THE ECONOMIC IMPACT OF SPATIAL INCOME INEQUALITY

by

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ABSTRACT

HUIPING LI. The economic impact of spatial income inequality
(Under the direction of DR. HARRISON CAMPBELL)

Spatial income inequality refers to the unequal distribution of income across communities. This study broadens the concept to include residential segregation, central city-suburban income disparity, and government fragmentation. Combining the complementary effect perspective and spatial mismatch hypothesis, this project hypothesizes that residential segregation negatively impacts metropolitan economic growth. Arguments from agglomeration effect suggest the natural tie between central cities and suburbs, and support the negative impact of distressed central cities on metropolitan economic growth. Although there is a hot debate between public choice theories and urban regionalism about metropolitan governance, this project follows the arguments of regionalists and hypothesizes that metropolitan areas with higher government fragmentation are associated with slower economic growth. Based on data from U.S. Census, U.S. Bureau of Economic Analysis, and other resources, this project conducted three OLS estimations on economic growth in ten years based on data in the 1980s, 1990s and 2000 to test the hypotheses. Dependent variables are annual average growth rates of real personal income per capita in 1980-1989, 1990-1999, and 2000-2005. Then an OLS estimation was conducted on the long-term economic growth from 1980 to 2005. Results show that racial segregation has a negative impact on both short term and long term economic growth. The negative impact of income segregation emerged from 1990s and turns robust in the model of 2000. The negative sign of percent of black families without a car indicates that theory about spatial mismatch in urban labor market suggesting the negative impact of residential segregation on economic growth is supported. The changing sign of income disparity between central cities and suburbs is not consistent and need to be cautiously interpreted. The positive impact of special districts supports regional-wide metropolitan governance. Although more analyses need to be done to understand the results from

the model of the data in 1990s, the results suggest policy implications. That is, comprehensive strategies need to be considered to increase the quality of life of the poor and economic growth through breaking the barriers among different communities. A comprehensive program plan, including social policy, financial policy, housing and land-use policy targeted to resolve the fundamental urban problem might be more effective than the current isolated policy structure implemented independently by different sectors in different fields.

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CHAPTER 1: INTRODUCTION

Residential segregation is significant in American society. Compared with its European peers, the degree of residential stratification in the United States is remarkably high. The census estimates missing data according to one's residence and the nearby areas (U.S. Census 2000). Since companies often use residential locations to estimate existing or potential markets, zip codes have become a yardstick measuring one's lifestyle (Weiss 1988). It indicates the kinds of magazines you read, the meals you serve at dinner, whether you are a liberal Republican or an apathetic Democrat. In other words, where you live determines how you live (Weiss 1988).

Location is also an important determinant for successful decision-making in business, government and all the other non-profit agencies. Those decisions and behaviors in turn reinforce stratified residential structure (Goss 1995).Retailers use zip codes to decide everything from where to locate a designer boutique to what kind of actor to use in their TV commercials. College and military recruiters rely on zip codes to target promising high-school graduates (Weiss 1988). Based on the clustered residence, contemporary marketing research developed geodemographics to enable marketers to predict behavioral responses of consumers according to statistical models of identity and residential location (Baker and Baker 1992, Goss 1995). The system has been applied in marketing as well as nonprofit agencies, including local governments and electoral campaign (Grande 1992, Bryan 1993).

All this means that neighborhood and community context have important effects on life chances in addition to individual characteristics and family background in the United States.

One's access to decent jobs, health care, and good quality food, and one's exposure to shapes one's ability to earn income (Swanstrom *et al*. 2002). "The sorting of economic classes across space in American metropolitan areas both promotes rising economic inequality, and amplifies its effects in ways that do not show up in the income statistics" (Swanstrom *et al*. 2002 P350).

Moreover, different economic strata do not just live in different neighborhoods, but in separate local political jurisdictions, particularly municipalities and school districts. Because these local jurisdictions fund and provide many important public services in the United States, residential segregation widens disparities both in the cost to taxpayers and the quality of public services. In addition, competition among local governments for tax base distorts metropolitan development, leading to geographical mismatches between where people live and where they work that further exacerbate economic inequalities.

1.1 Research Question

An extensive literature has documented that various institutions, pro-suburbanization federal policies and exclusive local policies have contributed to, and reinforced, residential stratification in the United State (Briggs 2005, Coutes *et al*. 1977, Dreier *et al*. 2002, Rusk 1993, Voith 2000). Many studies suggest that the market is the primary force driving the process. Americans prefer living in neighborhoods occupied primarily by households with incomes equal to or higher than their own, with similar cultural values, outlooks, and similar racial or ethnic backgrounds (Berry 1975, Downs 1994, Evans 1973). Desirability is translated into home prices, property values and capital values (Thorns 1981). Households need to pay enough to live in their desired communities.

To cater to the preferences of middle-income and upper-income households, builders create large subdivisions of homes similar in size and price which results in internally homogeneous neighborhoods (Downs 1994). Thus, demand-side motivations and supply-side forces translate income inequality into a residential hierarchy across urban areas in the United States: High-

income households cluster in high-prestige areas, middle-income in middling-prestige areas and so forth. At the top are a few high-prestige communities with expensive homes; at the bottom are a large number of low-prestige communities of often deteriorated housing in the central cities and inner suburbs (Downs 1994). Urban landscape is thus symbolized as residential segmentation, the evident division between distressed central cities and prosperous suburbs, and the fragmented political jurisdictions. Because race has played a striking role in the residential stratification process, racial segregation is also included in this study. Hence, this study defines spatial income inequality as the stratified and segregated communities scattered across urban areas, the distinct separation between cities and suburbs, and the fragmented government structure.

Factors stratifying residential space are an important topic for research. However, this dissertation is interested in the economic consequences of spatial income inequality. Does spatial income inequality affect metropolitan economic growth? If so, what is the magnitude of its effect? What are the mechanisms that link spatial income inequality to metropolitan growth? What, if any, policy actions should be warranted? This project formulizes theoretical rationale about why and how residential segregation affects economic growth on the metropolitan scale, and examines the exact impact of segmented residential and political structure on metropolitan economic growth.

Integrating the complementary effects perspective from the economic growth literature, the spatial mismatch hypothesis from sociology and argument for the importance of central cities from social and economic geography, this study hypothesizes that spatial income inequality has a negative effect on metropolitan economic growth. To test this hypothesis, three cross-sectional analyses are conducted based on data from 1980, 1990 and 2000. Then another OLS estimation is conducted to examine the long-term economic effect. This research contributes these three literatures by linking them together. The following sections elaborate it in detail. Results of these analyses have significant policy implications as well because growing social and economic segregation may have enormous effect on the nation's efforts to address its urban problems.

1.2 Theoretical Significance

The impact of income inequality on economic growth has been of keen interest to economists. Extensive research efforts have developed three arguments articulating the underlying mechanisms (Barro 1999, Kenworthy 2004). They are savings rate arguments, market imperfection arguments and political economy arguments[1]. Each of them can support either negative or positive influences of income inequality on economic growth.

Empirical studies across countries confirm a negative effect of income inequality on economic growth (Bowles, Gordon and Weisskopf 1990, Clarke 1995, Mo 2000, Persson and Tabellini 1994). However, Bhatta (2001) came to the opposite conclusion in a cross-MSA study. Therefore, it is uncertain that results of international studies can be applied directly to a cross-MSA (or cross-state) analysis within a country. Moreover, although factors stratifying urban arrears are under study, there is an agreement that urban stratification is the consequence when individuals/households with different income share the space. Since segregated residential structure results in unequal access to resources and public services, it actually aggravates and reinforces income inequality. Yet most studies measure income inequality by GINI coefficients or percentile indices and they don't account for the spatial component of inequality[2] (Bhatta 2001, Chakravorty 1996 2006, Garofalo and Fogarty 1979). In this sense, conventional research about the connection between income inequality and economic growth does not provide a complete story.

Geographers have been the main investigators of the spatial feature of income inequality. They document that central-city and suburban economics are complementary. Arguments for the importance of cities include image effects of central cities, the importance of city amenities and sense of place in attracting investments and human capital, and the fiscal burdens a distressed city

[1] Detailed elaborations of the arguments are in section *income inequality.*
[2] Benabou (1993) presented that residential segregation has a negative impact of macroeconomic growth. However, this article used the disparity between central cities and suburbs as the measurement for segregation. In addition, it is a theoretical prediction instead of an empirical study.

brings to a broad metropolitan area (Downs 1994, Ihlanfeldt 1995). Agglomeration-effect arguments including labor market economies, scale economies in the production of intermediate inputs and communication economies provide theoretical mechanisms explaining the importance of central cities to suburbs (Downs 1994, O'Sullivan 1993). Studies in this group are sometimes criticized for conflating central city and suburban ring for the categories of metro poor and nonpoor respectively (Gottlieb 1998).

Although research in this group is extensive, this question has not been fully addressed. Spatial income inequality contains not only a central city and suburban component, but also includes residential stratification on the neighborhood level. Taking spatial income inequality simply as the division of central city and suburbs will lead to incomplete studies in this field. Sociologists filled in this gap by developing an extensive literature about the causes and consequences of concentrated poverty following the lively debate of Wilson (1987). They attained fruitful results about how residential segregation has been formed and how living in a high poverty neighborhood affects the life of the poor and the disadvantaged (Massey and Denton 1998).

However, these studies focus on the effect of residential location on the poor and minorities, which is mainly an equity issue, and they do not examine the effect of residential location on the non-poor and whites. For example, the spatial mismatch hypothesis proposed by sociologists/social geographers in this line suggests that residential location of the poor inhibits their access to employment. It illustrates that racial discrimination, physical distance, suburbanization and de-industrialization contribute the disadvantages of poor minorities in the labor market (Kain 1968, Kasarda 1990, Ihlanfeldt and Sjoquist 1998, Presson and Mclafferty 1999).

Yet residential segregation does not just mean the poor and minorities live isolated from the rest of the society, but that the well-off and other income strata also live separately from other groups in the society (Massey 1996, Coulton *et al*. 1996). By examining only one extreme,

concentrated poverty (and black) neighborhoods, researchers in this vein have failed to appreciate the broader dynamic of how economic and social classes are distributed across the metropolitan space, and why those dynamics undermine efforts to address the needs of minorities and the poor. This study, by examining the impact of residential segregation on the entire population, attempts to explore the broader metropolitan dynamic and its effects.

This dissertation completes this task by conducting a cross-MSA study within the United States, following the analytical framework of endogenous economic growth theory. This study contributes to the literature in two aspects. First, it incorporates the spatial dimension of income inequality into conventional economic growth research. Second, this study extends the research subjects of sociology and social geography to the entire population, poor and non-poor, minorities and whites, by looking at the impact of hierarchical residential segregation on the macroeconomic performance of the entire area.

1.3 Policy Significance

This research has significant policy implications as well. The middle class and upper- middle class living in homogenous suburban communities intend to sustain the homogeneity in their communities. They establish independent jurisdictions to pass local zoning, building code, subdivision, and other regulations that raise the cost of housing high enough to exclude low-income people, and to avoid certain externalities regulated by broader governments to affect them (Downs 1994). Residents in the same jurisdictions usually have similar policy preferences for the small and homogeneous localities (Downs 1994). Hence, hierarchical residential structure may have been induced by market forces, but were reinforced by fragmented institutional settings and exclusive land-use and housing policies. If results from this project show a negative impact of segregated residential structure, and if results are supportive of the theories proposed by this thesis linking segregated urban structure and economic growth, comprehensive strategies need to be shaped to cultivate a mixed living structure to break the racial and class barriers and to

facilitate urban macroeconomic growth. Since the 1990s, the federal government has issued ambitious housing policies to improve the living conditions of the poor and enhance their life chances. Major policies include HOPE VI, Moving to Work (MTW), and the Moving to Opportunities (MTO) experiment. If the theory in this project is supported by the results, it indicates that these policies are working on the mechanism through which segregation impacts urban growth. They can not resolve the urban problem fundamentally. Social and financial policies against discrimination, urban planning strategies pro-mixed race and mixed income communities, programs supporting the poor to stay and share the resources in lower poverty communities are needed together to increase economic growth through changing the urban landscape. To do so, regional governance instead of fragmented local governments should be more effective in policy implementation.

This dissertation has five chapters. Following is the literature review. The third chapter explains the methodology. Results are discussed in the fourth chapter. The fifth chapter concludes this study.

CHAPTER 2: LITERATURE REVIEW

This chapter reviews literature about how and why income inequality, central city-suburban disparity and residential segregation affect metropolitan economic growth, according to which, produces the hypotheses of this study. Section 2.1 illustrates the relationship among spatial income inequality, income inequality and economic growth. Section 2.2 presents three possible mechanisms, through which income inequality affects economic growth. The literature is mainly from cross-national analyses provided by neo-classical economic growth research. Section 2.3 introduces the social, geographical and political dimensions of spatial income inequality. Residential segregation reflects the social dimension, central city—suburban disparity represents the geographical dimension and government fragmentation indicates the political dimension. Section 2.4 integrates the complementary-effect perspective from endogenous economic growth literature, the spatial mismatch hypothesis and school segregation literature and proposes a negative effect of residential segregation on metropolitan economic growth. Section 2.5 elaborates the complementary connection between central cities and suburbs from the perspective of agglomeration effects and spatial spillover effects. Section 2.6 discusses studies on government fragmentation and integration and reviews empirical findings on the relationship between state annexation statues and municipal annexation activities. Based on the existing research, this project hypothesizes the negative impact of government fragmentation and restrictive annexation laws on metropolitan economic growth.

2.1 Income Inequality, Spatial Income Inequality and Economic Growth

Traditionally, sociology's interests in inequality have focused on class, race, gender and other forms of social stratification. Geographical territory had not been considered by sociologists as a base of stratification until 1980s (Soja 1989).The study of spatial inequality examines how and why markers of stratification, such as economic well-being, access to resources as well as other inequalities related to race, gender, class and other variables varies across space.

The concept of space developed various perspectives to explain the stratification process once it was incorporated into the study of inequality. It is recognized that space intertwined with other social factors in complex ways (McCall 2001). Class, gender, race/ethnicity difference exists in populations across different geographical locations. It also exhibits in the way that different social groups treat and experience space. For example, women's work-to-home pattern is different from men's (Domosh and Seager 2001). Second, space is seen as the channel of inequality process. It constrains or amplifies social inequality. For example, residential location limits the job opportunities for the poor minorities living in neighborhoods of concentrated poverty. It amplifies inequality through different access to government programs and commercial retail centers between the poor and the rich (Swanstrom *et al*. 2001). Third, space is created through inequality process. Struggles and negotiations among different groups -- capitalists, labors, governments and citizens--shape the spatial distribution of social structure, environment, and economic development (Hooks and Smith 2004). The diverse strategies to explain the relationship between space and inequality reveals that defining space precisely in stratification research is inherently difficult and complex. Space has a taken-for-granted nature, but it is also an axis "along which we experience and conceptualize the world" (Massey 1994: 251).

Despite the complexity of the relationship of space and stratification, this project takes spatial inequality as a consequence of income inequality. That is, spatial inequality is created by income inequality. As mentioned in the introduction, spatial inequality includes residential segregation

and central city-suburban disparity. They are significant phenomena that shape the American urban landscape, and the spatial inequality has a different channel to affect macroeconomic performance, this study takes spatial inequality as a concept independent of income inequality, instead of defining it as the spatial dimension of income inequality as the literature suggested, although these two concepts are closely related (Chakravorty 2006). Spatial inequality is created by income inequality, and associated with income inequality. Income inequality is amplified by spatial inequality.

This project assesses the economic impact of spatial income inequality. Figure 1 describes the theoretical connections among economic growth, income inequality and spatial income inequality. Each concept is connected with other concepts in mutual directions. Neo-classical economics provides theories about the economic impact of income inequality. Stratification theory elaborates how economic growth generalizes and transforms income inequality. Through housing markets and exclusive land-use policies, income inequality creates spatial income inequality. On the other hand, spatial income inequality affects income inequality through the uneven access of resources among residents of different neighborhoods. Endogenous economic growth theory combined with the spatial mismatch hypothesis theorizes the economic impact of spatial income inequality. Government structure and urban policies reinforce the impacts too. Through income inequality and the housing markets, economic growth has an effect on spatial income inequality. This study concentrates on explaining the two thick solid arrows pointing economic growth from spatial income inequality.

The next section elaborates theories about the effects of income inequality on economic growth. After that, this chapter will illustrate the underlying theories that connected spatial income inequality and economic growth.

