Metropolitan Governance Matters:
The Low Economic Performance of Metropolitan Cities in South Korea

Sung-Bae Kim*

Abstract: This study undertakes an empirical analysis to identify the determinants of the low economic performance of major metropolitan cities in Korea. Using panel data of the metropolitan cities between 2000 to 2016, I carried out ageneralized least square estimation and obtained the following results. First, traditional explanatory variables such as capital investment, labor force, and R&D investments are highly significant with positive expected signs. Second, national-level governance arrangements for the metropolitan cities have negative impacts on the economic performance of the cities. Last, the impacts of subnational governance arrangements on economic performance are not entirely conclusive. These pieces of evidence suggest that improving the economic performance of the metropolitan cities may require a restructuring of the current framework of metropolitan governance.

Keywords: metropolitan governance, economic performance, metropolitan cities, panel data analysis

INTRODUCTION

One peculiar aspect of the Korean territorial development pattern is the low economic performance of major metropolitan cities, such as Busan, Daegu, Incheon, Gwangju, and Daejeon. The ratios of per capita GRDP in these cities to the national average were mostly below 1 in 2014; in the case of Daegu, the ratio amounted to

just 0.63. Given the nature of urban areas, this pattern is unusual. If the market works correctly, the ratios ought to be much higher than the national average, because most metropolitan cities have advantages in economies of agglomeration, labor force skill, and innovation capacity, to name just a few. The ascendancy of the metropolitan cities is the pattern usually found in most OECD metropolitan regions, and thus the pattern in Korea is a perplexing one.

While the Korean territorial development pattern is unusual given the economic advantages of metropolitan cities, there is another factor that makes the pattern a kind of puzzle. This factor has to do with the legal status of metropolitan cities in Korea. Originally, the central government designated metropolitan cities to cope with the country's rapid urbanization and economic growth, giving a broad range of competencies and resources to selected cities with a population of over one million. Currently, metropolitan cities enjoy a special legal status that puts them on the same footing as the highest level of subnational government, the province. Therefore, their power and budget are much more significant than that of most other metropolitan area governance bodies in OECD countries (Ahrend & Schumann, 2014). Even in practice, there is not much difference in terms of power between metropolitan cities and the capital city of Seoul. In light of these strengths, the economic stagnancy of these metropolitan cities is indeed baffling.

In this study, I attempt to explain the puzzle of the economic stagnancy of metropolitan cities. Specifically, I carry out an empirical analysis to identify the major determinants of it. The fundamental hypothesis is that the national metropolitan governance structure is the primary cause. The central government established the governance structure to alleviate the spatial disparity created by the rapid economic development of Korea. The two approaches the central government adopted have been to reduce concentration in the capital region and promote a balanced growth in all provinces, often at the expense of the metropolitan cities. Although seemingly innocuous, these methods have been detrimental to the economic performance of the metropolitan cities. Without such a governance structure, these cities would have been more productive than the national average, as indicated by the performance most major cities of OECD countries.

This paper is structured as follows. In the next section, I present descriptive evidence regarding the stagnant economic performance of the metropolitan cities. I then describe the conceptual framework of this study, undertaking a review of the literature review and explaining the nature of metropolitan governance in Korea. The third section develops an empirical strategy for estimating the relationship between metropolitan governance arrangements and economic performance using panel data analysis. The fourth section presents and discusses the main result of the empirical analysis. The final section highlights the main conclusion and draws some policy implications.

DESCRIPTIVE EVIDENCE

There is substantial evidence that metropolitan cities usually perform economically better than provincial cities (Brookings Institution, 2007, 2008; Melo, Graham, & Noland, 2009; OECD, 2015b). One study from the early 2000s, for example, indicated that doubling the size of a city would likely increase productivity by an amount that ranges from roughly 3-8% (Rosenthal and Strange, 2004). However, the evidence we find in Korea does not fit this mold.

The descriptive statistics in figure 1 illustrate that the per capita GRDP of metropolitan cities such as Busan, Daegu, Incheon, Gwangju, and Daejeon is much lower than the national average. Of these cities, Daegu's is the lowest, amounting to about 63% of the national average. Even Seoul's is about the same as the national average. This stagnancy is unusual given that metropolitan cities have the status of the highest level of subnational government with far-reaching powers and larger budgets than most other cities in Korea.

Figure 1. The Ratio of Regional to National per Capita GRDP in Metropolitan Cities, 2014
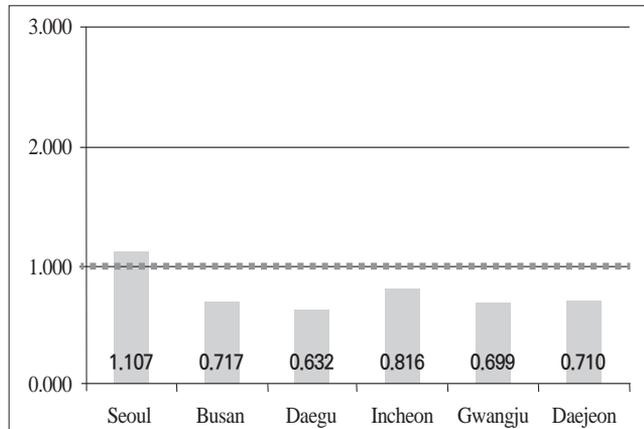
The rather unusual GRDP of the metropolitan cities raises the question of how it stacks up against that of other geographical units in Korea. Figure 2 compares the ratio with that of the provinces and the special cities (cities that have more legal authority in terms of administrative and financial matters than an ordinary city) with a population of over 500,000 inhabitants. This comparison reveals that of GRDP of the provinces is generally higher than the national average except for Gyeonggi and Jeonbuk. Considering the mostly rural nature of these provinces, this

state of affairs is rather striking. Of particular interest is the relatively low ratio of Gyeonggi province, which is considered an economic powerhouse of Korea in many respects. Most manufacturing firms tend to establish headquarters in the region because of its proximity to Seoul, which is the largest market in Korea. Figure 2 also shows the comparison with the ratio of the special cities. Again, it is surprising to see that the ratio for most special cities is higher than the national average, except for Cheongju. The exceptionally high level of Whasung is likely due to the relocation of Samsung Electronics facilities to the city. The relatively low level of Cheongju can be explained by the recent consolidation of the city with Chungwon county, which is mostly a rural area.

