate on Conflict and Collaboration 2010
Syracuse University, Syracuse, New York

B.A., International Studies 2008
University of Nottingham

## PUBLICATION

Yu Shi. 2016. "State Budget Shortfalls and Budget Balancing Strategies During and After the Great Recession of 2008." *Journal of Public Budgeting, Accounting and Financial Management*, 28 (1).

Rebecca Hendrick., Yu Shi. 2015. "Macro-Level Determinants of Local Government Interaction. How Metropolitan Regions in the United States Compare". *Urban Affairs Review*, 51 (3).

## PROFESSIONAL AFFILIATIONS

Association for Budgeting and Financial Management (ABFM)
American Society for Public Administration (ASPA)
Public Management Research Association (PMRA)
Association for Public Policy Analysis and management (APPAM)
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## TEACHING

University of Illinois at Chicago 2010-2013
Instructor for Public Budgeting and Financial Management (undergraduate level)
Teaching Assistant and Lecturer for Data Analysis for Public Administration (graduate level)

## AWARDS

Donald C. Stone Award (finalist), 2016
UIC Presenter Award, 2015 &2016
The Graduate School Council Travel Award, 2014 & 2015 &2016
Maxwell Tuition Scholarship, Syracuse University, 2009
Maxwell Professor Scholar Award, Syracuse University, 2008