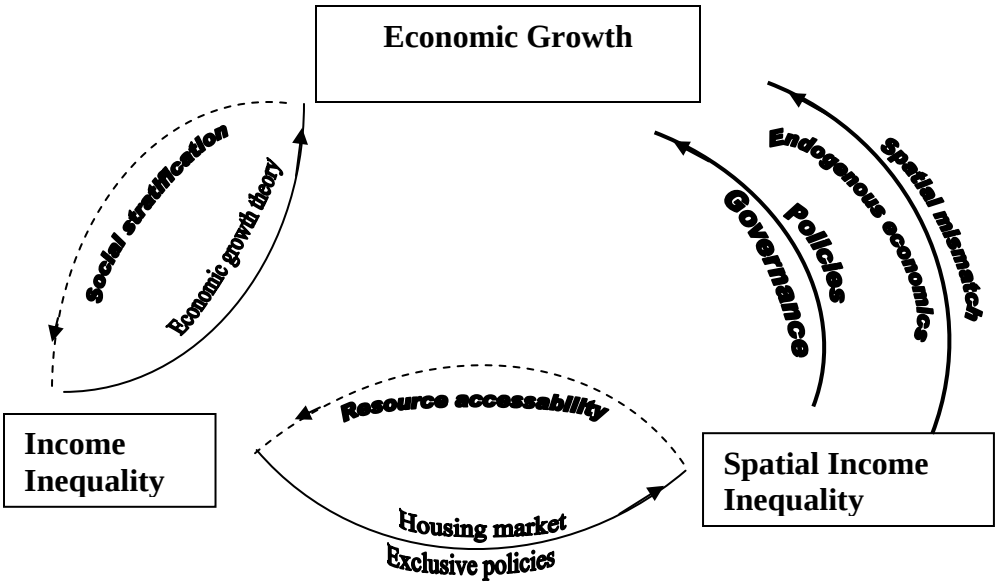

Figure 2.1 Income inequality, spatial income inequality and economic growth

2.2 Income Inequality and Economic Growth

Socioeconomic segregation is created by income inequality, associated with income inequality and also exacerbates income inequality through jobs, public services and retail services (Swanstrom *et al*. 2002, Watson 2006). Income inequality at the metropolitan scale is a continuing subject of interest among urban scholars (Gottlieb 1998). Empirical studies on metropolitan income inequality supplemented with studies on residential segregation broaden the range of public policy at the metropolitan scale. For example, empirical results about the negative economic impact of income inequality would suggest traditional people-based social welfare programs for alleviating poverty. A robust finding about the social and economic effect of spatial income inequality can lead to policies such as central-city revitalization, magnet school programs or relaxation of exclusively zoning programs. Because of the intertwining nature of income inequality and socioeconomic segregation, studies on economic effects of both spatial income inequality and income inequality present comprehensive policy strategies for social problems.

Due to the extensive literature on the economic effects of income inequality, we start with income inequality as the theoretical elaboration of this project. Theories about the economic impact of income inequality not only assist portraying the overall framework of this study, but also shed light on the theoretical connection between spatial income inequality and economic growth.

Savings rate arguments, market imperfection arguments, and political economy arguments are three well-developed theories articulating the underlying mechanisms of the impact of income inequality on subsequent economic growth (Barro 1999, Kenworthy 2004). Each of them supports positive and negative influences of income inequality on metropolitan economic growth.

Savings rate arguments present a positive correlation between income inequality and economic growth (Barro 1999). Savings rates, i.e., savings as a percentage of income, increase with the level of income (Barro 1999). Those with moderate or low incomes tend to spend most of their income. The wealthy thus are the principle source of investment in a capitalist economy. Therefore, a society concentrating incomes into the hands of a few rich people is associated with a higher saving rate, thus higher investment rate, and consequently the growth rate. Second, compressed earnings distributions and the high tax rates used to fund redistributive programs reduce the financial gain from hard work and skill development. This is thought to act as a disincentive to people's work efforts and investments in skills. Thus, a society concentrating incomes into hands of a few rich people is associated with a higher saving rate, which presumably provides capital for investment and thereby grows faster.

One vulnerability of the arguments is that savings do not necessarily go to investments, especially for the metropolitan areas where capital is a common resource for all the metropolitan economies. It means internal savings from a metropolitan area might go to another area, and vice versa a metropolitan area with a low saving rate might be able to attract external capital investments due to its natural resources, geographical location, labor pool, or local development policies. In other words, for the economies of metropolitan areas, capital investment is less

dependent on internal savings. In addition, since the wealthy tend to save a higher share of their income than do the poor, greater inequality may yield weaker consumer demand. Low demand may lead to less investment, owing to a lower profit rate, less capacity utilization, and eventually less income growth (Kenworthy 2004).

Credit market imperfection arguments stress the negative impact of inequality on individuals' capabilities to accumulate human and physical capital (Deininger and Squire 1997). Lower assets and incomes constrain people's borrowing probabilities for their investments on human and physical capital. Thus, higher inequality is associated with lower human and physical capital and consequently with lower per capita income growth rates. This is particularly likely to be true in the United States. Even with substantial funds available for financial aid, many students from lower-income households are forced to pay a relatively large amount to attend college. According to Kane (2001), 66 percent of children from top income quartile attended a four-year college compared to 28 percent of those from families in the bottom quartile.

At the other hand, income concentration accumulates resources for the wealthy to invest in their human capital. It is argued that more investment in human capital exhibits increasing returns. For example, an individual with bachelor degree earns significantly higher than a person without college degree. Thus, income concentration is associated with large investments in human capital which is associated with higher returns and subsequently beneficial to economic growth.

Political economics argues the majority of voters below the mean income vote for redistributive policies which deter the investment incentives and consequently reduce economic growth (Alesina and Rodrik 1994, Persson and Tabellini 1994). However, this effect does not appear to occur in affluent nations (Alesina and Rodrik 1994, Kenworthy 2004, Persson and Tabellini 1994). Given the vote turnout in the US is low and the lobbies for special-interest advocacies are pretty strong (Olson 1965, Schattsneider 1960), the political economy channels

may not be significantly influencing the inequality-growth relationship in the MSAs (Bhatta 2001).

As the above discussion shows, inequality affects growth through various mechanisms that often work in opposite directions. Thus, empirical investigation is the key to understanding the effect of income inequality on economic growth.

Many empirical studies across countries confirm a negative effect of income inequality on economic growth (Clarke 1995, Mo 2000, Persson and Tabellini 1994). According to the results from the analyses based on the 'Barro-type' regression, Clarke (1995) found initial income inequality has a negative impact on growth. This result is robust across different measurements of income inequality, such as GINI coefficient, Theil's index and the coefficient of variation. This correlation holds for both democracies and non-democracies. Mo (2000) not only assessed the negative impact of income inequality on growth based on the endogenous growth model, but also examined the channels through which inequality affects growth. He found the negative effects of income inequality penetrate all aspects of economy through the human capital accumulation channel, the income redistribution channel and the political instability channel. While the weights of each channel are controversial, Mo's study suggests the income redistribution is the most important. This result is confirmed by Persson and Tabellini (1994). Based on endogenous growth and endogenous policy making theory, Persson and Tabellini developed a general-equilibrium model and found a negative impact of income inequality on growth. Their analysis suggests that the negative effects of initial income inequality are from redistributive policies, which is consistent with the finding from Mo (2000). Data for most empirical studies on this question are from data sets assembled by Robert Barro and J-W Lee[3] and Deimnger and Squire[4]

[3] This data set is available in NBER website.

[4] This data set is available in World Bank website.

[5]. Thus all these empirical studies found negative effects of income inequality on growth. And it is likely that income inequality affects growth through redistributive policies a society implemented for social stability as the political economics argument presents.

However, a cross-MSA study by Bhatta (2001) gained a positive impact of income inequality on metropolitan income growth. It implies it is uncertain whether the results of the international studies can be applied directly to the cross-MSA (or cross-state) analysis within a country.

While I acknowledge the uncertainty about the application of the results from cross-country studies to cross-MSA studies within the U.S., with the knowledge that human capital and physical capital are both mobile enough to be common resources under the MSA context, and with the reality that population and economies of MSAs have been affected by national, state and local redistributive policies, I expect a negative association between income inequality and economic growth.

H_{1a}: Metropolitan areas with high income inequality should be associated with slower economic growth rates.

H_{1b}: Metropolitan areas with high poverty rates should be associated with slower economic growth rates.

2.3 Spatial Income Inequality

As a phenomenon created by and associated with income inequality, spatial income inequality is multi-dimensional: social, geographical and political. It is social because it is the socioeconomic status stratified by space. It is geographical in the sense that the distinction between different social-economic classes upon geographical boundaries is significantly clear on the American urban landscape. It is well documented that the fragmented urban government structure corresponds with segmented residential structure. Urban policies, either directly or

[5] Most studies use data after 1970 because there is too much missing data for observations before 1970.

indirectly, have reinforced residential segregation or been fighting for integration. Thus the political dimension of spatial income inequality in urban studies is unavoidable.

Residential segregation has been the central feature of the American metropolitan areas. About 40 years ago, Gerhard Lenski defined the study of social inequality as' who gets what and why' (Lenski 1966). Today, residential location and race are associated with this key question of social equity. Spatial disparity penetrates almost all urban socioeconomic dimensions, such as health, crime, employment, education and fiscal resources. Location determines access to virtually all the products and services associated with good life (Squires and Kubrin 2005). Segregation shapes the context in which policy decisions are made (Watson 2006).

Health disparities are the most concrete disadvantage associated with spatial and racial division in urban areas. Research documents that access to clean air and water, exposure to lead paint, stress, obesity, diet, social isolation, proximity to hospitals and availability of health insurance all vary by neighborhood and contribute to long-established disparities in heath and wellness (Bullard 1996, Dreier *et al* 2002, Klinenberg 2002).

Crime is a critical factor of life quality. Although most serious crime rates have gone down in recent years, crime remains concentrated in central cities and selected inner-ring suburbs (U.S. Department of Justice 2001).

Spatial mismatch theorists recognized that employment is far more dependent partially on place and race (Kain 1968, 1992, 2004). Lack of exposure to mainstream middle-class role models and social networks is a major contributor to urban jobless and social problems (Wilson 1987). Neighborhood quality associates with school quality. Reliance on property tax to fund public schools actually nurtures on-going inequality in nation's schools that is explicitly tied to place.

Geographically the disparity between central cities and their suburbs is remarkable in the metropolitan socioeconomic landscape. It is a crucial measurement of residential segregation. It is the macro-level expression of segregation on metropolitan areas. American urban growth has

long been characterized by central city decline, its loss of fiscal independence and waning of this political power. This problem has not been effectively addressed by federal, state and local polices. The problems facing central cities have proven extremely frustrating. In addition, with the federal safety net passing down to state and local government, local political and financial support is determinate for the effectiveness of public services and antipoverty programs.

In addition, segregation and the deterioration of central cities reinforce themselves through hindering effective political process and policies. The social and income disparity between central cities and their suburbs and between rich and poor communities fosters the mutual ignorance and has been a strong impediment to initiatives on matters with regional significance (Frisken 2001, Kantor 2006, Savitch and Vogel 2004). Suburban residents build their own local political jurisdictions and implement exclusive policies to protect their property and well-being. They question why they should pay for the recovery of a distress area that they believe does not touch them (Stegman 1997). Hence, spatial income inequality is associated with conservatism in politics (Dunleavy 1979, Engels 1969). Liberal policies to revitalize distressed areas or to support the disadvantaged inhabitants wane. As a result, for metropolitan areas with high poverty concentrations, it has been extremely hard to raise tax base for public services from the well-off suburbs. Thus it is substantially important to provide the political rationale convincing the non-poor that the impact of segregation is in their welfare equation.

However, existing literature in both urban studies and sociology has focused on the consequences of residential segregation on the disadvantaged/the poor and the minority. Racial segregation and income sorting deteriorate the poor's heath, concentrate crime in poor/minority communities, and limit the job and education opportunities of the residents in distressed neighborhoods. Little research has been done to demonstrate the impact of residential segregation on the entire population or the entire metropolitan area, or the impact of central city-suburban disparity on metropolitan growth. This project examines the impact of residential segregation on the metropolitan economic performance, i.e. the impact on the welfare of the entire urban

population: the poor and non-poor, white and minorities. It will provide empirical evidence that lifting the conditions and opportunities of the poor and disadvantaged is beneficial for the entire population.

With an increased importance of the metropolitan-level geography in the global economy and in the management of quality of life, a very diverse urban government structure has been created by the power balance between the regionalism of public service provision and conservative politics nurtured by segregation. Thus it is necessary to integrate the efficiency and equity issues of the government structure and policies in this empirical study.

Figure 2.2 shows the theoretical foundation of each dimension of spatial income inequality to economic growth, i.e. residential segregation, the disparity between central cities and their suburbs, government structure and metropolitan economic growth. Endogenous economic growth theory combined with spatial mismatch hypothesis proposes a negative impact of residential segregation on metropolitan economic growth. Agglomeration effects and spill-over effects argue for the importance of central city to suburban growth. Public choice theories and regionalism either support or oppose fragmented government structure.

The following section elaborates theories linked residential segregation and economic growth. The effect of central city and suburban income disparity is then discussed. And the political dimension, which means government structure and urban policies in this study, is presented last.

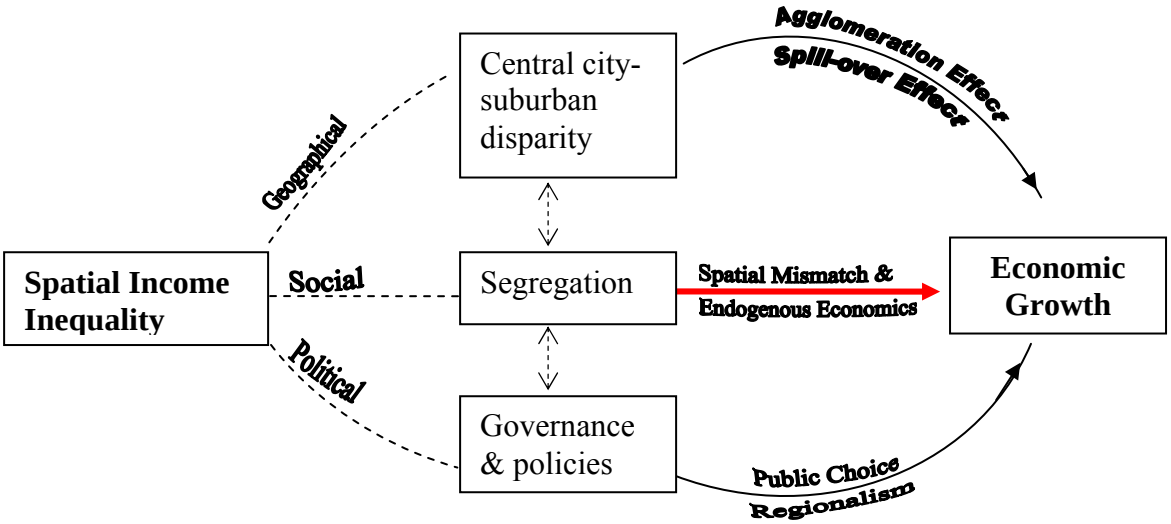

Figure 2.2 Spatial income inequality and economic growth

2.4 Residential Segregation and Economic Growth

Abundant research has established the spatial mismatch hypothesis and posited the deteriorating education quality in public schools from education segregation. Combined with endogenous economic growth theory, this line of research provides a theoretical framework that connects residential segregation and metropolitan economic growth. Residential segregation slows down metropolitan economic growth by deterring education investment of the society, through the labor market mechanism and the education system.

2.4.1 Complementary Effect Perspective

Endogenous growth theories argue that new ideas (or innovation, technological progress, knowledge growth)[6] are the engine of local and national economic growth. Social interactions among individuals (the external effect of human capital) are one source of knowledge growth. The number of researchers and subsidies to R&D is one determinant factor to economic growth. However, recent research states that since low- skill labor is complementary to high-skill labor,

[6] This dissertation takes these terms as interchangeable items.

the ratio of production workers to researchers is the determinant of economic growth instead of the number of researchers.

The idea-based endogenous growth models propose that the economic growth rate is proportional to the total amount of research undertaken in the economy. Thus, R&D subsidies will foster research intensity and therefore lead to higher economic growth. Other things equal, an increase in the population raises the number of researchers and hence drives the growth of per capita income (Aghion and Howitt 1992, Grossman and Helpman 1991, Romer 1990b).