Figure 2. The Ratio of Regional to National per capita GRDP in the Provinces and Special Cities (Cities with a Population of over 500,000), 2014
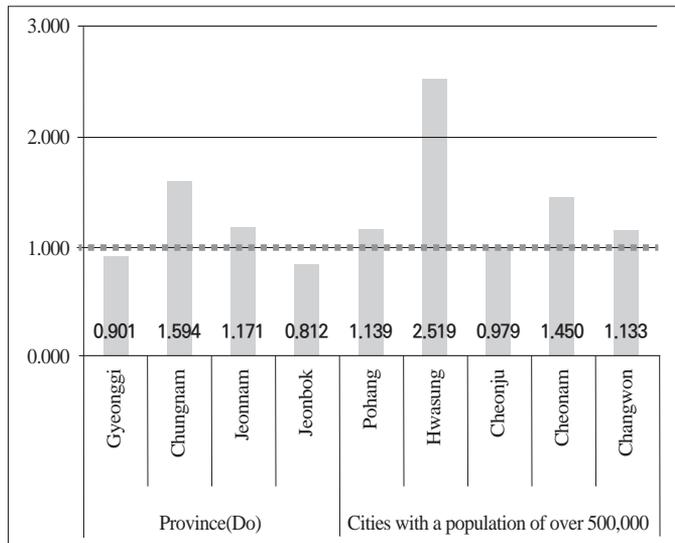
In order to determine whether the pattern of the ratio of the metropolitan cities is temporary, I examined the trend of the ratio over 14 years (from 2000 to 2014). As shown in Figure 3, the pattern has been very consistent over the period. Furthermore, the pattern for most of the metropolitan cities has a slight downward trend, and thus the gap between GRDP in these cities and the national average continues to grow. Even Seoul shows a long-term downward-moving trend, even though its ratio is higher than the national average. Incheon, the traditional manufacturing center of Korea, also has a consistently lower ratio than the national average and likewise shows a downward-moving trend.

Figure 3. Trends in the Ratio of Regional to National per capita GRDP in Metropolitan Cities, 2000-2014.
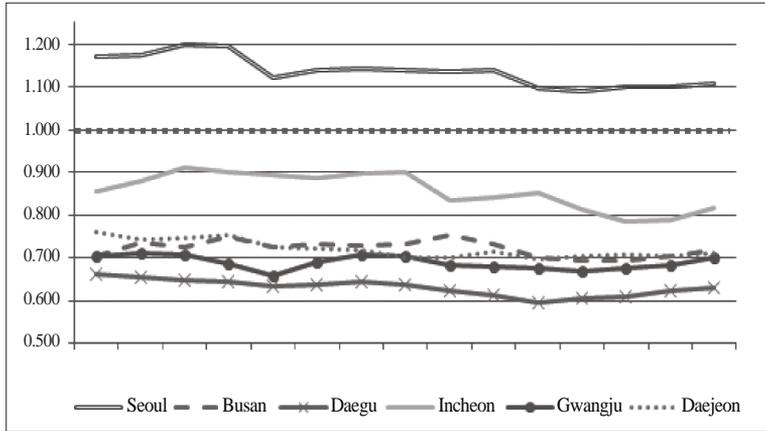
For comparison, I examined the trends of other geographical units, which figure 4 documents. The ratio in the provinces has generally been higher than the national average since 2000 and shows a slightly upward-moving trend. Of particular significance is the pattern of the ratio for Gyeonggi province, which is slightly lower than the national average, and the trend has been downward moving downward over the entire period. This pattern is concerning given that Gyeonggi province is widely considered to be the economic powerhouse of Korea.

Figure 4. Trends in the Ratio of Regional to National per Capita GRDP in Selective Provinces and Special Cities, 2000-2014.
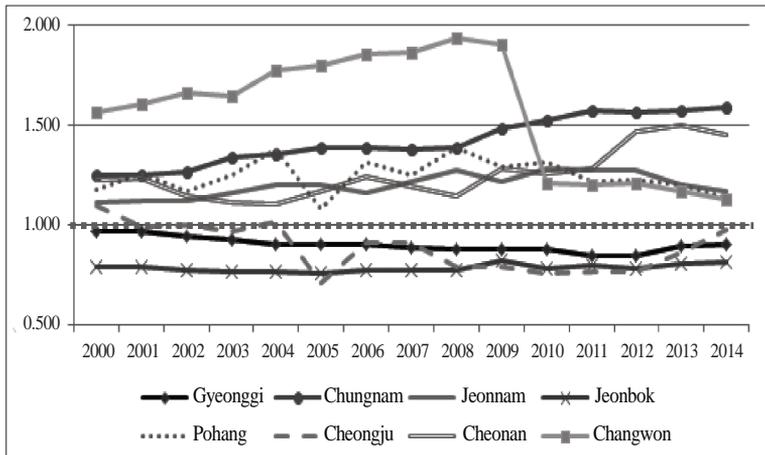
I also examined the trends for several special cities. The trends for these cities appear diverse. Changwon, the major manufacturing center of Kyungnam province, shows a volatile tendency. While its ratio is much higher than the national average, there has been an abrupt decline since 2009. This decline may be the result of the merging of Changwon with neighboring cities, including Masan and Jinhae. After the merger, Changwon became a new integrated city with a population equal to those of other metropolitan cities. In contrast, we can see a steady upward-moving trend in Cheonan. Because of its proximity to the Seoul metropolitan area and the extension of the subway from Seoul, the economic condition of Cheonan has improved substantially.

While it is remarkable that the ratio for the metropolitan cities in Kore is lower than those of provinces and special cities, more striking is the comparison with Tokyo, New York, Boston, London, Paris, Berlin, Rome, and Madrid, which figure 5 shows. As expected, except for Tokyo and Berlin, the ratio of the cities is much higher than the national average. Of these, Boston's ratio was the most conspicuous, almost twice the national average. Even for Tokyo, the ratio was much higher than in other cities in 2000. The predominance of these cities is what we should expect as most theoretical and empirical studies of the urban economy suggest.

Figure 5. The Ratio of Regional to National per Capita GRDP in Selective OECD Metropolitan Cities, 2000, 2011
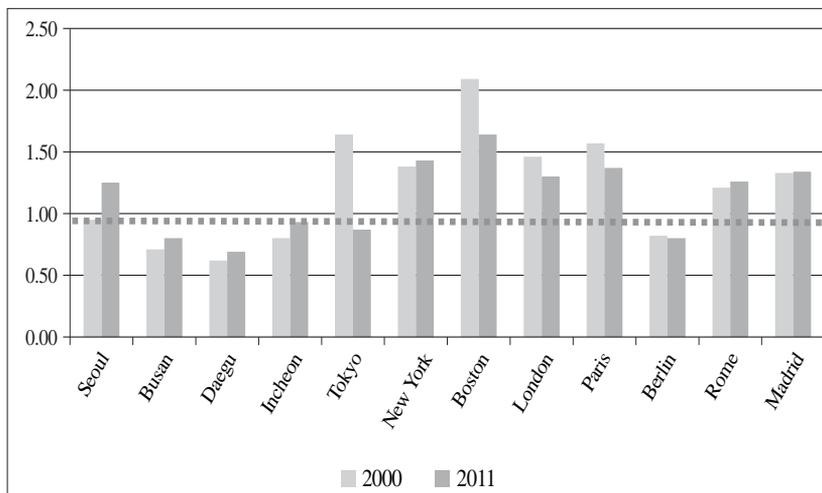
CONCEPTUAL FRAMEWORK

In this section, I review literature in the field that helps illuminate the general relationship between the economic performance of metropolitan cities and metropolitan governance, and I describe the specific features of metropolitan governance in Korea. Both these general and specific aspects inform the conceptual foundation of this study.

Literature Review

This study aims to identify possible causes for the economic stagnancy of the metropolitan cities in Korea. This task naturally leads to a review the literature that addresses the relationship between economic performance and institutions of metropolitan governance. The effect of governance on the economic performance of metropolitan area is well documented (Brenner, 2004; Feiock, 2004; OECD, 2015a). There are typically close economic and social linkages among the subregions of a metropolitan area. The geographical scope of those linkages usually reaches beyond the jurisdictions of an individual local government. This scale mismatch implies that no single local government can address all challenges and opportunities within a metropolitan area on its own (Ahrend, Gamper, & Schumann, 2014). For that reason, local governments generally need to have cooperation mechanisms in place. In response, local governments tend to institutionalize a number of governance mechanisms in order to coordinate policies in metropolitan areas. Often, these mechanisms were developed either by local actors or by the central government, and they varied between countries as well as between different metropolitan areas within the same county.

Before we begin our discussion, we need to be more specific about the concept of metropolitan governance. This specification will help limit the boundary of the related literature that we need to examine. I define metropolitan governance as the mechanism designed to address a mismatch between administrative and functionally defined city boundaries (Cheshire & Gordon, 1996). Given the broadness of this definition, I further divide metropolitan governance into two different types: metropolitan governance structure and metropolitan governance arrangement. The former refers to the institutional setting in which the actors seeking to solve a collective problem often make decisions and interact with each other. Such structures distribute decision-making authority and responsibility and delegate authority. In contrast, the latter refers to a particular way of achieving the goal of governance. The governance arrangement includes specific policies or organizations that have been

put in place to provide metropolitan area governance.

The institution of metropolitan governance has been the subject of long-running scientific and political debate. This debate mainly concerns the best way to overcome the disparity between functionally integrated metropolitan areas and institutional territories that are politically fragmented. Scholarship on this issue identifies three intellectual traditions of metropolitan governance (Nelson & Foster, 1999; Savitch & Vogel, 2009).

The first tradition, often called the metropolitan reform tradition, dates to the mid-twentieth century. This approach to reform is centralist in that it argues that large, multiple purpose governments are most efficient when it comes to administration and production and thus are best suited to internalize the externalities of growth (especially of congestion) and realize economies of scale in service delivery. They also argue that a centralized system can draw more human, material, and financial resources and offer more services to residents and business than governance systems comprised of relatively small, resource-limited, sometimes part-time-staffed municipalities. Scholars such as Neil Peirce, Curtis Johnson, and John Hall (1993), Myron Orfied (1997) and H. V. Savitch and Ronald Vogel (2000) have insisted on the supremacy of this approach.

A number of recent empirical studies provide support for this line of argument. In a broad empirical study of American metropolitan areas, Arthur Nelson and Kathryn Foster (1999) argue that less fragmentation is positively correlated to per capita income growth. Building on this study, Dean Stansel (2005) also finds that general-purpose governments (i.e., counties) are positively and significantly correlated with population growth and per capita income. More recently, Rudiger Ahrend, Catherine Gamper, and Abel Schumann (2014) examined the relationship between metropolitan governance structure and economic performance. This study is the first empirical analysis of how metropolitan governance structures affect the relationship between cities' governmental fragmentation and productivity. Ahrend, Gamper, and Schumann find that cities with fragmented governance structures tend to have lower levels of productivity. In particular, for given population size, a metropolitan area with twice the number of municipalities is associated with around 6% lower productivity. They also find that the effect is mitigated by almost half if there is a governance body at the metropolitan level.

The second tradition, the polycentric governance approach, emerged in the late 1950s as a critique of the then dominant metropolitan reform tradition. Drawing on Charles Tiebout's (1956) idea of people voting with their feet, this approach argues that a fragmented territorial administration offers a broader choice of service and tax bundles to firms and residents and that the competition between autonomous

local constitutions leads to effective matching of service demands and fosters efficiency in the allocation of public service. Besides, another benefit, according to proponents of this approach, is that it makes it possible to assess the performance of local administrators in comparison with their neighborhoods (Bartolini & Santolini, 2012). Furthermore, proponents insist that this approach has the benefit of taming the Leviathan due to the proliferation of many administrative bodies that must compete against one another (Brennan & Buchanan, 1980). Recently, Elinor Ostrom (2010) has summarized the advantages of this approach. Smaller local governments are better able to satisfy the needs of citizens than larger governments and allow for greater participation by citizens, and they tend to be better at monitoring performance and costs of service provision. When jurisdictions are smaller, citizens can more easily move to a municipality that offers the desired mix of taxes and service provision. The proponents of this approach are mainly public choice theorists such as Charles Tiebout (1956),Vincent Ostrom, Tiebout, and Robert Warren (1961), Elinor Ostrom (1983, 2010) and Roger Parks and Ronald Oakerson (2000).

Many empirical studies likewise back this school of thought. Randall Eberts and Timothy Gronberg (1990) focus on the impact of the number of local governments on the amount of spending, showing that fragmentation tends to increase local spending, attracting more firms and people in the area and thus positively contributing to economic growth. Jered Carr and Richard Feiock (1999) have assessed the impacts of city-county consolidation on economic development by examining how well nine consolidated governments fared from 1950 to 1993 in attracting manufacturing and retail/service firms to their areas. They were not able to find any evidence that consolidation did enhance economic development and therefore for the hypothesis that the polycentric approach was superior to other approaches. Similarly, Lawrence Martin and Jeannie Hock Schiff (2011) explore city-county consolidations and whether the advantages promised by consolidation advocates have been realized in the performance of such government structures. They consider three elements in their evaluation of the performance of such consolidations: efficiency in service delivery, promotion of economic development, and redress of urban/suburban disparities and the impact of that redress on ethnic minority representation. The authors conclude that there is little empirical supports to suggest that city-county consolidations increase efficiency, promote economic development, or increase equity.