The predictions are criticized for the inconsistency between their predictions and the empirical evidence in the 20th-century (Jones 1995). From 1960 to 2007, expenditure on R&D increased dramatically. For example, U.S. R & D expenditures in 2007 were nearly five times of that in 1960[7]. The number of scientists and engineers engaged in R &D in the U.S. has grown from under 500,000 to 4.8 million in 2000 with an annual growth rate of 6.8% in contrast with 1.6% of the annual total employment growth rate. Other developed countries have experienced even larger R & D employment[8]. At the same time, patent grants and economic growth rates have been constant in most developed countries[9] (Jones 1995, Segerstrom 1998).

Jones (1995), Kortum (1997) and Segerstrom (1998) construct a semi-endogenous model to account for the puzzling trend. They obtain the result that the growth rate of output per capita is proportional to the growth rate of the population, instead of population size. However, these models contain the neoclassical model's prediction that policies (such as R&D subsidies) have no impact on long-run economic growth. It is at odds with the spirit of the endogenous growth theory. By eliminating the growth effect of scale, the work of Aghion and Howitt (1998 ch.12),

[7] U.S. R & D expenditure increased to $ 307,553 in 2007 from $65,155 in 1960 in 2000 constant dollars, according to the data from National Science Foundation, Division of Science Resource Statistics (NSF/SRS).
[8] National Science Foundation.
[9] According to the data from World Intellectual Property Organization, the growth of patent grants is relatively constant in most European countries from 1960 to 2005, if not declined. Patent grants grow persistently in U.S. and Japan. The GDP growth rate of U.S. has been constant (even slightly decreasing) from 1960 to 2005 according to the statistics of Bureau of Economic Analysis.

Dinoupolous and Thompson (1998), Peretto (1998) and Young (1998) propose that increases in the population raise number of products available in direct proportion, but leave research efforts (and therefore growth) unchanged. These models reintroduce the policy effects (e.g. R& D subsidies, support for high-technology manufacturing) on the long-run rate of growth (Helpman 1992, Jones 1999, Rebeiro 2000). In addition, they obtain long-run growth in the absence of population growth.

Based on the idea-based structure of Romer's (1990a) model and with the specification for the accumulation of human capital technically similar to Lucas (1988), the model of Ribeiro (2000) carries a surprising result that growth depends positively on the ratio of final-goods workers to researchers. This model allows for the effects of economic policy (a subsidy to the research sector) on the economic growth rate. This result implies complementarity between high-skill labor and low-skill labor.

Based on the complementary effect perspective of low-skill labor to high-skill labor, Benabou (1993) elaborates the negative effect of segregation on economic growth. If the low skilled persons are segregated in communities totally deprived of high-skill workers, the return to education for low-skill labor is negative. It serves as a disincentive for education investment of the poor population. Thus, the exodus of the high-skill group leads agents in the deteriorative communities to remain unskilled and drop out of the labor force. The reduction of the supply of the low-skilled workers then decreases the demand of the high-skill workers because low-skill labor is a complementary input for the high-skill labor. Hence, the incentives for individuals in high-skilled communities to invest in education decline. Therefore, total education investments of the society shrink, which slows down economic growth. Thus, Benabou provides a theory proposing a negative impact of segregation on aggregate economic growth through the complementary nature between high-skill and low-skill labors in labor market. That is, residential segregation induces a collapse of a city's productive capability by reducing the supply of the low-skill workers and ultimately the incentive of education investments of a society. The disruptive

consequence of segregation mainly lies in its disincentive impact on investments for human capital accumulation. Figure 2.3 shows Benabou's theory.

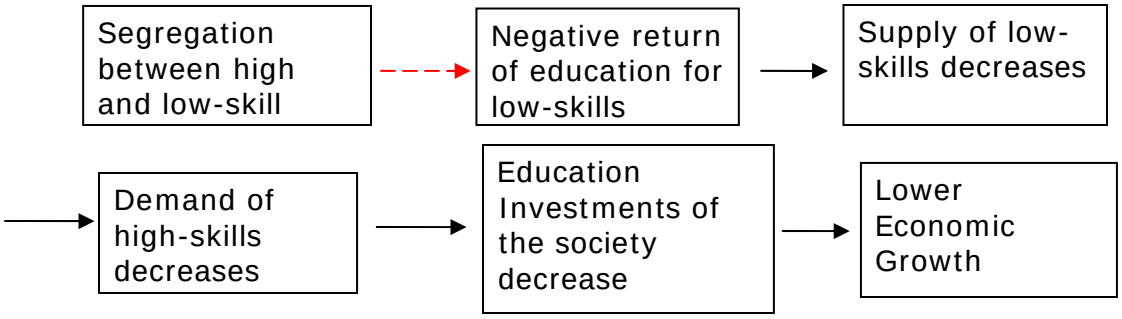

Figure 2.3 The negative impact of residential segregation on economic growth

The first arrow in the relationship is the most important in Benabou's theory. It leads to the subsequent consequences. However, Benabou did not explain why the return to education investments for the low-skill population might be negative when high-skill and low-skill labors are segregated. The well-developed spatial mismatch hypothesis provides the mechanism.

2.4.2 Spatial Mismatch Hypothesis

The spatial mismatch hypothesis in social geography proposes that segregated residential structures (both by race and income) reduce employment opportunities for minorities and the poor. Living in high poverty neighborhoods is thought to undermine workforce participation primarily in two ways: by accentuating the physical distance between place of residence and jobs, and by limiting access to networks that link people into job opportunities (Kain 1968). The majority of research on this topic concludes physical distance from job openings has a negative effect on labor market outcomes (Holzer 1991, Ihlanfeldt and Sjoquist 1998). "Although it is unlikely to be a complete explanation, this research is generally persuasive in showing that job accessibility—generally measured in spatial terms—is an important contributing factor to minorities' labor market difficulties" (Fernandez and Su 2004 P.53).

Most research on spatial mismatch argues that race and social processes are more important in explaining the geographical barriers to employment for inner city residents, especially minorities (mainly African-Americans) (Ihlanfeldt and Sjoquist 1998, Preston and Mclafferty 1999). These

studies conclude racial discrimination in employment and absence of place-based social networks are the primary explanations for employment and compensation variations among blacks and whites (Gabriel and Rosenthal 1996, Kasinitz and Rosenberg 1996).

There is growing evidence that employers' of non-skilled and semi-skilled jobs are affected by local circumstances (Aponte 1996, Hanson and Pratt 1995, Holzer and Ihlandfeldt 1996). For example, employers have been reported to weight different job applicants on the basis of their addresses, refusing to hire residents of public housing or from very poor neighborhoods (Kirschenman and Neckerman 1991, Kasinitz and Rosenberg 1996). Also, employers fill job openings by relying on social trust accumulated with present employees, rather than through want ads (O' Regan 1993). This makes it difficult for the residents of poor inner-city neighborhoods to find and keep employment because they lack local social networks as sources of information about job vacancies and as sources of referrals to local employers (Hanson and Pratt 1995, Kasinitz and Rosenberg 1996).

Besides physical distance, racial discrimination and social network, Kasarda (1990) proposed economic restructuring contributes the job-housing mismatch. Economic restructuring leads to jobs and qualified workers moving in opposite direction (Kasarda 1990). Advances in computers and telecommunications in mid-1970s allowed firms to decentralize operations within metropolitan areas as well as across regions and around the world (Sassen 1991, Wyly *et al* 1998). Emergence of a service economy driven by small to medium-sized firms propels the suburbanization of production services and low-wage services (Blair and Premus 1987, Mills 1992), and consequently jobs, middle-classes and public services (Berry 1975, Teitz and Chapple 1998, Wyly *et al*. 1998). Meanwhile, the traditional economy characterized by heavily unionized, high-wage, blue-collar factory jobs concentrated in central cities has eroded (Bluestone and Harrison 1982, Wilson 1987). Central city residents, the traditional low-wage blue-collar workers, cannot move out to follow the jobs and middle-classes because of the constraints of community attachment, discrimination, or lack of information about job and housing

opportunities (Teitz and Chapple 1998). Thus, cities become the enclaves of the most disadvantaged who are isolated from the mainstream, hard to get employed and living in deteriorated conditions.

Hence, the spatial mismatch hypothesis proposes that the segregated and isolated minorities and poor and minorities find themselves in unproductive and deteriorating communities where employment is hard find because of physical distance barriers, discrimination in employment and housing, and lack of social networks and information. This part of the population is the source of low-skill and low-wage labor. When they are forced to stay out the labor market, they cannot gain any income to compensate the costs they invested for the quantity and quality of education they have. Thus, residential segregation induces negative returns to education for low-skill labor. Till now, the spatial mismatch hypothesis fills in the gap of the theory based on complementary effect perspective proposed by Benabou (1993) and Ribeiro (2000). This theoretical combination delicately elaborates the disruptive impact of residential segregation on aggregate economic growth. The second set of hypothesis of this dissertation is confidently developed accordingly[10]:

H_{2a}: Metropolitan areas highly segregated by race should be associated with lower economic growth rates.

H_{2b}: Metropolitan areas highly segregated by income should be associated with lower economic growth rates.

H_{2c}: Metropolitan areas highly segregated by skills should be associated with lower economic growth rates[11].

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[10] Watson (2006) actually found a negative association between income segregation and metropolitan growth measured by population growth.

[11] Endogenous economic growth theories suggest knowledge spillovers associated with increased education can serve as the engine of growth for national and local economies. The dense concentration of educated people in spatially limited areas enhances these spillovers by permitting a great deal of interaction, which fosters new ideas, processes and products that may lead to faster productivity growth for urban firms (Carlino 1995, Rauch 1993). Individuals with high income, however, are usually highly educated or experienced, are concentrated and clustered in similar-ranked communities in the hierarchical residential structure. Personal interactions among residents hosted by location proximity exchange information and foster new ideas, processes and products. That means knowledge spillovers occur through

This section describes how residential segregation as a disincentive to education investments for the poor and the entire population, ultimately slows down the aggregate economic growth through labor market inaccessibility for the minorities and the poor. Because of the well-documented close association of residential segregation and education segregation, the mechanism of segregation that hinders economic growth through the education system is elaborated as follows. It is direct but also closely relates to the labor market.

2.4.3 School Segregation

School segregation is associated and fostered by residential segregation. Public school failure concentrates in high poverty communities (Bifulco and Ladd 2006, Fry 2007). When schooling is locally funded, school district income (which is from local taxes) determines school spending and school quality. It in turn affects the education outcomes (Benabou 1996, Fernandez and Rogerson 1996). As a result, children from low-income families are concentrated in poor communities where few resources are spent on schooling. Since there is a strong relationship between school expenditure and education achievements, school attainments of poor children might fall for low teacher quality, teacher expectations of students and physical facilities. Previous research has found that the drop-out rate in severely distressed neighborhoods is three times more than that in non-poverty neighborhoods (Kasarda 1993).

Meanwhile, children from high-income families in white and suburban neighborhoods are concentrated in schools with adequate funding and with peers of similar socioeconomic background. This might increase their education achievements (Benabou 1994, Down 1994, Massey and Denton 1993, Wilson 1987).

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social interactions among residents of the prestigious and middle prestige communities, which will facilitate both the productivity progress and economic growth. Thus a possible positive relationship might hold between the hierarchical residential structure and economic growth. However, the economic agglomeration literature doesn't distinguish the concentration of workers from the concentration of residents. Hence, I hypothesize a negative association according to the related literature and will include indices of agglomeration effect to test the possibility of the positive connection.

If education quality is a linear function of school fiscal resources, total school attainment might not change because the increase of education achievements of the high-income children might offset the declining schooling of the poor children (Mayer 2002). But the declining schooling of children of distressed communities is substantially important concerning the complementary relation between high-skill and low-skill labor for production; children living in poor communities might be the major source of low-skill workers. The deteriorating schools supported by high poverty neighborhoods enlarges the disparity between education qualities the poor children attained and the associated job requirements, in addition to the potential social problems associated with high school drop-out. If the education the low-income children get does not prepare them well to cope with the needs of the labor market, economic growth might slow down for lack of the production and business services from low-income positions.

Besides the school finance argument, it is well-established that both rich and poor children benefit from affluent neighbors. Those benefits can be derived from role-model effects and social networks (Jencks and Mayer 1990, Sampson and Laub 1994, Wilson 1987). Ainsworth (2002) found that neighborhood high-status residents have a significantly positive effect on students' time spent on homework and math/reading achievements.

Racial and class makeup of students in schools is not only associated with test scores and drop out rates, but also influences the student's college choice and school attainment (Wells and Crain 1994). Research consistently finds African American students who move from segregated schools to desegregated schools are more likely to finish high school and go to college. They are also more likely to attend a desegregated college. In other words, desegregation practice affords black students the opportunity to develop confidence in their scholastic abilities and their adaptive and coping skills in majority white settings (Braddock 1980, Kaufman and Rosenbaum 1992). It also helps them gain social contacts and develop social networks that will help them attain higher occupational status and income later in their lives (Crain 1970, Dawkins 1991, Green 1982).

School segregation and desegregation practices affect all groups of students, minorities and whites, rather than only minorities. Student body diversity promotes learning outcomes through students' interactions across racial and ethnic lines, and 'better prepares students for an increasingly diverse environment and workforce, and better prepares them as professionals' (Grutter v. Bollinger 2003, Orfield and Lee 2005). These benefits are significant, as major American businesses have made it clear that "skills needed in today's increasingly global marketplace can only be developed through exposure to widely diverse people, culture, ideas and viewpoints" (Grutter v. Bollinger 2003).

Hence, school segregation, facilitated by residential segregation, constrains the education and employment opportunities of minorities and poor and consequently limits their life chances. Following the complementary-effects arguments, school failure of poverty concentrated communities contributes to the shortage of low-skill labor and so decreases the demand of high-skill labor, which ultimately creates a disincentive for educational investments of the entire society and disrupts the entire economic growth. On the other hand, school segregation negatively affects the educational achievement of the whole body of the students by inhibiting the growth of new knowledge and the adoption of the diverse environments. According to idea-based endogenous economic theory, knowledge progress drives economic growth. School segregation should be associated with lower economic growth. Therefore, both the complementary effect argument and the idea driven argument suggest the following hypothesis:

H_{2d}: Metropolitan areas with high level of school segregation should be associated with slower economic growth rates.

2.5 Central City-Suburban Disparity and Economic Growth

With the advancement of telecommunication technology and the development of transportation systems, the U.S. urban growth process has been dominated by suburbanization

since 1950s. Its consequences are deteriorating central cities and the enlarging central city-suburban disparities.

The remarkable geographical distinction in social, economic and fiscal resources between these two areas shapes the political power structure, determines policy priorities, and affects the efficiency of policy implementation in the U.S. urban areas. With the passing down of federal safety net to state and local governments, major cities are more subject to the gyrations of local economies for revenue flow. Yet the out-flight of business and middle-class households erodes cities' tax base. The shortage and insecurity of revenue resources constrain cities' incentives and capabilities to satisfy the public's demand for public services. In addition, the national economy, based on the fundamentally inequitable economic units, is more vulnerable and less resilient to an economic recession. Given the slim possibility of change of urban growth process and the lack of intergovernmental support, cities found they are in worse condition in this recession than their experiences in the midst of 1990-1991, even after controlling for the severity of the economic recession. The geographical and political separation within states and metropolitan areas makes it inefficient to make coherent economic-stimulating plans for economic recovery.

A growing prosperous central city and the approaching economies between the central city and its suburbs symbolize a healthy metropolitan economy. It is well documented that central cities and their adjacent suburbs are complementary economies instead of self-sufficient ones (Gottlieb 2000, Mills 1990, Savitch *et al*. 1992 1993, Voith 1998). Yet a fast growing central city is not necessarily associated with a narrowed gap between the city and its suburbs. And the economy performance of a distressed city and its suburbs might be synonymous (Gottlieb 2000, Hill and Brennan 2005). The history of urban growth reveals that a thriving city and its latent suburbs might reflect the suburbs have not utilized the city resources sufficiently. While a deleterious city and the slow-growing suburbs might reveal the detrimental effect of a shrinking city to the regional economy. A distressed city and the growing suburbs present the fact that suburbs serve as the growth engine for a metropolitan area by depriving city resources. Suburban residents

enjoy the public services and facilities and earn income from central cities, yet they do not contribute tax revenue to central cities. This zero-sum urban growth pattern is widely questioned for its social, economic and political equity issues. The agglomeration economics and spatial spillovers effect perspective suggest that economically the divided urban growth pattern is inefficient, non-sustainable and not resilient.