Indeed, the dispute between centralist and polycentrist school has sparked a myriad of studies aiming to demonstrate the superiority of each approach. If anything, the empirical evidence is not conclusive (Keating, 1995). In the midst of this debate, however, a third school of thought, often called the new regionalism has

emerged. This approach argues that governance in the sense of the coordination of actors to produce public policies cannot only result from hierarchical decision making (the centralist approach) or competition (the polycentric approach) but must also involve negotiation or cooperation. Drawing on the work on multilevel governance in Europe (Hooghe & Marks, 2003), this approach emphasizes the importance of voluntary cooperation and joint-decision systems as a means to coordinate policy making across state levels in a context of increasing interdependences.

Under the first two approaches, metropolitan areas constitute a self-sufficient system, and thus they have been mainly concerned with the question of how to achieve efficiency, and equity within the areas. However, the third approach sees the metropolitan area as one of many interdependent systems in the context of economic globalization. Since metropolitan economies compete against each other on a global scale, the essence of metropolitan governance on the third approach is to provide the critical local assets required to ensure, maintain and improve competitiveness. Thus, while the first two approaches are mainly concerned with the horizontal coordination of local government decisions, the third approach focuses on the role of both horizontal and vertical coordination of policies in metropolitan governance (Wallis, 1994; Savitch & Vogel, 2000, 2009; Brenner, 2002, 2004).

Metropolitan Governance in Korea

As is the case of the views of optimal metropolitan governance, the institution of metropolitan governance also varies widely across and within countries. The pattern of metropolitan governance is determined by various factors specific to each country such as the size and number of local governments, political structure (i.e., whether a country is unitary or federal), and whether policy making is centralized or decentralized.

Traditionally, Korea has been a very centralized unitary country, and the central government has overwhelming authority in every sphere of public policy making. The central government's perceptions on the optimal spatial pattern for economic development have dominated the pattern of metropolitan governance. Until 1990, metropolitan areas were mainly regarded as locations where priority industrial complexes were to be built. The national economic policy at this time aimed to nurture investment in the capital region and strategic port locations for exports. For this reason, public attention was not directed toward establishing a plan for or implementing area-wide level policies in metropolitan areas. Even the mayors for these areas were appointed by the central government, and thus they did not play an active role in policy planning and implementation for the areas.

However, after the country became more democratized and decentralized starting in 1990, subnational governments began to play a larger role. Though once dominated by the central government, the mechanisms of metropolitan area governance now became more diverse. Like other forms of multilevel governance, Korean metropolitan governance is characterized by the vertical and horizontal interactions of different actors that can assume many different forms (Hooghe & Marks, 2003). Currently, we can identify various mechanisms initiated and developed by both the central government and subnational governments.

In the following paragraphs, I distinguish between two types of metropolitan governance arrangement in Korea. One encompasses national-level governance arrangements and the other subnational-level governance arrangements. The former are established and controlled by the central government, whereas the latter are introduced and developed by subnational governments. The subnational-level arrangements also include those that the central government has established but whose operation has delegated to subnational governments. Table 1 shows the two groups of metropolitan governance arrangements.

Table 1. Classification of Metropolitan Governance Arrangements

Type	Governance Arrangements
National-level governance	Growth management plan of the Seoul metropolitan area (1984) Free Economic Zone Authority (2003, 2008) Regional plans for land use, transportation, and economic development (1994-2005) National balanced development plans under each administration (2003-2017)
Subnational-level governance	Designation of metropolitan city (1963-97) Seoul metropolitan area Metropolitan Transportation Authority (2005) Council of Local Government Cooperation (G9) (2007)

National-Level Governance

We can identify at least three types of national-level metropolitan governance arrangements. The first type specifically targets the metropolitan cities either by controlling or promoting investments in those cities. There are two arrangements in the first category: the growth management plan of the Seoul metropolitan area (the legal basis for which was the Seoul Metropolitan Area Readjustment Planning Act enacted in 1982) and Free Economic Zone Authority, established by Design and

Operation of Free Economic Zones Law that was enacted in 2002.

The Seoul metropolitan area growth management plan is considered one of the most basic national-level arrangements for metropolitan governance. Since the 1960s, there has been a steady growth in the population of Seoul owing to the rapid economic growth of Korea, and urban sprawl has become rampant in the adjacent regions such as Incheon and Gyeonggi province. The central government developed the growth management plan in 1984 to address these problems. The plan was designed to reduce population concentration in the Seoul metropolitan area by allowing the government to control economic activities and to effect planned development through a spatial restructuring of the area.

The Free Economic Zone Authority was first introduced in 2003 and is regarded as a national-level metropolitan governance arrangement. The central government established authorities in several provinces and metropolitan cities to improve the business environment of particular regions. These authorities are expected to contribute to the economic growth of the regions by deregulating, licensing support, and attracting foreign investment. While the Committee of Ministry of Finance and Planning develops most policies, these authorities are responsible for implementing them. The mayor and governor of participating regions designate the director of the authority and dispatch staff. So far, the government has established eight authorities including an interprovincial one.

The second type of governance arrangement aims to coordinate the decisions made by local governments in metropolitan areas. These arrangements affect the functioning of metropolitan areas indirectly through the regional plans established for metropolitan cities and their surrounding area. We can identify several governance arrangements in such domains as regional development, transportation, and land-use planning.

The first governance arrangement is the area-wide land-use plan introduced in 2000 that has been implemented in five metropolitan cities including Busan, Dague, Gwangju, Daejeon, and the Seoul metropolitan area. The goal of a regional land-use plan is to compensate for the limitations of the land-use plan of individual cities. Thus, under this system, the land-use plan for the individual city must follow the directions of the regional land-use plan. A particular objective of the regional plan is to manage the greenbelt areas (which are development-restricted zones) in these areas. For coordination and consultation purposes, the central government has established a committee on the regional land-use planning at the ministry level as well as the local advisory committee at the regional level that is responsible for advising in the development of the plan.

Another governance arrangement of this type is the area-wide transportation

plan for the metropolitan regions established by the central government. The central government designates the metropolitan transportation planning regions and develops a specific plan for these metropolitan regions. The plan aims to meet the transportation needs arising from the expansion of metropolitan functions of each region and reduce the congestion in the metropolitan regions. The plan outlines how metropolitan transportation facilities such as interregional roads and railroads and transfer facilities are to be funded and managed. The Ministry of Construction and Transportation prepares the plans, while local governments are primarily responsible for their implementation. Thus far, the central government had devised plans for five metropolitan areas in Korea including the Seoul metropolitan area, Busan, Daegu, Gwangju, and Daejeon.