Longstanding, inextricable and continually changing central city-suburban ties can be illustrated by the history of city growth. Besides the endowed advantages of geographical locations, natural resources and climate, cities formed and grew through industries and population flow and concentration. As agglomeration economics suggests, an industry presence in a city might be a result of the availability of natural resources, historical accident or simply by government policies. However, once an industry develops in a city, it will reproduce or attract outside firms in the same industry. By locating together, firms in the same industry can take advantage of the common labor pool, economies of scale of intermediate inputs production and lower transportation costs, such as the high-tech industry in Silicon Valley, the TV and motion picture industry in Los Angeles, and the auto industry in Detroit (Carlino 2005, Down 1994, Ihlanfeldt 1995, Krugman 1991a 1991b, O'Sullivan 1993).

Not only does the firm's industry matter for city's growth, but the size of the city itself also matters. We can only find some particular special services, such as financial and business services, in large cities because only large cities can provide sufficient client base for these firms in special business services to flourish. The rise of these types of special services in large cities is external to any single firm or industry as suggested by urbanization economics.

Besides serving as the necessary business client base, large population size and high population density is the endogenous engine for city growth. The physical proximity among a highly skilled population facilitates knowledge transfer and expedites knowledge creation, which is identified as knowledge spillover by agglomeration economists. Knowledge innovation originating from face-to-face communications among workers from different firms might lead to

unexpected combinations of seemingly unrelated ideas and may provide leaps to new goods or to new ways of producing existing goods (Beeson 1992, Glaeser 1993, Jacobs 1969). Thus city growth shifts from firms' proximity to suppliers and customers to proximity of highly skilled workers. Cities with a certain population size grow self-sustainably. It implies concentration of highly skilled workers is the determinant for city growth (Glaeser *et al*. 1992, Hill and Brennan 2005, Rauch 1991). This is consistent with the arguments from endogenous economists. Endogenous economists present that social interactions among individuals are the microeconomic foundation for knowledge diffusion and innovation. It is the knowledge spillover effects that stimulate knowledge and ultimately economic output growth (Lucas 1988, Mathur 1999). Knowledge spillover effects associated with additional education serves as the engine of local and national economic growth.

This argument is confirmed by empirical evidence. Additional years of education increase total factor productivity substantially (Ciccone and Hall 1996, Rauch 1993). The dense concentration of educated people in spatially limited areas enhances these spillovers by permitting a great deal of interactions which foster new ideas, processes and products that may lead to faster productivity growth for urban firms (Carlino 1995). Therefore, attracting highly skilled workers is the theme for city policymakers with growth on the top of their agenda.

Yet some researchers point out that the agglomeration effect is limited because it is internalized to change the ratio of capital and labor. So city size will ultimately decline when the agglomeration effect is exhausted (Petrakos 1992). This might be true since cities do not expand their boundaries infinitely. Moreover, the traditional view suggests that a city's level of population, employment and output stabilizes at a certain level for high living and business costs (rents) associated with congestion, which implies gains from agglomeration are ultimately offset.

The story described above reveals agglomeration effects associated with business and human capital concentration nurture city prosperity. Yet the congestion created by concentration urges city residents spin out. Researchers have documented that individuals (families) with higher

human capital are more sensitive to the quality of neighborhoods than those with low human wealth. The better educated families (and individuals) thus move to suburbs to avoid congestion, noise and crime problems and to enjoy larger space and better living environment (Andrew 1994 and Benabou1994). Following are the businesses either seeking lower production costs or targeting the out flight middle and upper classes for service provision. The once self-sufficient countryside became suburbs dependent on the city.

With the new construction of highway networks, the development of computers and telecommunication technologies, the availability of cheap FHA mortgage and the generous tax allowance, the once small-town suburbia grew into giant settlements. Suburban growth continues as former low-density suburbs became small cities. The two entities, city and suburbs, thrive into a commercial, cultural and political metropolis which replace that of a city. The role of city in urban development started to be falsely questioned and the status of suburbs is far over-stated.

Although cities have deteriorated while suburbs thrive, cities and suburbs are symbiotic instead of independent. The history of American urban growth reveals suburbs are fostered by business and knowledge agglomeration in the city. In other words, suburban growth roots in a prosperous city. As long as a strong central city is held, suburban prosperity could continue. Suburbs with a declining urban core are vulnerable and do not have long-term potential, because a blight central city cast a long shadow. Most business or individuals with high human capital would not move to a declining environment.

As elaborated above, the concentration of business and human capital serves as the engine of city growth. High skilled individuals have higher income and more wealth. The rise of real income leads to more demand for the variety of goods and services such as cultural and leisure activities including sports teams, gourmet restaurants and live theaters (Glaeser *et al*. 2001). These services are more plentiful in large cities for both of the big local market and the substantial economics of scale. With the middle and upper classes spreading out of the city, the luxury goods and services in central cities dwindle because of the shrinking client base. It again

reversely affects the location choice of individuals with higher income for fewer amenities and their less attractiveness of life style. Without a sustained flow of human capital, how can a city keep growing in a long term? Businesses will not select a decentralizing city as their location for scattered and smaller client base, and lower quality labor pool. The city thus deteriorates for its slim fiscal resources are not sufficient to provide attractive public services and maintain public infrastructure. This is detrimental to its suburbs. The deleterious city shadows the opportunities for suburban growth because of a negative image effect. For example, Headhunters find it difficult to lure top-talented people to the Detroit metropolitan area, even if the place is far away from Detroit city (Voith 1992). Thus the separation between cities and suburbs is destructive. These two entities constitute one economic market and only a vibrate city can harbor sustained suburban growth and then a prosperous metropolitan economy.

Studies testing the complementarity between central city and suburbs are overwhelmingly empirical. Hill and Brennan (2005) found a positive correlation of job growth between central cities and suburbs based on the analysis on 100 cities. They conclude cities and suburbs are one market for business location. Gottlieb (1998) reviewed thirteen articles in 1990s and found that a consistent positive correlation between central city and suburban performance, which means they are complements rather than substitutes. These empirical studies use population growth, employment growth, per capita income growth, stock of office and house values as the indices of economic performance[12]. Besides the positive correlation between these two urban areas, Voith (1998) builds a structural model and teases out the causal relationship between central city income growth and that of their suburbs. Instrumental estimation results indicate income growth in large cities enhances suburban growth, but income growth in small cities has little effect. He also found the correlation between central cities and suburbs has grown stronger over time.

Moreover, according to the spatial spillover argument, problems associated with urban decay will penetrate to inner-ring suburbs. Crime rates are high and property values are lower in suburbs

[12] See table 1 in Gottlieb (1998) for more information.

that neighbor distressed cities (Brown 1982, Haughwout 1997, Voith 1996). Suburbs have to confront the fact that they cannot evade both the direct and indirect poverty-related expenditure by relaxing the legal mandate on income or healthcare (Gottlieb 2000, Pack 1998). Only eliminating the poverty is sufficient, although it is controversial about the costs and efficient ways of turning a dependent population into productive population.

Yet the interdependent economy between central cities and their suburbs, and the tax burden they share for re-distributive programs provides these two entities with the foundation to form political and administrative coalitions. It is the precondition to breakdown the vicious circle of the urban growth process which is likely to endure indefinitely: suburbs appropriate the benefits by their association with metropolises and evading their responsibilities; central cities suffer the trend of decay by their own negative synergies. Central cities are naturally endowed the location advantages, such as centrality and accessibility. The waste of these assets in American cities undermines regional economic performance. Thus, based on the arguments of agglomeration effects and spatial spillover effects, this dissertation develops the third set of hypothesis:

H_{3a}: Metropolitan areas with large income disparities between central cities and suburbs should be associated with slower economic growth rates.

H_{3b}: Metropolitan areas with high poverty concentrations in central cities should be associated ith slower economic growth rates.

2.6 Institutions and Economic Growth

2.6.1 Government Structure

The history of urban development in the U.S. has been characterized by searching for a way to organize governmental systems of cities and regions to the territorial reach of population settlement and economic activities. Urban growth and the interplay of diverse influences of urban conditions, determines urban government structure (Foster 1997, Hamilton 2000). Urban growth, together with higher population densities and increased social interactions, generates a need for

collectivized urban service provision (Foster 1993, Monkkonen 1988, Paddison 1983). The disparity between inner cities and their suburbs, or between poor and rich municipalities, has been a strong impediment to initiatives on matters of regional significance (Frisken 2001, Kantor 2006, Savitch and Vogel 2004). Both city officials and suburban officials object to or resist closer ties with each other because city populations are increasingly differentiated from suburban residents by income and ethnicity. State governments are reluctant to create units that could rival them in importance (Frisken 2001, Nice 1983). The pull factors of dependent-induced urban regionalism, public service provision, social problem alleviation and various political impediments have created diverse urban government structures and revitalized scholarly research about its efficiency and equity.

A growing literature addresses the links between government structure, household location choice and urban growth (Foster 1993, Nelson 1990, Nelson and Foster 1999, Ward 1987). It conveys conceptual agreement that government structure may influence growth by creating a particular institutional and policy environment for development; government entities can attract (or repel) households and firms which are the building blocks of growth (Danielson and Doig 1982). This literature is advanced through the political fragmentation debate.

Public choice arguments posit that fragmented systems of metropolitan governance are superior to consolidated systems because they are more democratic and efficient to operate (Frisken and Norris 2001, Tiebout 1956, Warren 1966). Assuming households have different preferences for service/tax bundles of public goods, metropolitan areas with fragmented systems are more democratic because they allow urban households to choose their resident location from a large number of communities. Given sufficient population, fragmentation produces a wide variety of communities that provide diverse public goods packages offering great potential to satisfy household preferences. In addition, this argument holds that greater interjurisdictional competition impels public goods suppliers to efficiently provide the level and quality of public goods consumers demand (Dye 1990, Kenyon 1997, Nunn, Klacik, and Schoedel 1996, Schneider

1989). Hence, areas with fragmented governance are theorized to attract more population than less fragmented areas (Foster 1993).

The public choice paradigm also asserts that overlapping governments signal responsiveness of governments to heterogeneous demands and recognition that different urban services achieve efficient production levels at different scales (Parks and Oakerson 1989). This assertion derives from the notion that different urban services have different geographic scales for efficient production as well as different levels of externalities. Fragmented government structures are thought to be attractive to pro-growth interests (investors) because they facilitate playing one community off against the other to obtain tax breaks, offer lenient environmental regulations, and provide other economic inducements unlikely in a less competitive system (Kenyon and Kincaid 1991, Van Dyne 1997). Local merchant capitalists favor fragmented structures as a stimulative environment for growth and a shield against redistributive policies typical of regionalized systems (Logan and Molotch 1987, Olin 1991, Orfield 1997).

Several critiques of the public choice argument help to explain why fragmented government systems failed to bring an end to the search for new ways to address problems identified with city-region expansion (Denters and Mossberger 2006, Frisken and Norris 2001, Keating 1995, Long 1972, Stephens and Wikstrom 2000, Stone 2005). Democratic theory has long posited that local decision making offers more opportunities for meaningful civic engagement. Citizens participate more in smaller municipalities (Oliver 2001). People in small communities are likely to have geographically proximate social networks. In other words, people in small communities are likely to know their neighbors or run into acquaintances in public places. An active social network and small physical size makes civic participation attractive. Residents in large communities tend to be less familiar with people they live near, are less likely to have friends in common and social relations between neighbors are less likely to be geographically proximate. In addition, by living in a big community, attending organizational meetings are more time-consuming or costly because of the drive time, traffic, and parking fee. In short, the hassles and

many distractions of big-city living might reduce the incentives of people to get involved in their community.

Yet Kelleher and Lowery (2004) did not find that the simple size of municipal government influences participation. Instead, they found that urban county institutions moving toward less fragmentation with greater concentration could improve local political participation[13]. This is contrary to Oliver (2001). In addition, the underlying mechanism of the Tiebout explanation assumes the evaluation of core municipal services is the strongest determinant of the likelihood for the citizens to move (Bickers, Salucci and Stein 2006). Yet results from the spatial-lag model and the analysis of interviews and news reports reveal that there are tax competitions among municipalities in Chicago metropolitan area on lower-mobile property tax, but not on the high-mobile sales tax. It indicates voice might be more prevalent for public service provision than exit (Hendrick, Wu and Jacob 2007).

The main issue is that fragmented regimes shaped the landscape of U.S. urban growth (Lewis 1996, Rusk 1995). Dominant local coalitions differ from municipality to municipality. The sorting of population into local governments along lines of race and class has created extraordinary levels of homogeneity that are strongly associated with reduced levels of citizen engagement (Swanstrom 2006). The fact that African-Americans have gained many local political offices does not mean the politics of central cities are healthy. Little meaningful party competition in central cities minimizes the incentives for political elites to mobilize the disadvantaged, which harms the poor (Keiser 1997). In fact, fragmented government systems not only contribute to the democracy problem, but also fail to deal adequately with growing disparities in the financial and social well-being of older US central cities relative to their suburbs. Municipal fragmentation stratifies communities, and the stratification tends to increase during periods of rapid growth (Hill 1974, Vicino 2008, Weiher 1991). During regional growth

[13] Kelleher and Lowery (2004) found moving either toward greater fragmentation with less concentration or toward less fragmentation with greater concentration could improve local political participation. However, fracturing the central cities into smaller units occurs infrequently.

spurts, suburban communities preserve their status by excluding households with low socioeconomic status and force new jobs or residences farther out, toward the metropolitan periphery. City governments then experience difficulties dealing with growing social problems out of declining tax bases (Campbell and Sacks 1967).

In fragmented systems, local governments, like individuals and firms, act in their own self-interests and impose costs (externalities) on others causing the region's wealth, and by implication the incomes of individuals, to suffer (Nelson and Foster 1999). Interjurisdictional competition for development induced by fragmented governments is criticized for promoting zero -sum games. It leads to inefficiently and inequitably located facilities, encourages haphazard development and overzoning of commercial and industrial land uses, and induces local governments to relax environmental standards (Barlow 1991, Lubell, Feiock and Ramirez 2005, Peirce, Johnson and Hall 1993). For example, a study conducted by Lubell *et al*. (2005) on counties in Florida found counties with active business interests are more vulnerable to the politics of growth machine, and are constrained for environment conservation polices. According to the results based on 14 cities comparison, Rusk (1995) presented that local governments highly fragmented are usually incapable of adopt integrating strategies. The unified local government has the zoning and planning power to implement policies enhancing racial and economic integration. Regional governments are more inclined to rationalize metropolitan-wide development, narrow intraregional disparities and spur investment in central city revitalization (Downs1994, Lewis 1996, Orfield 1997, Pastor, Dreier, Grigsby and Lopez-Garciz 1997, Vicino 2008).

Moreover, the argument for integrated government arrangements stresses that larger jurisdictions have the ability to realize the economics of scale in production, and to internalize the inefficient externalities associated with smaller, more numerous government units (Frisken 1991, Rusk 1993 1995, Wingo 1972). Regional government structures might have the motivation and authority over allocation of one or more resources that everyone needs to sustain economic

activities (Lubell, Feiock and Ramirez 2005). Integrated political structures enable the provision of area-wide services that individual municipalities are unwilling or unable to provide on their own, thereby serving a wider variety of intrametroplitan interests and enhancing the regional quality of life (Frisken 1991). Regional concerns such as water, economic development, airports, transit and pollution control is ensured by unified governments with regional consideration (Adams 1997, Bollens 1997). Improved service coordination, increased regulatory consistency and a reduced number of required government interactions associated with integrated political structure should reduce frustration and lower development and investment risks, thus attracting growth (Barlow 1991).

Empirical evidence from case studies, business surveys and aggregate analysis yield few conclusions linking metropolitan government structures, central city-suburb disparity and economic growth. A case study found no relationship between the 1973 consolidation of the city of Jacksonville with Duval County, Florida. However, the consolidation of the city of Indianapolis and Marion County, Indiana was positively associated with economic growth (Blomquist and Parks 1995, Feiock and Carr 1997). Survey findings reveal strong support among business and community elites for regional government (Henderson and Rosenbaum 1973, Teaford 1979). On the metropolitan scale, the potential for one-stop permitting is apparently more attractive to business interests than is the opportunity to play one community than another (Edwards and Bohland 1991). When environmental problems have passed some threshold of dissatisfaction, residents are more likely to support regional governments to manage the issues affecting regional quality of life, such as traffic congestion and pollution (Gerston and Haas 1993, Nelson and Foster 1999). Evidence from aggregate studies is also ambiguous. Rusk (1993, 1995) reports politically integrated metropolitan areas are associated with lower central city-suburb disparity, lower residential segregation and higher population growth. McCarville (2004) identified the negative association between government fragmentation and economic growth. Savitch and Vogel (2004) found city-county consolidation does not lessen urban sprawl. It

implies that integrated government does not mitigate residential segregation. Results of Foster (1993) provide mixed results: supportive to fragmentation, high proportions of unincorporated population is associated with lower growth rates. Yet metropolitan areas with regionalized school districts relative to municipalities grew more rapidly.