The final governance arrangement, the regional development plan, which coordinates local government decisions and was first introduced in 1994 under the law of regional balanced development and promotion of small- and medium-sized enterprises. This planning system was initially devised as the implementation mechanism of the national land comprehensive development plan for 1992-2001. The goal of the plan was to form a deconcentrated land development pattern that would encourage people to relocate and stimulate the regional economy. Since 1994, the central government has established regional development plans for ten major regions, including the four metropolitan cities of Busan, Daegu, Gwangjuand Daejeon. The central government completed the last plan, which was for the middle inland area, in 2007.

Unlike the two other types of governance arrangements, the third type does not target the metropolitan cities directly but nevertheless has substantial impacts on the functioning of the metropolitan cities. This type of governance arrangement comprises the five-year national balanced development plans established under each administration, the legal basis for which is Special Act on Balanced National Development enacted in 2004. The Korean government introduced the national balanced developed plan in 2003 as a way to lessen the disparity in the level of regional development. The policy tools for the plan have evolved from specialized programs targeting specific regions to a more articulated scheme in which different programs support regional competitiveness on different scales. More recent policies have focused on mobilizing untapped sources of regional growth and marshaling innovation potential in the region. While the spatial coverage of the plans is much broader than metropolitan cities, they have a substantial impact on the economic performance of the metropolitan cities.

In the following, I briefly describe how each administration have used the plans to effect national-level metropolitan governance arrangements. The Roh Moo-hyun

administration (2003-8) introduced national balanced development as a top national priority. The administration laid down the legal foundations for the national balanced development plan, the goal of which was to reduce disparities between regions and to deconcentrate economic activities outside the capital region. Significant governance arrangements under the plan during the Roh Moo-hyun administration include the development of technology parks to promote the knowledge economy, the establishment of the presidential committee on national balanced development, and the creation of a regional innovation system. The committee was responsible for preparing the five-year plan for national balanced development (2004-2008). A special government account was also created to provide financial resources for the implementation of the national balanced development plan.

Under the Lee Myung-bak administration (2008-13), the paradigm for national balanced development shifted from one that emphasized balanced regional growth to one that prioritized regional competitiveness. The shift required adjustments in governance, resource allocation, and policy mix. The national balanced development plan during this time aimed to mobilize untapped sources of regional growth and marshal innovation potential in all regions by stimulating bottom-up initiatives and networks. The primary goal was to promote industrial development in regions defined by functional economic boundaries rather than by political boundaries. Specific governance arrangements introduced under this administration include increased funding for the regional development plan, new programs to foster cross-regional collaboration managed by the Ministry of Knowledge Economy and the creation of economic regional committees to support bottom-up initiatives and development planning in regions.

Most recently, there has been another directional shift in national balanced development strategy under the Park Geun-hye administration (2013-17). The so-called new scheme for regional development employs a more balanced approach by seeking to both encourage regional growth and strengthen the link between and urban and rural areas and to assure a minimum standard of living even in remote rural areas. As of 2016, the ending time for our empirical study, the new scheme was still in the conceptualization stage.

Subnational-Level Governance

Several subnational-level metropolitan governance arrangements have been developed in recent years in Korea. Local governments, now equipped with more authority and dissatisfied with the approaches led by the central government, mainly took the initiative in developing these arrangements. We can identify three types

of such arrangements. The first is unique and is based on the concept of metropolitan cities. The metropolitan cities are designated to cope with the country's rapid urbanization and economic growth, with a special legal status that the central government gave them. Typically, metropolitan cities are active in the field of transportation, regional development, and spatial planning. Currently, there are seven metropolitan cities in Korea: Busan Daegu, Daejeon, Gwangju, Incheon, Sejong, and Ulsan.

In 2005, a few adjoining regional governments instituted the Seoul metropolitan area Metropolitan Transport Authority as one of the second type of subnational governance arrangements. The primary functions of the authority are to develop a metropolitan public transportation plan and to build and operate a metropolitan bus rapid transit system. The authority is composed of two metropolitan cities—Seoul and Incheon—and one province—Gyeonggi. The participating regions usually make joint investments in the authority and dispatch staff to operate it. This authority is a regional single-purpose district designed to secure the economies of scale associated with area-wide infrastructure provision. The presence of such a district should be associated positively with the economic performance of the region. Despite its significance as a subnational cooperative body, however, it was hampered in its initial operation by several limitations, including weak policy coordination authority, ambiguous devolution in the assignment of work, and limited budgets for project implementation (Kim, 2018).

The third type of subnational governance arrangement, the Council of Local Government Cooperation, or the so-called Group 9 (G9), is a kind of voluntary association among local actors. In 2007, several local governments established the council voluntarily for mutual prosperity. The council consists of the city of Daejeon and neighboring eight local governments (three cities and five counties). The principal role of the council is to identify and implement cooperative projects in G9 areas that address such as public transportation, tourism, agro-products transaction, and urban-rural exchange. The significance of this council lies in the fact that this is the first arrangement initiated by the subnational government and grounded in horizontal cooperation. Despite its significance, the council suffers from problems caused by a vulnerable institutional basis, including a memorandum of understanding that provides a weak legal foundation for policy implementation, insufficient funds with which to carry out the cooperative projects, and lack of active cooperation on such matters as the joint installation of public facilities and services (Koo et al., 2016).

EMPIRICAL STRATEGY

To carry out the empirical estimation, I first set up a baseline model drawing on theoretical literature on regional economic growth and then extended the model using variables representing the influence of metropolitan governance arrangements. I created the variables for metropolitan governance arrangement mainly using dummy variables and interaction terms, applying techniques in the interrupted time series analysis (Mohr, 1995; Kontopantelis et al., 2015). The variables I created serve to represent the detailed aspects of particular metropolitan governance arrangements. I chose the estimation method based on statistical issues.

Baseline Model

The empirical analysis relies on estimating multiple regression models based on an augmented Cobb-Douglas production function. The standard production function, which relates growth regional product (G) to a constant (A), capital (K), and labor (L), is extended to include a measure of knowledge capital (R). This approach conceptualizes R&D investment as playing the role of input in production (Prenzel et al. 2018).

(1) $Y_{it} = AK_{it}^{\alpha}R_{it}^{\beta}L_{it}^{\gamma}e^{\varepsilon it}$

In order to obtain a model that can be estimated using standard linear regression techniques, I apply a logarithmic transformation to both sides of equation 1. To facilitate the notation, I denote the logarithm of variables using lower case letters.

(2) $y_{it} = a + \alpha k_{it} + \beta r_{it} + \gamma l_{it} + \varepsilon_{it}$

Formulating the empirical model using the Cobb-Douglas function with log transformation has two advantages. First, the log transformation in equation 2 addresses the skewness of the data, which arises from the fact that some of the cities included in the dataset are substantially larger than the average. Second, the model retains its useful theoretical interpretation; the exponent in a Cobb-Douglas function represents the respective output elasticity for the production factors. We thus can represent by the coefficient the percentage change in GRDP when knowledge capital increased by 1% and labor and physical capital were constant.

Extension of Baseline Model with Governance Arrangements

For empirical estimation, I begin with a parsimonious specification of the regional growth equation that is consistent with the standard neoclassical regional growth model. The exogenous variables in the equation comprise capital investment (CINV), labor force (LABF), and knowledge capital (RINV). I extend the equation by adding a few additional economic variables, as well as dummy variables and interaction terms representing metropolitan governance arrangements. Equation 3 captures these two extensions.

$$
\begin{aligned}
(3) \quad \ln(\text{GRDP})_{it} = {} & a + \beta_1 * \ln(\text{CINV})_{it} + \beta_2 * \ln(\text{LABF})it + \beta_3 * \ln(\text{RINV})_{it} \\
& + \gamma * \ln(\text{MGRP})_{it} + \delta * \ln(\text{NCGR})_{it} + \pi * \ln(\text{RIFR})_{it} \\
& + \sum \rho * \text{dummy}_i + \sum \theta * \text{dummy}_i * X_{it} + \varepsilon_{it}
\end{aligned}
$$

The first extension takes into account the introduction of the economic variables such as manufacturing GRDP (MGRP), the number of college graduates in the labor force (NCGR), and the ratio of independent financial resources (RIFR). These variables are added to the baseline model not only to account for the unexplained variation of GRDP but also to facilitate the further extension of the model to incorporate the effects of the metropolitan governance arrangements.

The second extension adds in dummy variables and interaction terms. A dummy variable indicates the introduction of new metropolitan governance arrangements reflecting before introduction periods, which is denoted by 0 and is otherwise 1. The coefficient of the dummy variable represents the change in the level of the outcome that occurs in the period immediately following the introduction of a new governance arrangement. Since the metropolitan governance arrangements work through a particular variable, the interaction terms are included to measure the impact of these governance arrangements. In the equation, I denote the interaction terms as dummy*X, where X indicates a particular economic variable. The coefficient of interaction terms thus represents the difference between preintroduction and postintroduction slopes of the outcome. Therefore, the total effects of the introduction of the new governance arrangements are the sum of these two coefficients.

Governance Arrangements Variables

Table 2 shows the dummy variables and interaction terms used to estimate the impacts of metropolitan governance arrangements. Several governance arrangements that did not vary in time and space during the study period have been excluded from the empirical estimation. Included are such national-level governance arrangements as regional land use plans, regional development plans, and regional transportation plans because the central government completed all of these plans before 2000. As for subregional governance arrangements, I have excluded the designation of metropolitan cities for the same reason.

For national-level governance arrangements, I first created a dummy variable, GMSMA, to estimate the influence of Seoul metropolitan area's growth management plan; this variable is a typical example of time constant covariate. I also added a dummy and an interaction term to estimate the impacts of the development of the free economic zones in several metropolitan cities in Korea. The central government developed these zones in such metropolitan cities as Busan, Incheon, and Daegu. An interaction term (INTFEZ) was created by multiplying the dummy variable by the amount of capital investment (CINV). The interaction term was expected to measure the outcome change from the introduction of the free economic zones, since the primary goal for establishing these zones was to attract foreign investment in these areas.

Since I am interested in estimating the effects of the national balanced development plans separately for each administration, I created a total of five dummy variables and two interaction terms. To begin with, the three dummy variables, NBPRoh, NBPLee, and NBPPark respectively represent the overall impacts (the change in the level of outcome) of the national balanced development plans for each administration. These dummy variables are expected to estimate a kind of multiple treatment period effects. I also include two other dummy variables, KPMRoh and KPMLee, to estimate a single-period specific effect of the national balanced development plans (except for the Park administration's plan, because Park assumed the presidency one year before my empirical analysis period was set to end). Although the national balanced development plans contain many different policy tools, I assume that the implementation of the most critical policy measures produces specific impacts on the metropolitan cities.

Table 2. Definition and Meaning of Variables

Variables	Definition	Meaning
GMSMA	dummy=1 for Seoul and Incheon	dummy for the Seoul metropolitan area growth management plan
FEZ	dummy=1 after 2004 for Busan and Incheon dummy=1 after 2009 for Daegu	dummy for the free economic zone
INTFEZ	(CINV(t)-CINV(2004))*FEZ for Busan and Incheon (CINV(t)-CINV(2009))*FEZ for Daegu	interaction term for the free economic zone
NBPRoh	dummy=1 if from 2003 to 2008	dummy for the national balanced development plan under the Roh administration
NBPLee	dummy=1 if from 2008 to 2013	dummy for the national balanced development plan under the Lee administration
NBPPark	dummy=1 if from 2013 to 2016	dummy for the national balanced development plan under the Park administration
KPMRoh	dummy=1 after 2007 for Busan and Daegu	dummy for a key policy measure under the Lee administration
INTRoh	(RINV(t)-RINV(2007))* KPMRoh	interaction term for a key policy measure under the Roh administration
KPMLee	dummy=1 after 2009 for Busan, Daegu, Daejeon, Gwangju.	dummy for a key policy measure under the Lee administration
INTLee	(RIFR(t)-RIFR(2009))*KPMLee	interaction term for a key policy measure under the Lee administration
TASMA	dummy=1 after 2005 for Seoul and Incheon	dummy for transportation authority for the Seoul metropolitan area
CLGC	dummy=1 after 2007 for Daejeon	dummy for G9

Finally, I added two interaction terms of a particular variable, INTRoh and INT-Lee that were derived by subtracting the current value of the variable from those in the previous year. While the two dummy variables can measure the change in the level of outcome from specific effects, the interaction terms can measure the changes in the slope of the outcome. The specific impacts under the Roh administration, for example, likely result from the development of innovation cities. The central government established eleven innovation cities across the nation. In my sample, Busan and Daegu are the metropolitan cities that were designated as the innovation cities. I include a dummy variable to estimate the specific impact resulting from the introduction of the innovation city program and an interaction term to measure the impacts from the increase in the R&D investment used to fund the development of innovation cities. Unlike the impacts measured by the dummy variable indicating the introduction of national balanced development plan under each administration, the impacts of the innovation cities continue to the present because the development of the innovation city is ongoing. The specific impacts under the Lee administration are likely caused by the introduction of a new financial measure, the regional development block grant. This measure contributed to the increase in the ratio of independent financial resources for the subnational government except for Seoul and Incheon. I added a dummy variable and an interaction term to capture the impact of the introduction of this new governance arrangement.