Despite the provoking scholarly debate on government fragmentation verses integration, and the mixed empirical evidence, the consistent support for integrated government systems from the business and community elites, and the recent arguments for regional governance suggest the following hypothesis:

H_{4a}: Metropolitan areas with fragmented government systems are associated with lower economic growth rates.

2.6.2 Annexation Policy

Annexation has long been the predominant form of municipal growth (Liner 1990, Klaff and Fuguitt 1978, Thomas 1984). "Growth in incorporated places can be sustained either by an increase in density or by consumption of more space at the periphery of the urban area." (Forstall 1972 p.236) Although there are little unincorporated area available for annexation as Hawley (1950) stated, annexation has been the principal means of population growth for incorporated places from 1950-1970 (Bollens 1949, Bromley and Smith 1973, Kaufman and Schnore 1975, Klaff and Fuguitt 1978). While competing "solutions", such as city/county consolidation and the creation of regional government structures have received greater attention, municipal annexation has remained the most favored and effective method cities have for jurisdictional expansion. It has been important for the city to protect the economic base through recapturing higher income residents and business that have left the municipality and through capturing new urban fringe residents who have migrated from other areas (Carr and Feiock 2001, Liner and Mcgregor 1996). Fringe area residents coordinate annexation activities for the possibility to obtain a higher level of public services. Through the process of annexation, metropolitan leaders have been able to develop a regional structure to limit fiscal and racial segregation (Duncan *et al*. 1962, Powell

2000, Rusk 1993 1995). Like other forms of government, the ability to annex adjacent territory reduces fragmentation of urban areas and the ability of different demographic groups to enact insular policies. It also empowers the central city to prudently control regional growth.

In the aggregate, municipal annexations have affected more people and greater area than any form of government reorganization. Therefore, annexation is the rule for incorporated places in the United States and must be considered in analyzing the economic and political development of cities (Carr and Feiock 2001, Kaufman and Schnore 1975, Klaff and Fuguitt 1978, McKenzie 1933).

Yet despite the ever-increasing use of annexation, the experience across individual states remains uneven. Legislative provisions governing annexation are numerous and differ widely between adjoining states, and between metropolitan communities (Galloway and Landis 1986). An understanding of the variety of state statues and their effects on annexation activities enables policy analysts to advise legislators and other decision makers about alternatives and the probable effects of changes in policy (Palmer and Lindsey 2001). The literature widely holds how successful municipalities can expand their boundaries partly depends on the state and local institutions and the types of annexation statue (Galloway and Landis 1986, Liner 1990, Liner and Mcgregor 1996, MacManus and Thomas 1979). There is a long-standing belief that more liberal annexation laws—those that put few constraints on annexation—will result in more annexation (Bollen 1949). Annexation statues should give municipalities strong powers to annex while imposing some restrictions such as contiguity and character of the land annexed (Reynolds 1992). State laws on annexation activities have a significant impact on annexation, although early attempts failed to determine the impact of state statue (Carr and Feiock 2001, Liner 1990, MacManus and Thomas 1979, Palmer and Lindsey 2001). For example, Dye (1964) classified cities according to legal constraints on annexation and concluded that laws did not seem to have much of a restrictive impact on cities' annexation activities from 1950 to 1960. MacManus and

Thomas (1979) analyzed annexation activities in 243 U.S. cities and failed to uncover relationships between annexation activities and state annexation laws.

To date, empirical research linking state-level incentives/constraints and local boundary expansion has generally relied on Sengstock's typology. Sengstock's topology groups state annexation laws according to the locus of the authority for authorizing municipal annexation: legislative, judiciary, quasi-legislative bodies, municipalities, or the property owners in the area proposed for annexation (Sengstock 1960). Sengstock (1960) classified state annexation laws into five categories:

Municipal Determination (MD): The extension of municipal boundaries through the unilateral action of local governing bodies.

Popular Determination (PD): Annexation decisions are made by local "residents" through referendum or petition; depending on the statue. "Residents" can be defined as municipal electorate, the owners and inhabitants of the annexed area, and/or the electorate of the diminished territory.

Judicial Determination (JD): Courts are empowered to determine if annexation will occur, using guidelines and criteria established by the legislature.

Legislative Determination (LD): In states where annexation procedures are too burdensome or nonexistent, municipal boundary changes may be made by special act of the state legislature in response to urgent or particular circumstances.

Quasi-legislative Determination (QD): This form of determination involves creation of independent, nonjudicial boards or tribunals to determine whether annexation or other boundary changes shall occur.

Since it was published, Sengstock's topology has become the most often used and citied classification system for annexation procedures. Although some argue that Sengstock classification is a poor indicator for annexation activity, more researchers maintain its determinate role (Dusenbury 1980, Galloway and Landis 1986).

Yet tests of the precise role of Sengstock's topology have produced conflicting results. Liner (1990 1993) and Liner and Mcgregor (1996) found that cities allowed to annex land areas under municipal determination provisions annexed at higher rates than cities that annexed under predominantly under other types of laws. Cities that annexed under judicial determination provisions were found to annex land areas at lower rates than cities that annexed under other types of laws. Galloway and Landis (1986) confirmed the argument that more progressive annexation approaches which place greater decision-making power over annexation in the hands of local government or in third-party judicial or quasi-legislative bodies will lead to a broader involvement of a city in annexation practices. However, their analysis supports the theory that popularly determined annexation practices diminish the opportunities and frequencies of city boundary change. Facer II (2006) maintained that laws designed to facilitate annexation are likely to be associated with high levels of annexation activity. However, this study did not find the restrictive effects of the legal constraints. In addition, Carr and Feiock (2001) demonstrated that procedural constraints expected to reduce annexation activity were instead shown to stimulate greater numbers of annexations. In short, previous literature confirms that state statues facilitating annexation has stimulated municipal annexation activities. Yet consensus has not been reached about whether procedural constraints retard municipal boundary expansion. Based on the discussion above, it is hypothesized that:

H_{4b}: Metropolitan areas under liberal state annexation laws are associated with higher growth rates than those with conservative state annexation laws.

CHAPTER 3: METHODOLOGY

My goal is to explore the relationship between the initial spatial income inequality and the subsequent economic growth measured by average annual growth rate of real personal income per capita between decennial census years across Metropolitan areas in the U.S. Following Benhabib and Spiegel (1994), I treat technological progress as a function of the stock of human capital. According to the theories about the effect of income inequality on economic growth and the linkage between central cities and suburbs, physical capital for a Metropolitan Area is determined by income inequality, technological progress and the institutional preference for investments. Combining these theories, section 3.1 elaborates the econometric equation to test the hypotheses. Variables operationalizing the estimation model and their data sources are explained in section 3.2.

3.1 Estimation Framework

This dissertation employs an endogenous economic growth model to examine the research question.

The standard growth accounting methodology with human capital specifies an aggregate production function in which per capita income, Y_t, is dependent on productivity progress, A_t, labor, L_t, physical capital, K_t, and human capital, H_t. Assuming Cobb-Douglas technology, $Y_t = A_t K_t^a L_t^b H_t^r \varepsilon_t$, and taking log differences, the relationship for long-term growth can be expressed as

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \alpha\frac{\dot{K}}{K} + \beta\frac{\dot{L}}{L} + \gamma\frac{\dot{H}}{H} + \varepsilon \quad [14] \qquad (1)$$

However, not all empirical studies have found significant role of human capital accumulation in the standard growth equation (Benhabib and Spiegel 1994, Mankiw, Romer and Weil 1992). Nelson and Phelps (1966) argued that simply including an index of human capital/education as an additional input would represent a gross misspecification of the productive process. They suggested that education facilitates the adoption and implementation of new technologies. According to the effect of agglomeration economies, the average stocks of human capital rather than the human capital accumulation have contributed to income growth substantially. Recent endogenous growth theories have modeled $\frac{\dot{A}}{A}$ directly as a function of the education level H, emphasizing the endogenous nature of growth and technical progress (for example, Lucas 1988). While treating the total quantity of $\frac{\dot{A}}{A}$ as exogenous, Romer (1990) studied the allocation of H

[14] This is the abstract version for the log difference equation:

$$\log Y_T - \log Y_{T-1} = (\log A_T - \log A_{T-1}) + \alpha(\log K_T - \log K_{T-1}) + \beta(\log L_T - \log L_{T-1}) + \gamma(\log H_T - \log H_{T-1}) + (\log \varepsilon_T - \log \varepsilon_{T-1})$$

between goods production and inventive activities which enhance the growth of *A*, is determined by market incentives.

For simplicity, this project abstracts from these important issues relating to the allocation and production of *H*. I assume that *H* is exogenously given and a higher level of *H* causes a higher level of $\frac{\dot{A}}{A}$. As some endogenous growth economists present, human capital can influence technology growth by two mechanisms. One is that human capital influences the relative growth rate of technology directly by enhancing the ability of a country/region to develop its own technological innovations. The other is that it increases a country/region's capability to adapt and implement technologies developed elsewhere, i.e. the 'catch-up' effect. Benhabib and Spiegel (1994) specified the growth of technology for country/region *i* as below:

$$\frac{\dot{A}}{A} = c + gH_i + mH_i[(Y_{\max} - Y_i)/Y_i] \qquad (2)$$

where *c* represents exogenous technological progress, gH_i represents endogenous technological progress associated with a country/region to innovate directly, and $mH_i[(Y_{\max} - Y_i)/Y_i]$ represents the diffusion of technology from abroad/outside.

Because technological gaps across U.S. metropolitan areas are not as substantially significant as those among countries, this study will not consider the 'catch up' component, $mH_i[(Y_{\max} - Y_i)/Y_i]$ to simplify the theoretical model. Therefore, equation (2) can be written as equation (2a) as follows:

$$\frac{\dot{A}}{A} = c + gH_i \qquad (2a)$$

The exogenous technological progress *c* can be interpreted broadly as the output of metropolitan characteristics such as culture, history, climate, demographic, social and political environment etc. Thus *c* can be modeled as a weighted sum of K metropolitan-specific factors represented by variables X_1, X_2,… X_k:

$$c = \beta_1 X_{it1} + \beta_2 X_{it2} + ... + \beta_k X_{itk} \quad (2\text{ b})$$

Thus the technological progress equation became equation (3):

$$\frac{\dot{A}}{A} = gH_i + \lambda X \quad (3)$$

Among all the metropolitan characteristics, I would like to briefly address the effect of the political environment on technological progress cross the metropolitan areas. The economic growth literature documents that institutions, e.g. whether a country with democratic political framework affect technological progress. Under the metropolitan area condition, the quality of professional service from the governments and how quickly governments respond to the needs of the research oriented industries might impact regional technological innovation (for example, research parks). Therefore, political environment is considered in this project.

We now turn to determine factors affecting physical capital growth across the metropolitan areas. Conventional wisdom suggests that investment is driven and made possible by profits (Schumpeter 1939). However, only when new techniques of production are employed to produce a certain product or if a new product is introduced, can profit arise. So it is the change in technical knowledge that is responsible for the change in the stock of producer goods (Adelman 1961). Following the standard economic growth accounting equation, with the assumption that saving completely goes to investment, physical capital growth is defined as the savings (investment) rate, $\frac{S}{Y}$, where S is the saving/investments of an economy and Y is the total output. Physical capital growth therefore positively relates to the growth of total factor productivity.

There is a common belief among political economists that the rich save proportionately more than the poor, so that greater inequality tends to generate higher savings. Moreover, the investment ratio can be higher as the capitalist can ‘exploit’ the mass of poor labor when the inequality is high. Therefore, the overall effect of income inequality on investment is positive.

However, all these arguments are based on cross-national studies, where the majority of investments are made by internal production units. In an open economy such as a metropolitan area, new investments might come from external investors. Sure, technological progress is important for the physical capital growth of an area, but it is uncertain how income inequality affects physical capital growth.

Moreover, as elaborated in Chapter 2, the decline of central cities and increasing disparity of central-city and suburbs (CSD) substantially affect the physical capital growth of an MSA. When investors choose an investment location, they consider the entire urban area as a whole instead of only the suburban areas of the MSA. The deteriorated central cities and large CSD impede the incentives of investors to invest in central cities. If the central city is concentrated with poverty, it is likely to have poor "fiscal health" and lack public funds to provide adequate public services (Ladd and Yinger 1989 p.9). In order to survive with declining revenues and surging public service demand, local governments tighten their belts with fiscal austerity initiatives: closing public hospitals, reducing library hours, deferring maintenance on aging sewers, playgrounds, and parks, and reducing the numbers of public employees (Swanstrom *et al*. 2002). Thus, the infrastructure of poor central cities is deleterious and so the residents get dwindled public services and limited access to good education. Aging infrastructure and lack of a qualified labor pool then inhibits investments to the whole urban area. Therefore, the central-city and suburb disparity (CSD) can have a negative impact on the investment ratio.

According to Benhabib and Spiegel (1994), human capital stock has is a significant determinant of physical capital growth. Lucas (1988) suggested the reason physical capital does not flow to poor countries might be because those countries are poorly endowed with factors complementary to physical capital, such as human capital, political stability, the size of middle class, etc. Physical capital needs human capital to master new technologies to realize the higher marginal product in areas that lack of physical capital.

Consider the urban areas within the U.S., industrial structure might be an important factor to attract external investments. Agglomeration economics states that an industry or several related industries concentrate in one geographic area so as to gain economies of scale and reduce the production costs and transaction costs. Transportation costs can be reduced by industries concentrating in an area nearside the demand market, and by producers and suppliers co-locating (Krugman 1991a). Industries can share a labor pool to reduce labor costs by concentrating in one area (Krugman 1991b).

More important, industrial concentration can accelerate the flow of ideas and perpetuate technological and institutional innovations, which is the spill-over effect of human capital concentration (Glaeser 2000). Therefore, industrial structure might affect external investments through inducing or hindering agglomeration effect. Thus, physical capital growth can be interpreted as equation (4):

$$\frac{\dot{K}}{K} = K(A, Inequality, CSD, H, Industries) \qquad (4)$$

where inequality indicates income inequality, industries means industrial structure in a metropolitan area.

Substituting equation (3) and (4) into equation (1), and incorporating the vector of spatial income inequality (SII)[15], the metropolitan economic growth can be described as equation (5)[16]:

$$\left(\frac{\dot{Y}}{Y}\right)_i = B_1 SII_{(T-1)i} + B_2 Inequality_{(T-1)i} + \lambda X_{(T-1)i} + \beta\left(\frac{\dot{L}}{L}\right)_i + gH_{(T-1)i} + \varepsilon \qquad (5)$$

Note that this model indicates how the initial values of independent variables affect economic growth. While it is true that economic growth might affect income inequality and residential segregation, this is a recursive relation rather than a simultaneous one, hence this model avoids

[15] As chapter 2 illustrated, the vector of spatial income inequality include residential segregation (both race and income), income disparity between central city and suburbs, and political institution variables closely associated with residential segregation.

[16] Industrial structure variables are treated as one of the metropolitan characteristics, the metrics of *X*, thus it does not appear in the final equation.

problems associated with endogeneity or simultaneity associated with these five primary independent variables.

Using this theoretical framework, this dissertation conducts three separate Ordinary Least Squares (OLS) analyses on census data from three decades, 1980, 1990 and 2000. It will then compare the results to identify the effects of spatial income inequality on the metropolitan economic growth and to examine the robustness of the results.

These analyses cover a total of 331 US metropolitan areas both Metropolitan Statistic Areas (MSAs) and Primary Metropolitan Areas (PMSAs)[17]. Thirty-one MSAs in Puerto Rico are not incorporated in this study.

I refer all metropolitan areas as MAs and define them according to the definition of the county composition of MAs used in U.S. Census 2000. Because county boundaries are relatively stable, this project uses county boundaries to coordinate the boundary change of MAs.

3.2 Data and Variable Description

Data for this study come from a large variety of sources: the Regional Economic Information System (REIS) of the Commerce Department's Bureau of Economic Analysis (BEA 1969-2005), the Census of Population and Housing Summary Tape File 3A (U.S. Bureau of the Census 1980, 1990 and 2000), the Census of Government (U.S. Bureau of the Census 1977, 1987 and 1997)[18], Metropolitan Racial and Ethnic Change Project (Lewis Mumford Center), Neighborhood Change Database (Urban Institute), America' Votes (David Leip 2003)[19] and some articles. Data from all the sources were compiled together within the estimation framework to perform the analyses.

3.2.1 Dependent Variables

[17] This study won't include NECTAs because: 1. this study uses counties as the basic unit to calculate some indices and keep the MSAs definition consistent through different time period. 2. All counties are already included in the MSAs and PMSAs.