To measure the impacts of the subnational-level governance arrangement on the economic performance of the metropolitan cities, I added two dummy variables, TASMA and CLGC. While TASMA, the first dummy variable, was expected to measure the impacts from the introduction of the metropolitan transportation authority for the Seoul metropolitan area, CLGC, the second dummy variable, was added to capture the impacts from the introduction of the G9. This second dummy variable applied only to the city of Daejeon, which was the prime actor behind the creation of this council.

Choice of Estimation Method

For the panel data analysis, I considered two factors in choosing the estimation method, the structure of error terms and the endogeneity problems resulting from the correlation between the independent variable and the idiosyncratic error term. I first opted for a fixed effect (FE) estimation to take into account the structure of the unobserved variation in error terms. The FE model made it possible to take into account both the heterogeneity among metropolitan cities and time-invariant unobserved characteristics of them, which could have influenced the dependent variable.

With FE estimation, however, we cannot measure the effects of the time-constant covariate, because these variables are canceled out by the transformation. This off-setting would have been a severe problem if a few observations showed a change in variables, and the problem would appear in a large standard error. Also, in the case of regional data, there was the possibility of serially correlated error terms. These two problems are apparent in the multiperiod panel data analysis I implemented.

To remedy these problems, I decided to use GLS estimation. This estimation technique, however, requires one to assume that these variables are not correlated with error terms. If this assumption does not hold, the estimation may end up being biased. The result from the estimation of the baseline model using GLS, however, indicated that the possibility of a correlation of unobserved attributes with error terms was not very high. Thus, I decided to use GLS estimation for the entire analysis.

RESULTS AND DISCUSSIONS

Table 3 shows the descriptive statistics of all variables. The dependent variable is the level of regional GRDP. The independent variables include the typical explanatory variables used in the empirical investigation of regional economic growth: physical capital, labor force, and knowledge capital (CINV, LABF, and RINV). I added three additional variables that can influence regional growth and have a bearing on the metropolitan governance structure (MGRP, NCGR, and RIFR). As I noted in describing the empirical strategy, all of these variables are in logarithmic transformation. I also added a dummy variable (FCRIS) to capture the impacts of the global financial crisis in 2008, since Korea suffered an economic setback from it. Finally, as noted, I added several dummy variables and interaction terms to measure the influence of metropolitan governance arrangements (see table 2).

Table 3. Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum	Observations
ln GRDP	17.7142	0.8008098	16.39677	19.69347	N = 119
ln CINV	16.46137	0.7051166	15.19468	18.05758	N = 119
ln LABF	7.092778	0.7169799	6.122493	8.591558	N = 119
ln RINV	13.90259	1.143484	12.08821	16.186	N = 119

ln MGRP	16.07534	0.6888279	14.71496	17.5102	N =119
ln NCGR	6.1104	0.7946863	4.59512	7.980366	N =119
ln RIFR	4.209987	0.1821563	3.806663	4.564348	N =119
FCRIS	0.4705882	0.5012447	0	1	N =119
GMSMA	0.2857143	0.4536641	0	1	N=119
FEZ	0.2857143	0.4536641	0	1	N =119
INTFEZ	3.941869	6.69082	0	16.88781	N =119
NBPRoh	0.2941176	0.4575717	0	1	N =119
NBPLee	0.3529412	0.4799053	0	1	N =119
NBPPark	0.2352941	0.4259761	0	1	N =119
KPMRoh	0.1680672	0.3755071	0	1	N =119
INTRoh	2.151842	5.134118	0	15.50191	N =119
KPMLee	0.3361345	0.4743829	0	1	N =119
INTLee	0.5498674	0.9621673	0	2.70805	N =119
TASMA	0.2016807	0.4029517	0	1	N =119
CLGC	0.0840336	0.2786113	0	1	N =119

Table 4 represents the result of estimating the baseline model in equation 3. A first observation is that most economic variables are highly significant with a p-value below 0.01. The estimates have the expected signs, with both R&D expenditure and physical capital exhibiting a positive correlation with GRDP. Across all estimations, increasing the value of exogenous variables by 1% while controlling for other variables is associated with a 0.09-0.46% increase in GRDP. The estimated coefficient is also significant and positive for the other variables. Thus, increasing the amount by 1% while controlling for other variables is associated with a 0.35-0.50% increase in GRDP.

Table 4. Estimation Results

	Coefficient	Standard Error	Z	P>z	95% Confidence	Interval
Economic Variables						
ln CINV	0.191246	0.043544	4.39	0.000***	0.10590	0.27658
ln LABF	0.162287	0.072417	2.24	0.025**	0.02034	0.30422
ln RINV	0.094621	0.015873	5.96	0.000***	0.06351	0.12573
ln MGRP	0.505005	0.030822	16.38	0.000***	0.44459	0.56541
ln NCGR	0.457392	0.06139	7.45	0.000***	0.33706	0.57771
ln RIFR	0.35052	0.09471	3.7	0.000***	0.16489	0.53614
FCRIS	-0.05216	0.025177	-2.07	0.038**	-0.1015	-0.0028
National-Level Governance Arrangements						
GMSMA	-0.13054	0.033678	-3.88	0.000***	-0.1965	-0.0645
FEZ	-0.06548	0.022913	-2.86	0.004***	-0.1103	-0.0205
INTFEZ	-0.0043	0.001635	-2.63	0.009***	-0.0075	-0.0011
NBPRoh	-0.01828	0.014916	-1.23	0.220	-0.0475	0.01095
NBPLee	-0.00186	0.013169	-0.14	0.888	-0.0276	0.02395
NBPPark	-0.01581	0.014948	-1.06	0.290	-0.0451	0.01349
KPMRoh	-0.00234	0.030848	-0.08	0.940	-0.0628	0.05812
INTRoh	-0.00045	0.002219	-0.2	0.840	-0.0048	0.00390
KPMLee	0.090299	0.031474	2.87	0.004***	0.02861	0.15198
INTLee	-0.0114	0.007424	-1.54	0.125	-0.0259	0.00315
Subnational-Level Governance Arrangements						
TASMA	0.009882	0.026982	0.37	0.714	-0.043	0.06276
CLGC	-0.06805	0.023347	-2.91	0.004***	-0.1138	-0.0222
Constant	-0.22929	0.504896	-0.45	0.650	-1.2188	0.76029
Observations	119					
Wald chi2(14)	13961.16					
Prob > chi2	0.0000					

The analysis suggests three results with respect to the effects of metropolitan governance arrangements. First, the impact of the Seoul metropolitan area's growth management plan shows a negative sign, and the coefficients are statistically significant. These results suggest that the relatively low economic performance of Seoul and Incheon is partly attributable to the implementation of the growth management scheme. These results may also provide supporting evidence of the negative impact of stringent regulations on the operation of the market and overall economic growth.