[18] The author appreciates the Census of Bureau providing their internal files of government organizations.

[19] The author is grateful for Dr. Steve Fernandez for purchase of the data from David Leip Company.

The dependent variable is measured by the average annual growth rate of real personal income per capita during 2000-2005 (for 2000 year data analysis), 1990-1999 (for 1990 decade analysis) and 1980-1989 (for 1980 decade analysis)[20]. Nominal personal income data is from REIS. This project used GDP price index from 1980 to 2005 to adjust the inflation effects. Consistent with the 1999 MA definition from the Census, this study aggregates county-level data to the MA level to keep MA boundaries consistent during these twenty five study years.

3.2.2. Spatial Income Inequality Variables

Incorporating spatial inequality into the endogenous economic growth model is one contribution of this dissertation. Spatial inequality means residential segregation, student segregation and central city-suburb income disparity. Residential segregation is measured by three variables: a racial dissimilarity index (RDI), an income dissimilarity index (IDI) and a skills dissimilarity index (SDI). Central city-suburb income disparity (CSD) and poverty concentration are indices for the income distribution between central cities and suburban areas. The student dissimilarity index indicates student segregation. Government fragmentation and annexation policies are evaluated as the institutional dimension of spatial income inequality. GINI coefficients and poverty rates are the measurements for income inequality. An examination of each variable and a description of the data are outlined below.

Racial Segregation

There is a large literature on how ethnic and residential segregation should be measured and conceptualized. Massy and Denton (1988) synthesized the diverse literature and report five segregation dimensions derived from an examination of 20 measures of residential segregation. They are evenness, exposure, concentration, centralization and clustering. These dimensions are distinct and identify separate components of segregation. Evenness refers to any difference in the

[20] I also tested average growth rate in five years, from 1990 to 1995 and from 1980 to 1985 as the dependent variables in 1990 and 1980 analyses accordingly, to keep the models consistent. The results are close to those from models with ten years growth rates. In addition, ten-year growth rates provide a clearer and continuous picture of economic performance. Thus, this project chose average growth rates as dependent variables for 1990 and 1980 decade analyses.

distribution of two groups (or one group and the remainder of the population) across spatial units (such as census tracts in this dissertation) into which an urban area is divided and on which the population is reported in censuses. Exposure means the probability of contact—or interaction—between either two members of the same group or two members of different groups. Concentration indicates the amount of physical space occupied by a given number of individuals from a particular ethnic group. Centralization denotes the location of the areas occupied by a group and is measured as the proximity and/or accessibility of those areas to the city center. These four measurements consider the population composition, density, and location of the spatial units but pay no attention to the relative location of those units to one another. A group may be isolated in census tracts that contain only members of that group. If these tracts are concentrated into one part of an urban area with each neighboring another, this area is clustered.

However, using factor analysis on 20 racial segregation measurements based on census data from 1980, 1990 and 2000, Johnson (2007) found that these five dimensions can be reduced to two factors: separateness and location. Separateness covers unevenness, isolation and clustering. It refers to the degree to which members of an ethnic group live apart from the reminder of the population in a coherent block of urban territory. Location includes concentration and centralization and signifies the degree to which members of the group are congregated (irrespective of their degree of isolation) into high-density areas. This result is similar to that reported in Reardon and O'Sullivan'(2004) and Reardon and Firebaugh (2002). This study mainly focuses on the separateness of racial segregation and both dimensions of income segregation because income segregation by place of residence is the main theme of this research.

The racial dissimilarity index (RDI) is the most commonly used index for racial segregation and is used in this dissertation. It is a measurement of evenness[21]. The formula of racial dissimilarity index is:

[21] The racial exposure index and the racial isolation index were examined based on census data of 1980, 1990 and 2000. The correlation of racial dissimilarity index and racial exposure/isolation index is about .70

$$RDI = \frac{1}{2}\sum_i \left| \frac{B_i}{B} - \frac{W_i}{W} \right|$$

Where B_i is the black population on tract i , B is the total black population of an MA. W_i is the white population on tract i and W is the white population of an MA[22]. Data in 1980, 1990 and 2000 are from the Metropolitan Racial and Ethnic Change Project of the Lewis Mumford Center.

Income Segregation

The need to eliminate spatial poverty concentration has been emphasized by urban and regional policy debates. However, scholars have not achieved consensus about how to measure income segregation. With one of the entropy indices popularized by Theil (1967, 1972), the relationship between income inequality and neighborhood segregation is generally illustrated by simply decomposing the income inequality metric (I_0) into a "within-neighborhood" component (I_W) which captures the weighted sum of income inequality within each neighborhood and a "between neighborhood" component (I_B) which captures the variability in neighborhood per capita incomes relative to the region-wide mean (Dawkins 2007, Shorrocks and Wan 2005). For example, Jargowsky's (1996) neighborhood sorting index (NSI) is equal to the square root of the ratio of between neighborhood income variance to total income variance. These measurements are criticized for their incapability to account for the spatial arrangement of neighborhoods, or the so-called "checkerboard problem" (Dawkins 2004, Morrill 1991, White 1983)[23]. Charkravorty (1996) proposed a spatially weighted measurement to quantify the extent of the checkerboard phenomenon. However, this spatially weighted matrix approach suffers a limitation: it is burdensome to apply this index to a large spatial scale. For example, if I wanted to utilize the index for this dissertation project, I would need to figure out all the neighboring tracts for each

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in 1990 and 2000. It is .95 in 1980. Therefore, this dissertation used racial dissimilarity index to indicate racial residential segregation.

[22] The author tested white-Hispanic, black-Hispanic dissimilarity indices. They are not significant and did not improve the model performance. So this dissertation mainly focuses on the white-black dissimilarity index.

[23] For detailed explanation pleasure refer to Dawkins (2007) pp.257.

census tract, and then do the calculation. Since the electronic boundary file of census tracts across the U.S. in 1980 is not publicly accessible, applying this index in this project is almost impossible.

The Centile Gap Index (CGI) proposed by Watson (2006) estimates how far the average family income within a tract deviates in percentile terms from the median family income in the tract, compared to how far it would deviate under perfect integration. The advantage of CGI is that if income distribution widens but families do not move, measured segregation is unchanged. There are other income segregation indices developed by Moran (1950) and Geary (1954) through spatial autocorrelation, which can be used to compare variability in per capita incomes among nearby neighborhoods with total variability in per capita incomes region-wide. Since all the indices have advantages and limitations and there is no agreement about the standard measurement, the dissimilarity index is used as the index for income segregation. The advantage of the dissimilarity index is that it is commonly used in the literature and it is easy to understand. Further, it is consistent with the measurement of racial segregation. The limitation of dissimilarity index is that we have to arbitrarily divide family (or household) income into poor and rich, which masks some information that other indices can provide by counting income as a continuous variable. In addition, the income dissimilarity index tends to underestimate the impacts of income transfers among adjacent neighborhoods relative to more distant neighborhoods (Dawkins 2004). The income dissimilarity index can reveal income transfers only when income is transferred from a neighborhoods with per capita income higher (or lower) than the average for the entire metropolitan area to one that is lower than or higher than the metrowide average. If the variability in neighborhood per capita income is a function of the distance between neighborhoods, this transfer bias takes on a spatial dimension, because in the segregated condition, neighborhoods at either extreme of the neighborhood per capita income are more likely to be clustered. Yet given its popularity and its convenience to calculate, dissimilarity index between rich and poor is

chosen as income segregation index. In order to compensate the limits of this single measurement, the dissimilarity index between high-skill and low-skill labors is also calculated.

The formula of income dissimilarity is: $IDI = \frac{1}{2}\sum_i \left|\frac{P_i}{P} - \frac{R_i}{R}\right|$ where

P_i indicate poor families on tract i, P is the total poor families of an MA. R_i indicate rich families on tract i and R are the total rich families of an MA[24].

Poor and rich is defined by the census poverty line for a four-member family. Following the definition of the Metropolitan Racial and Ethnical Change Project of the Lewis Mumford Center, families with income 175% of the poverty line and below are poor; families with income above 350% of poverty line are rich; and families with income above 175% poverty line but less than 350% poverty line are classified as middle income. Nominal income is used to calculate this index. Income categories are listed in table 1.

Table 1: income categories for the definition of poor and rich families

time	poverty line	poor	middle	rich
1980	$7450	<=$13,037	$13,037-$26,075	>=$26,075
1990	$12700	$22,500	$22,500 - $45,000	$45,000
2000	$17050	$30,000	$30,000 - $60,000	$60,000

Data sources: Lewis Mumford Center and U.S. Social Security Administration

Skills dissimilarity index is defined as: $KDI = \frac{1}{2}\sum_i \left|\frac{H_i}{H} - \frac{L_i}{L}\right|$ where

H_i indicate high-skill labor in tract i, H is the total high-skill labor of an MA. L_i indicate low-skills on tract i and L are the total low-skills of an MA. High skills and low skills are defined by census occupation[25].

According to the occupation category in the Census, if a person is working in a managerial, executive, administrative, professional specialty, technicians or related occupations, he/she is

[24] This study tested the dissimilarity index between rich and middle income, and between middle income and poor. They do not have significant contributions to the model.

[25] This dissertation uses occupation instead of education because this index based on education is highly correlated with the education variables using as human capital index.

defined as high-skill labor. Sales persons, machine operators, assemblers and inspectors, handlers, equipment cleaners, helpers, laborer, and workers in transportation and material moving occupations are classified as low-skill labors[26]. These data are from Census CD file SF3 in 1980, 1990 and 2000[27].

Student Segregation

Student segregation[28] is measured by the student racial dissimilarity index between white and black students, and the student income dissimilarity index between rich kids and poor kids. So student racial dissimilarity index is: $SRDI = \frac{1}{2}\sum_i \left|\frac{SW_i}{SW} - \frac{SB_i}{SB}\right|$ where

SW_i is the number of white students in school i and SW is the total number of white students of an MA. SB_i is the number of black students in school i and SB is the total number of black students of an MA. The student income dissimilarity index is:

$$SIDI = \frac{1}{2}\sum_i \left|\frac{SR_i}{SR} - \frac{SP_i}{SP}\right| \quad \text{where}$$

SR_i is the number of rich students in school i and SR is the total number of rich students of an MA. SP_i is the number of poor students in school i and SP is the total number of poor students of an MA. Data for student dissimilarity indices in 1990 and 2000 are directly extracted from the Metropolitan Racial and Ethnic Change Project of Lewis Mumford Center. Data are not available in 1980 to calculate these indices[29].

Central-city and Suburb Disparity

Ratio of income of central cities to suburbs is used to measure the income disparity between the central city and its suburbs. The Census defines the largest place as the central city of an

[26] The census occupation categories in 2000 are slightly different from those in 1990 and 1980. While high-skill labor has the same definition, low-skills are defined in 2000 as workers in Construction, extraction, and maintenance occupations and Production, transportation, and material moving occupations

[27] I extracted 2000 occupation data from Neighborhood Change Database (NCDB). Because this dataset uses 2000 tract boundary as the base to normalize the historical census data, 2000 data from NCDB is actually the same as that from census CD 2000.

[28] Student in this index is defined as students in elementary school.

[29] Information is from the Department of Education.

MA[30]. The central city is the major city of an MA. The largest central city, in some cases, up to two additional central cities are included in an MA title. There are also central cities not included in the MA title. Central cities do not change with the expansion of MAs from 1980 to 2000. There are 542 central cities in the decennial period of 1980, 1990 and 2000. The growth of MAs has created more suburbs due to the decentralized urban growth pattern. The number of suburbs is 9363, 10351, and 11397 in 1980, 1990 and 2000 respectively[31].

Yet the concept of central cities in applied research is not consistent as how it is defined by the Census. Some studies used the largest central city as the boundary of central city, such as the work of Hill and Brennan (2005), Madden (2003), Nathan and Adams (1989), Rusk (1994), and Savitch *et al*. (1992). Mumphrey and Akundi (1993) and Voith (1998) used counties containing central cities to indicate central city areas. Some other researchers, such as Cooke and Marchant (2006), create their measurement for central cities according to the age of properties. There are also studies that use the census definition of central cities, such as Mills (1990), the SOCDS project managed by HUD, and the Metropolitan Racial and Ethnic Change project conducted jointly by the University of Albany, SUNY and the Brown University.

A further examination of these studies revealed that the Census definition of central cities is commonly used for large scaled studies (all MAs are included). While the studies using the largest cities for central cities have relatively small sample size[32]. In addition, some researchers indicate the largest central cities as the primary central cities (Hill and Brennan 2005). Thus, this project uses the Census definitions of central cities to create the index for central city-suburb disparity. However, because tract boundary data in 1980 and the city boundary data in 2000 are not publicly accessible, city boundary annexation is not considered in this index. That is, central

[30] From 2006, principle cities are used to designate the largest city of an MA. Additional cities qualify if specified requirements are met concerning population size and employment. "Principle cities" replaced "central cities" as the previous defined term.
[31] Data is from SOCDS Census Data created by HUD.
[32] For example, the largest MAs 14, 22, 55 or 75 MAs were selected as the study sample.

city areas in 1980 might be smaller than those in 2000. It results in underestimation of this index in 1980 because cities prefer annexing fringe areas with good growth potentials.

Two indicators are created to measure the income disparity between central cities and their suburbs. They are:

— the ratio of city to suburb median household income. Data in 1990 and 2000 are from the Metropolitan Racial and Ethnic Change of Lewis Mumford Center. This index for 1980 is calculated based on Census data from SF3[33].

— poverty concentration or the ratio of the percentages of persons in poverty in central cities to those of their suburbs. Data in 1990 and 2000 is calculated based on the indices from the Metropolitan Racial and Ethnic Change of Lewis Mumford Center. This index for 1980 is calculated based on data from Census SF3.

Institutions

There are a large variety of ways to measure metropolitan government structure and there is no agreement about their validity and precision. Identifying government units at the local level and regional level will help to create measurements for government fragmentation and integration. Developing good measurements is not the focus of this dissertation, thus this project chose five measurements of government structure: total number of governments per 10,000 population, general-purpose governments per 10,000 population, special districts per 10,000 population, school districts per 10,000 population, and special district dominance, which is calculated by the ratio of special district per 10,000 population to general-purpose government per 10,000 population. The first four indices are traditional measurements for government fragmentation. The larger the numbers, the more decentralized the governance of an MA. Yet they are criticized for obscuring the fact that, depending on its service area, an additional government might integrate rather than fragment the metropolis. The last measurement indicates the degree to which

[33] In 1980, the ratio of city to suburb of mean household income, instead of median household income was calculated because median household income of MA is hard to estimate. Therefore, this index is not comparable longitudinally to those in 1990 and 2000.

metropolitan areas rely on limited-purpose special districts for service provision. It measures the relative government integration or functional fragmentation as Foster (1993) argued. Data are from Census of Government.

Sengstock's topology has been the most widely used approach to classify state annexation statue. It categorizes state annexation laws into five groups according to the final decision-making authority for annexation: municipal determinant, population determinant, legislative determinant, quasi-legislative determinant, and judicial determinant. This study creates five dummy variables to indicate each category.

Annexation statues are state laws. However, the analysis unit of this project is metropolitan areas. To identify the governing annexation laws of each metropolitan area, central cities of each metropolitan area were identified first. Annexation policy codes were then assigned based on the state of the central cities. Another dummy variable named *different* is created for the metropolises with multiple central cities of different states. State annexation policies data in 1990 are from Galloway and Landis (1986) and the data for 1980 and 2000 are from Palmer and Lindsey (2001).

Income Inequality

The Gini coefficient, ratio of family income[34] shares going to the top 20% and bottom 20% quintiles of MAs, and the poverty rate are three measurements of income inequality. The Gini coefficient is the most widely used aggregate measure of inequality for the whole population in an economy. It is defined as the ratio between the average difference between all possible pairs of incomes in the population and the total income of the economy (Cowell 1995). I used PRLN 04 developed by Professor Nielsen at UNC Chapel Hill to calculate the Gini coefficient. PRLN 04 is a DOS program coded by Professor Nielsen to calculate the Gini coefficient of income inequality

[34] Income of individuals, family and households is used as measurements of income. Households tend to share the common economic fate. Residents of are a household not necessarily related to the householder for their earnings to be considered as part of the household income, Thus household income become one of the widely accepted measures of income. However, household income masks the gains or decrease of the family or individual income as its size is not commonly considered. The distortion makes direct comparisons between quintiles impossible. For this matter, family income is used to measure income inequality.

from income distribution data giving the number of individuals in income categories with the top categories open, such as those published by the Census Bureau. The program estimates the Gini coefficient by reconstructing the continuous distribution of income underlying the empirical distribution[35]. This project aggregates tract-level family income data to the MA level and then uses this program to estimate the Gini coefficient. County boundaries are used to keep MA boundaries consistent as defined in 1999.