Second, both coefficients of the dummy and interaction term that I used to estimate the influence of the free economic zones are negative but statistically significant. This result is an unexpected one that defies easy explanation. One possible reason is that operational system is inefficient. Although the central government designated the free economic zones, it did no run them but instead delegated the operational responsibility to the subnational government. Because the subnational government did not play role in creating the zones, it is likely that they have neglected the job of in operating them. Without support from the central government is not enough, the effectiveness of these zones appears to be very low, as suggested in other studies (Jeong, 2011). The recent evaluation of the zones reveals that the central government revoked the status of free economic zone in some areas and is currently investigating others before deciding whether the revoke the status in other areas.

Last, the result of estimating the impact of national balanced development plans is negative on the economic performance of the metropolitan cities. This negative relationship is understandable in that these plans are mainly targeting the development of underdeveloped regions. However, the coefficients of these variables are not statistically significant. As for the specific impacts of these plans, both dummy and interaction terms under the Roh administration show a negative sign but are statistically insignificant. However, the result of specific impacts under the Lee administration is different. The dummy variable has a positive sign and is statistically significant. This result may reflect the finding in other studies that increasing the financial autonomy of local governments has a positive impact on the economic growth of the region (Song, 2012). The coefficient for the interaction term, however, is negative, although statistically insignificant.

As for subnational-level governance arrangements, I first consider the transportation authority of the Seoul metropolitan area. The coefficient of this variable is positive but statistically insignificant. The positive sign may reflect the fact that the introduction of the transportation authority has improved the quality of

the infrastructure and reduced traffic congestion. The point of this arrangement is to increase the economic efficiency of the metropolitan cities. The coefficient of the dummy variable indicating the introduction of the G9 shows a negative sign but is statically significant. This result is unexpected, and it is hard to find a proper reason for the negative relationship. As indicated in some studies, however, the negative sign may be partly attributable to the ineffectiveness of the council. Studies reported the limited effectiveness of this council due to the lack of leadership and the absence of any legal measures except for the memorandum of understanding among local governments (Koo et al., 2016).

CONCLUSION

This study empirically analyzes the causes of the stagnant economic performance of metropolitan cities in Korea. The analysis suggests three main results. First, most traditional explanatory variables such as physical capital, labor force, and R&D expenditure are highly significant with a p-value below 0.01 and has the expected signs. This result may indicate that the economic performance of metropolitan regions depends crucially on the extent of such resources as physical capital, labor force, and R&D expenditure.

Second, the impacts of the metropolitan governance arrangements implemented by the central government show a negative relationship that is statistically significant. These results suggest that the low economic performance of the metropolitan cities in Korea can be partly attributable to the implementation of national-level governance arrangements. The results are supported by the estimation of the impact of the national balanced development plan. Overall, the impacts of the plans are negative with respect to the economic performance of the metropolitan cities, while their statistical significance is not quite robust except for the case of the growth management of the Seoul metropolitan area. I obtained a similar result in the case of the free economic zones in a few metropolitan cities.

Third, the impacts of subnational-level metropolitan governance arrangements on economic performance are not entirely conclusive. I found a positive relationship between the introduction of the transportation authority in the Seoul metropolitan area and economic performance, but the relationship is not statistically significant. As for the case of a locally initiated subnational-level arrangement like the G9, I found a negative relationship with the economic performance of the metropolitan city that is statistically significant. This result is to a certain degree unexpected and hard to explain. However, the negative relationship may be partly

attributable to the ineffectiveness of the council.

The results of the empirical estimation of the model have policy implications for the economic performance of metropolitan cities. We begin with the factors responsible for the economic growth of the metropolitan regions. All these variables are important determinants of economic performance of metropolitan areas, as we have seen. In order to boost the economic performance of metropolitan cities, therefore, it is necessary to increase the size of the labor force, especially the highly skilled labor force, increase the amount of capital investment, and more importantly, in the amount of R&D investment. In addition, giving the metropolitan governments more financial autonomy can significantly contribute to the performance of metropolitan cities.

We also can draw several policy implications with respect to the specific governance arrangements. First, the growth management plan of the Seoul metropolitan area has had a substantial negative impact on the economic performance of Seoul and Incheon. This policy measure was introduced to control the growth of the Seoul metropolitan area, and thus this is the outcome that was expected. However, it is not clear whether this policy tool has contributed to the growth of the metropolitan cities outside the Seoul metropolitan area. The estimation result suggests that the overall impact of this metropolitan governance arrangement on the nation is negative and that other policy tools may be needed to obtain better economic performance in the metropolitan cities.

Another critical policy implication we can draw is that the national balanced development plan appears to harm the economic performance of metropolitan cities. In particular, if these plans are to be useful for national balanced development, they must be able to boost the economic performance of the metropolitan cities outside the Seoul metropolitan area, such as Busan, Daegu, Gwangju, and Daejeon. However, these plans seem to have no noticeable impact on the economic performance of these cities.

A number of policy implications concerning subnational-level governance arrangement likewise follow from this study. Empirically, the estimation results regarding the influence of subnational-level governance arrangement are somewhat unexpected, except for the transportation authority for the Seoul metropolitan area. The case of the transportation authority seems to show the importance of governance bodies created by cooperative efforts among local government without central intervention. Therefore, more subnational governance arrangements that are initiated by the cities and neighboring regions may be needed to improve the economic performance of metropolitan cities. Such arrangements call for institutional devices that can prompt more active participation on the part

of participating local governments.

One final comment is that if the level of GRDP in the major metropolitan cities in Korea had been on par with the national average during the period of the analysis, it could have contributed substantially to the growth of GDP in the nation as a whole due to their population size. Thus, although the empirical results I obtained in this study may not be entirely satisfactory, this study can serve as a catalyst for further empirical studies that not only seek to identify the primary cause of the low economic performance of metropolitan cities but also to provide recommendations for restructuring the metropolitan governance structure in Korea.

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