By taking the family income category mid-point as the average family income, I calculated the ratio of family income of the top 20 quintile to the bottom 20% quintile based on Census SF3 data. The poverty rate is the percentage of population in poverty of the total population of an MA, according to the data from Census SF3. Measurements of spatial income inequality are listed in table 3.1

[35] For more detailed description of this program please refer to Professor Nielsen's webpage: http://www.unc.edu/~nielsen/data/data.htm

Table 3.1 Spatial Income Inequality

Variables	Measurements	Descriptions	Data sources
Racial dissimilarity index	$RDI = \frac{1}{2}\sum_i \left\lvert \frac{B_i}{B} - \frac{W_i}{W} \right\rvert$	It reflects the relative distribution of Black and White population across tracts within a metropolitan area. It is interpreted as the proportion of the Black population needed to move across tracts to achieve an even distribution.	Lewis Mumford Center
Income dissimilarity index	$IDI = \frac{1}{2}\sum_i \left\lvert \frac{P_i}{P} - \frac{R_i}{R} \right\rvert$	It reflects the relative distribution of poor and rich population across tracts within a metropolitan area. It is interpreted as the proportion of the poor population needed to move across tracts to achieve an even distribution.	Lewis Mumford Center U.S. Bureau of Census
Skills dissimilarity index	$KDI = \frac{1}{2}\sum_i \left\lvert \frac{H_i}{H} - \frac{L_i}{L} \right\rvert$	It reflects the relative distribution of low-skill population and high-skill population across tracts within a metropolitan area. It is interpreted as the proportion of the low-skill population needed to move across tracts to achieve an even distribution.	U.S. Bureau of Census

Student racial dissimilarity index	$SRDI = \frac{1}{2}\sum_i \left\| \frac{B_i}{B} - \frac{W_i}{W} \right\|$	It reflects the relative distribution of Black and White kids across schools within a metropolitan area. It is interpreted as the proportion of Black students needed to switch schools for students to be evenly distributed.	Lewis Mumford Center
Student income dissimilarity index	$SIDI = \frac{1}{2}\sum_i \left\| \frac{P_i}{P} - \frac{R_i}{R} \right\|$	It reflects the relative distribution of Poor and Rich kids across schools within a metropolitan area. It is interpreted as the proportion of Poor kids needed to switch schools for students to be evenly distributed.	Lewis Mumford Center
Central city - suburban disparity	$CSD = \frac{I_{city}}{I_{suburb}} * 100$	It is the ratio of median household income in central city areas to that of the suburban areas.	Lewis Mumford Center, U.S. Bureau of Census
Poverty concentration	$Poverty = \frac{P_{city}}{P_{total}} * 100$	It is the ratio of the poverty rate in central cities to that of the suburban areas.	Lewis Mumford Center, U.S. Bureau of Census

Government structure	Number of total government/ 1000 population; Number of general purpose government/ 1000 pop; Number of special purpose government/ 1000 pop; Ratio between the two; Number of school districts (per 1000 population)		U.S. Census of Government
State annexation policy	Municipal Determination (MD); (Yes=1, No=0) Popular Determination (PD); Judicial Determination (JD); Quasi-legislative Determination (QL); Legislative Determination (LD)		Galloway and Landis (1986); Palmer and Lindsey (2001)
Income inequality (GINI coefficient))	$G = 1 - 2\int_0^1 L(X)dX.$	It is defined based on the Lorenz curve and can be calculated as half of the relative mean difference, which is the mean difference divided by the average.	U.S. Bureau of Census
Poverty rate	Percent of population in poverty		U.S. Bureau of Census

3.2.3 Variables for Human Capital and Labor

Human capital is measured by the percentage of high school graduates of total labor force and percentage of population with college degrees of the entire labor force. Data are from the Census.

Labor is measured by annual population growth rate. The economic growth literature uses population to indicate labor. In the 2000 model, labor is measured by the annual population growth rate from 1995 to 2000. In the 1990 model, it is the annual growth rate from 1980 to 1990. The time period measuring the population growth rate is 1970 to 1980 in 1980 model.

According to the Census, Labor force consists of both employed and unemployed population with 16 years old or over. Labor base for each time period in this project is measured by the percentage of labor force of the entire population of a Metropolitan Area.

3.2.4 Metropolitan Characteristics

Metropolitan size, race, ethnicity, industrial structure, political homogeneity, and regional dummies were incorporated into the estimation model as metropolitan characteristics. Metropolitan size is the square miles of MAs. Data are from Neighborhood Change Database. Race is measured by percent of black population and ethnicity is the percent of Hispanics. Data are from Census SF3. Percent of employment in manufacturing industries is the indicator for industrial structure[36]. Data are collected from Bureau of Economic Analysis. Political homogeneity is calculated by $PH=\left|P_{dem}-P_{rep}\right|*100$ where P_{dem} is the percentage of population voting for democratic candidate in president election, and P_{rep} is percentage of population voting for republican candidate. These Data are from David Leip (2003). Election data in 1976, 1988 and 2000 were used to create this index.

This project includes New England (Northeast), the South and the West as the regional dummies to control regional effect. Table 3.2 lists the variables

[36] This study also used percent of employment in FIRE, professional, scientific and management industries as a measurement for post-industrial industries. But data of this variable is only available in 2000.

Table 3.2: *Metropolitan Area Characteristics*

Variables	**descriptions**	**Data sources**
MA size	Square Miles of each MA (10,000) Total population of each MA	NCDB
Race and Ethnicity	Percentage of blacks Percentage of Hispanics	Census Bureau Census Bureau
Industrial Structure	Percentage of Employment in manufacturing industry	Bureau of Economic Analysis
Political Homogeneity	$PH=\left\|P_{dem} - P_{rep}\right\| *100$ P_{dem} is the percentage of democratic party affiliation of the region's delegation to the U.S. House of Representatives; P_{rep} is percentage of republican party affiliation of the region's delegation to the U.S. House of Representatives	*David Leip* 2003
Regions	New England (Northeast), South, West, Midwest	Census Bureau

3.2.5 Instrumental Variables

In order to test the theories underlying the hypotheses, I include two sets of variables: variables testing the theoretical linkage between residential segregation and variables testing the agglomeration effect that ties cities and suburbs. They are the percent of black families without cars and population density of each MA respectively.

3.3 Boundary Issues

Unlike the political entities of states and counties, the Office of Management and Budget (OMB) draws the boundaries of Metropolitan Areas (MAs) according to population size for economic statistics reasons. The dynamics of population changes foresee the written fate of waving boundaries of MAs. Thus all applied research handling longitudinal data on MA level has to confront the constantly changing boundaries. This project is not an exception. Given counties change their boundaries in very rare cases, county boundaries are used to coordinate the expansions and shrinkage of MA boundaries. Ten PMSAs from Boston-Worcester-Lawrence, MA-NH-ME-CT CMSA and five PMSAs from New York-Northern New Jersey-Long Island, NY-NJ-CT-PA CMSA are excluded from this research. County boundaries cross PMSA boundaries in these fifteen PMSAs. In other words, multiple PMSAs share same set of counties in this case. Thus complicated boundary issues are created. Advanced Geographical Information Technology is needed to track the changes of these MAs' boundaries and it is very time consuming. This project leaves this issue and excludes these fifteen PMSAs in the analyses at this stage[37].

With population growth and urbanization from 1980 to 2005, existing cities have grown and new cities have emerged. Therefore, lines dividing city and suburban areas also need to be clarified to calculate variables measuring the disparity between the central city and suburbs. A report from HUD suggests that the number of central cities did not change from 1980 to 2000. Yet areas of central cities might change due to annexation process, especially in the Northeast region. Since data of city boundaries and the census tract boundaries in 1980 are not publicly

[37] The ten PMSAs in Boston-Worcester-Lawrence, MA-NH-ME-CT CMA are: Boston, MA-NH PMSA, Brockton, MA PMSA, Fitchburg-Leominster, MA PMSA, Lawrence, MA-NH PMSA, Lowell, MA-NH PMSA, Manchester, NH PMSA, Nashua, NH PMSA, New Bedford, MA PMSA, Portsmouth-Rochester, NH-ME PMSA, and Worcester, MA-CT PMSA. The Five PMSAs in New York-Nortern New Jersey-Long Island, NY-NJ-CT-PA CMSA are: Bridgeport, CT PMSA, Danbury, CT PMSA, New Haven-Meriden, CT PMSA, Stemford-Norwalk, CT PMSA, and Waterbury, CT PMSA.. Their population is 2.8% of the population of all the metropolitan areas across the U.S..

available, this project does not consider the city annexation process in creating the index for the central city and suburban income disparity. Thus this index in 1980 might be underestimated because areas annexed by cities usually have good growth potential.

The third boundary issue this project has confronted is at the census tract level. Boundaries of census tracts have been varying in each decennial survey year due to population growth. This project does not keep the tract-level boundary consistent in calculating the variables given census tracts are not the unit of analysis for this project. Furthermore, Galster (2007) compared segregation indices with the transformed tract boundaries by NCDB and the original census tract boundaries and did not find significant difference between these two sets of variables.

Yet given the fact that the U.S. was not fully tracted in 1980, this project evaluates the untracted areas of each MA in 1980. It turns out that around 10.8% of MA areas in 2000 were not tracted in 1980. Almost all MAs in 1980 contain un-tracted areas according to the boundary of 2000. Especially for Kenosha, WI and Milwaukee-Waukesha, WI, they have more than 50% of area un-tracted in 1980. They are excluded from the analysis for this matter.

CHAPTER 4: RESULTS

This chapter reports the results from the analyses examining the impact of residential segregation, central city-suburban income disparity and government structure. The results provide initial evidence supporting the hypotheses. Section 4.1 describes the results from descriptive analysis to provide primary information about the distribution pattern of all the variables across the metropolitan areas and regions through three decades. Section 4.2 explains variable choices in the testing model, although different measurements were developed for each major concept. Section 4.3 shows the basic relationship among major variables measuring spatial income inequality and income growth. The correlation coefficient between racial segregation and income growth has been increasing over time. Section 4.4 presents the results from three OLS estimations based on decennials data and the results about the impact on the long-term economic growth measured by average annual growth of real personal income per capita in 1980-2005. Results suggest that racial segregation not only drags down the short-term economic growth in each testing decade, but also negatively impacts the long-term income growth in 25 years. Negative impact of income segregation has emerged in the 1990s and is robust in the model of 2000. Results from the model based on data in the 1990s create validity concerns for interpretation. Section 4.5 summarizes the results and posits that it is desirable to examine whether structural change occurred in the 1990s to enhance our understanding of the research questions.

4.1 Descriptive Evidence

This section reports the exploratory and descriptive assessment of distribution pattern of all the variables across all the Metropolitan Areas (MAs), across different regions and across different time periods.

4.1.1 Descriptive Results across MAs

Table 4.1 presents trends of economic growth and spatial income inequality from 1980 to 2000 (institutional variables are reported in Table 4.2). From 1980 to 2005, economic growth measured by annual growth rate of real personal income per capita has been slowing down. Whether this declining trend reflects the convergent nature of economic growth suggested by neo-classical economic growth literature is a valuable open question worthy a further exploration.

Racial segregation measured by the racial dissimilarity index has been declining continually through the three decades. It is consistent with the evidence of many studies of segregation. Literature on segregation has noted the continued average declines of Black-White segregation from 1980 to 2000 (Adelman 2004, Armor and Clark 1995, Charles 2003, Farley and Frey 1994, Fischer 2003, Iceland 2004).

The 1980s saw almost all American metropolitan areas experienced a rise in segregation of the rich from the poor, measured by either income dissimilarity index or skills dissimilarity index, though these changes were slightly offset by modest declines in segregation during the 1990s. It is consistent with the evidence provided by Massey and Fischer (2006), although they utilized different concepts of poor and affluent. This result is partially coincident with the argument that income inequality is positively associated with economic segregation.

Income inequality, measured by GINI coefficient, rose continually from 1980 to 2000. Research has well illustrated factors contributing the enlarging income gap. The post-1970 economy generally produced a bi-polar society (Sassen 1991). New technologies have generated high paid jobs in high-technology and professional service industries as well as many low paid

jobs for routine services. Thus the economy of post-1970 has persistently increased the population of poor individuals and households (Bernhardt *et al* 2000). The results from this project show a decline in poverty rate from 1980 to 1990, and then it jumps again from 1990 to 2000. Whether it is due to the data quality or it is a fact contrary to the literature is a question worthy further examination.

As literature widely suggested, income segregation is generated by income inequality and is associated with income inequality. Empirical evidence demonstrated that rising income inequality is associated with rising residential segregation by income (Mayer 2001, Watson 2006). Watson (2006) also found that income inequality actually generated residential segregation by income using data from 1970 to 2000. Results from this project are partially coincident with the argument that income inequality is positively associated with economic segregation. The rising income inequality and economic segregation in the 1980s imply a contribution of income inequality to income segregation. However, increasing income inequality and declining residential segregation by income in the 1990s opposes the finding of Watson (2006) and suggests further research to examine the relationship between these two phenomena. In addition, the fact that income segregation did not follow the trend of racial segregation also requires further study.

Income disparity between central cities and suburbs is measured by the percentage of median family income in central cities to that of the suburbs. As table 4.1 shows, family income of central families has been persistently dwindled within two decades compared with their peers in suburban areas. The income gap between these two areas has been enlarged from 1980 to 2000[38]. Consequently, poverty has concentrated in central cities during the same period, as the central city distress literature posited.

The different changing patterns of indices of income disparity between central cities and suburbs and those of economic segregation implies that residential segregation of income and

[38] The author used mean family income of central cities and suburbs to calculate the index in 1980. Although this index is not exactly the same as those in 1990 and 2000, it can reflect the trend very well.

central city-suburban income disparity are two distinct dimensions of the metropolitan social landscape. They are not just two categories of measurements for metropolitan economic segregation, as many literatures explained.

Racial segregation in schools declined in 1990s following the trend of racial segregation. However, school income segregation did not follow the trend of residential income segregation. It increased in 1990s, which associated with the trend in income inequality and central city and suburban income disparity[39]. It might reflect the strong preference of families' school choice with different income levels.

Table 4.1: Trends of residential segregation and economic growth from 1980 to 2000

Variables	**1980**	**1990**	**2000**
Annual growth rate of real personal income per capita	2.30 (1.00)	2.01(0.61)	0.788 (1.08)
Racial Segregation			
Racial dissimilarity index	60.75(13.64)	55.90(13.64)	51.47(13.7)
Income Segregation			
Income dissimilarity index	28.91(6.24)	35.43(6.44)	34.32(6.43)
Skills dissimilarity index	22.36(5.00)	27.58(5.71)	22.26(4.82)
School Segregation			
Student Racial Dissimilarity index	--	53.85(14.49)	53.477(14.51)
Student Income Dissimilarity index	--	35.19(11.79)	39.12(11.41)
Central city-suburb disparity			
Percent of central-city income of suburbs	94.59(24.83)	82.46(16.78)	79.20(15.51)
Poverty concentration	--	1.40(0.46)	1.45 (0.45)
Income Inequality			
GINI	37.16(2.58)	39.45(2.88)	41.23(3.09)
Poverty rate	11.19(3.98)	9.66(1.03)	12.28(4.25)

Note: Standard Deviations are in parentheses.

Table 4.2 presents the trends of metropolitan government structure and state annexation policies. From 1980 to 2000, general-purpose government and school districts per 10,000 people persistently declined, yet special districts at the same time were relatively stable with a slight increase. As a result, the total number of governments in MAs decreased. And the ratio of special districts to general-purpose governments, which measures relative regionalism, has been

[39] Data needed to calculate school segregation in 1980 is not available.

increasing significantly. It means metropolitan areas have been growing with more and more special districts specialized in particular service.

State annexation policies have a significant impact on municipalities' territory expansion. The literature has widely acknowledged the positive effect of liberal annexation policies on city growth. Yet results from frequency analyses show the most liberal annexation policy, Municipal Determination policy, grew in 1980s but had a profound decline in 1990s. The Popular Determination policy, however, have grew remarkably from 1980 to 2000. A detailed examination by region found that the growth pattern of these two kinds of policies is not regional growth driven. Answers to why the most liberal annexation policy stopped growing in 1990, and why Popular Determination policy has sustained the growing trend will enhance our understanding of the connection between state annexation policies and urban growth.

Legislative Determination policy has shrunk steadily from 1980 to 2000. It might reflect the pressure from urban growth to relax the constraints for city expansion. Judicial Determination, Quasi-Legislative Determination, and MAs with central cities in different states have been stable in these two decades.

Table 4.2 Trends of metropolitan government structure and annexation policies

Variables	**1980**	**1990**	**2000**
Government Structure			
Total government/10,000 population	2.90(2.24)	2.78(2.21)	2.82(2.16)
General-purpose government/10,000 population	1.26(1.34)	1.19(1.31)	1.06(1.24)
Special districts/10,000 population	1.09(1.09)	1.09(1.15)	1.19(1.09)
School districts/10,000 population	0.55(0.51)	0.49(0.45)	0.47(0.38)
Ratio of special-purpose government to general government	1.53(2.14)	1.74(2.39)	2.52(4.41)
State Annexation Policies			
Municipal Determination (MD)	71(22.76%)	79 (25.08%)	60 (19.17%)
Popular Determination (PD)	106(33.97%)	116 (36.83%)	140 (44.73%)
Judicial Determination (JD)	29(9.29%)	32(10.16%)	28 (8.95%)
Quasi-legislative Determination (QL)	61(19.55%)	60 (19.05%)	63 (20.13%)
Legislative Determination (LD)	24(7.69%)	11 (3.49%)	7(2.24%)
Annexation Policies with central cities cross states (Diff)	16 (5.13%)	13 (4.13%)	15 (4.79%)

Note: Standard Deviations in parentheses for Government Structure variables
Percentage is in parentheses for State Annexation Policy variables.

Table 4.3 reports the trends of labor, human capital and Metropolitan Area characteristic variables. Human capital measured by percent of population with at least a four year college degree has been growing significantly from 1980 to 2000. But the percent of general labor has been decreasing remarkably. In these two periods, population growth generally slowed down in metropolitan areas.

The average size of MAs has a slight decline, which is a surprise. On the other hand, MAs are more and more densely populated and politically more and more homogenous from 1980 to 2000. Urban population diversity measured by percent of black population has increased as literature suggested. Manufacturing industries dwindled across MAs with the economic structure transforming from a manufacturing economy to a post-industrial one during these two decades[40].

Table 4.3 Labor, human capital and MA characteristics

Variables	**1980**	**1990**	**2000**
Human Capital and Labor			
Percent of population with college + degree	16.69(5.65)	19.74(6.34)	23.47(7.27)
Percent of labor among total population	65.41(5.66)	65.00(4.96)	49.72(6.07)
Annual growth rate of population	1.69(1.49)	1.06(1.28)	1.04(1.01)
MA characteristics			
Area (square miles)	2266.11 (3261.65)	2168.50 (2929.13)	2221.04 (3261.60)
Population density	330 (852.16)	362 (847.65)	419 (941.06)
Percent of black	9.91(10.02)	10.26(10.20)	10.83(10.71)
Political homogeneity	11.60(9.45)	17.05(12.08)	20.84(14.35)
Percent of manufacturing employment	17.90(9.07)	14.33(7.18)	13.97(6.55)

Note: Standard Deviations are in the parentheses.

4.1.2 Descriptive Results by Region

Table 4.4 presents the trends of economic growth and residential segregation across four regions. Results from this table confirm the descriptive evidence across the MAs. Economic growth rates have been slowing from 1980 to 2005 in all four regions. Racial segregation declined in each region. Income segregation increased in 1980s and decreased in 1990. Income

[40] Unfortunately, data is not available in census 1990 and 1980 to measure the growth of high-tech. industries.

disparity between central cities and the suburban areas has been enlarging. Income inequality has been rising and population under poverty line has been growing.

Yet these variables do perform regional variance. From 1980 to 1989, the Northeast had the fastest growth rate (3.13), South and Midwest followed with paralleled rates (2.43 and 2.11), the West was left far behind with a growth rate of 1.68.

The decade of 1990s saw the Midwest and the South as the leading regions driving income growth with growth rates of 2.25 and 2.00 percent. The West was catching up. Its income growth rate was 1.93 percent. The Northeast region quickly fell behind as the region with the least growth. The regional growth pattern in the 1990s partially reflected the economic structure change that occurred in the late 1990s. The flourishing internet and high-tech industry in the West explained the sustained and perpetuated growing trend. The fast growing rates in the Midwest and the South region might reflect the prosperous new industries and the traditional manufacturing industry (especially the auto industry in the Midwest region). The Northeast is the only region with slower income growth in the 1990s and it is the only region with a declining growth trend from 1980 to 2005. All other three regions experienced a relatively fast growing period in 1990s compared with 1980s. Reasons for the dwindling income growth rate in Northeast need to be gauged to restore this area.

The time from 2000 to 2005 was marked by the surging states in the South and West. Compared with the Midwest and Northeast, these two regions maintained good income growth with the leading effect of booming high-tech and service oriented industries. The Midwest region dropped from the top to the bottom, following the fate of the Northeast. The shrinking traditional manufacturing industries and the slugging auto industry might mainly contribute the decay of the Midwest in 2000. Figure 4.1 shows the income growth trend across three periods.

Table 4.4 Trend of Economic Growth and Residential Segregation by Region

Variables	Northeast			Midwest			South			West		
	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000
Annual growth rate of real personal income per capita	.3.13 (.82)	1.71 (.37)	.627 (.582)	2.11 (.50)	2.25 (.36)	.400 (.821)	2.43 (1.13)	2.00 (.57)	1.091 (1.213)	1.68 (.82)	1.93 (.89)	.761 (1.167
Racial Segregation												
Racial dissimilarity index	64.48 (13.61)	62.18 (13.43)	58.66 (12.68)	64.78 (14.20)	61.00 (14.49)	55.37 (14.96)	62.50 (11.57)	56.48 (11.06)	53.01 (10.24)	50.17 (11.51)	44.26 (10.16)	38.92 (10.78
Income Segregation												
Income dissimilarity index	26.07 (5.93)	31.82 (6.18)	31.42 (6.14)	27.56 (5.24)	36.75 (5.50)	35.13 (5.61)	30.67 (6.47)	35.60 (6.71)	34.36 (6.95)	28.97 (6.05)	36.07 (6.32)	35.33 (6.00)
Skills dissimilarity index	22.68 (4.43)	25.71 (5.31)	20.61 (4.68)	22.44 (4.31)	26.72 (4.81)	21.20 (4.25)	23.64 (5.34)	29.39 (5.94)	23.08 (4.76)	19.54 (4.39)	26.29 (5.62)	23.07 (5.19)
School Segregation												
Student Racial Dissimilarity index	--	63.26 (15.51)	62.04 (16.08)	--	61.80 (12.15)	60.16 (13.39)	--	49.29 (13.47)	51.46 (12.46)	--	46.84 (9.81)	43.37 (10.78
Student Income Dissimilarity index	--	46.23 (17.58)	42.66 (14.44)	--	35.86 (10.94)	38.97 (11.65)	--	33.75 (10.45)	36.73 (9.78)	--	30.98 (8.94)	41.97 (10.61
Central city-suburb disparity												
Percent of central-city income of suburbs	79.9 (16.19)	71.71 (13.09)	67.79 (12.55)	92.00 (25.38)	75.81 (13.61)	72.93 (10.55)	101.9 (25.93)	86.79 (17.48)	83.20 (16.30)	92.61 (.22)	88.81 (14.90)	86.53 (13.78
Poverty concentration	--	1.89 (.64)	1.94 (.63)	--	1.51 (.44)	1.57 (.41)	--	1.27 (.32)	1.34 (.32)	--	1.19 (.24)	1.23 (.26)
Income Inequality												
GINI	35.19 (2.28)	37.90 (2.80)	40.61 (3.52)	25.18 (1.48)	37.63 (1.82)	38.87 (2.13)	38.71 (2.22)	40.96 (2.80)	42.51 (2.59)	37.77 (2.01)	39.62 (2.34)	41.93 (2.96)
Poverty rate	9.82 (2.56)	9.34 (.59)	10.89 (3.69)	8.67 (1.64)	9.36 (.74)	9.83 (2.31)	13.56 (4.55)	9.82 (1.23)	14.00 (4.52)	10.40 (2.79)	9.94 (.99)	12.76 (4.23)
N	45	45	45	74[1]	76	76	129[2]	130	129[6]	65	65	65

[1] Two PMSAs, Kenosha, WI PMSA and Milwaukee-Waukesha, WI PMSA are not included in the analysis, because there are more than 50% of tracts in 2000 were not tracted in 1980.

[2,6] Danville, VA MSA was dropped from the analysis because of missing data on population.

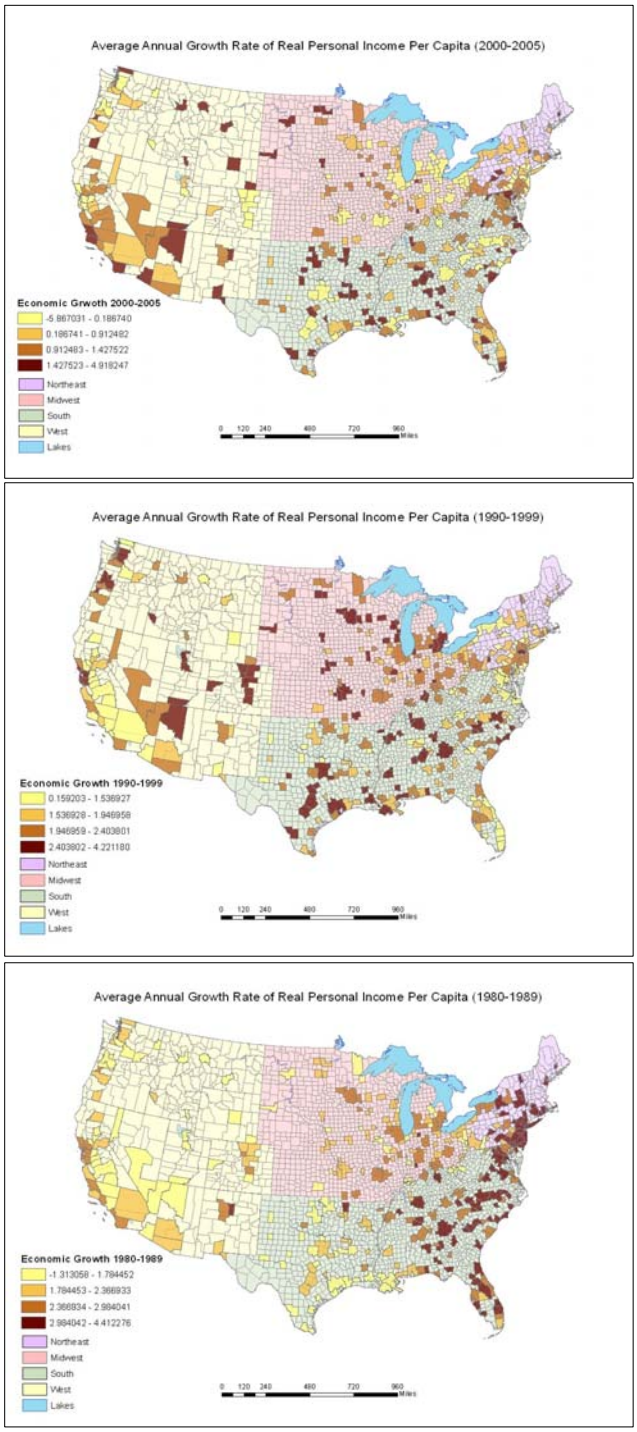

Figure 4.1 Income growth in 1980-1989, 1990-1999, and 2000-2005

In the three time periods, racial segregation in the Northeast region has declined moderately, but it maintained as the most segregated area. The West has been the least segregated by race and racial segregation declined sharply during 1980s and 1990s. Income segregation does not show a remarkable regional variance. The Northeast has slightly lower income segregation than the other three regions. Yet it has higher income segregation in schools. Racially, schools in the Northeast and Midwest were more segregated than those in the South and West.

Income disparity between central city and suburban areas is lower in the South and the West, than that in the Northeast and Midwest. Income is distributed most equally in the Midwest and the South has the higher income inequality. Associated with income equality, the Midwest has the lowest poverty rate, while the poverty rate in the South and West are relatively higher, especially in 2000. It might reflect theories about post-industrial economies that produce higher income inequality and more population in poverty.

As shown in table 4.5, the number of total governments per 10,000 population and the number of general-purpose governments per 10,000 population have been declining through two decades and across four regions. The number of special districts has been increasing at the same time. As a result, the public service professionalism, or relatively regionalism has been increasing. Yet the regional variation of institutional fragmentation of MAs has been significant.

The Midwest has been the most fragmented region across two decades. It has the most governments per 10,000 population, and the most general-purpose governments per 10,000 population. It might because the general-purpose governments provide most of public services that the number of special district is not comparable. As a result, the Midwest contains the lowest ratio of special districts to general-purpose governments. The Northeast follows the Midwest as a fragmented region. Its number of general-purpose governments is relatively high, thus the role of special districts is not as remarkable as the South and the West.

Institutionally, the West is not as integrated as the South. Its total number of governments per 10,000 is much higher than in the South. Yet it has the least general-purpose governments and the

most special districts per 10,000, which make it the area with most of its public services provided at a regional-wide scale. The South is the least fragmented region with the lowest number of total governments per 10,000 population. The growth in the general-purpose governments and special districts are parallel. Yet the role of special districts in public service provision is significant compared with the Midwest and the Northeast.

Regional variation of state annexation policies is extraordinary. The South has been the most liberal region for annexation. Most central cities of MAs in the South have Municipal Determination policies and Popular Determination policies. It makes it easier for southern cities to expand their territories through annexation. The West is the most conservative region with most cities having Quasi-Legislative Determination policies. Cities with this kind of policies have to go through much more complex procedures to annex.

Annexation policies in the Midwest are diverse and balanced in each category. It is hard to classify the Northeast as liberal or conservative. Most cities in the Northeast have Popular Determination policies, the relatively liberal annexation policy, or Legislative Determination policies, the most conservative policy. Yet states in the Northeast have moved toward the liberal direction in the 1990s because there are more cities with Popular Determination policies and fewer cities having Legislative Determination policies. Figure 5.2 shows the distribution of Municipal Determination, Popular Determination, and Judicial Determination policies.

Table 4.6 shows that human capital has been increasing in all the regions from 1980 to 2000, yet population in labor force have been declining. Population has been flowing to the West and South through two decades. Thus these two regions maintain faster population growth and also more diverse ethnic composition. The black population has concentrated in the South, while the West maintained the favorable region for the Hispanic population.

Manufacturing industries have been declining across four regions. The Northeast and the Midwest contain more manufacturing industries compared with the South and West.

Politically MAs are moving toward homogeneity in all the regions.

Table 4.5 Trend of Government Structure and State Annexation Policies by region

Variables	Northeast			Midwest			South			West		
	1980	**1990**	**2000**	**1980**	**1990**	**2000**	**1980**	**1990**	**2000**	**1980**	**1990**	**2000**
Government Structure												
Total government/10,000 population	3.71 (2.03)	3.64 (1.97)	3.44 (1.99)	4.22 (2.88)	4.14 (2.81)	4.10 (2.71)	1.75 (1.26)	1.67 (1.37)	1.73 (1.39)	3.09 (1.98)	2.78 (1.74)	2.67 (1.57)
General-purpose government/10,000 population	1.82 (1.21)	1.78 (1.22)	1.66 (1.17)	2.42 (1.92)	2.32 (1.83)	2.10 (1.71)	.78 (.52)	.71 (.53)	.60 (.05)	.49 (.40)	.43 (.35)	.31 (.27)
Special districts/10,000 population	1.25 (.78)	1.26 (.69)	1.21 (.75)	1.09 (1.19)	1.14 (1.67)	1.38 (1.26)	.65 (.65)	.69 (.81)	.76 (.79)	1.84 (1.40)	1.74 (1.20)	1.80 (1.24)
School districts/10,000 population	.64 (.49)	.6 (.45)	.57 (.42)	.71 (.42)	.69 (.38)	.62 (.32)	.33 (.39)	.28 (.34)	.31 (.33)	.76 (.65)	.62 (.54)	.49 (.39)
Ratio of special-purpose government to general government	.79 (.38)	.86 (.42)	.85 (.46)	.53 (.59)	.56 (.59)	.79 (.76)	.93 (.89)	1.11 (1.07)	1.64 (1.66)	4.34 (3.14)	5.00 (3.44)	7.42 (7.53)
State Annexation Policies												
Municipal Determination (MD)	0	0	0	19 (74)	19 (76)	14 (76)	48 (129)	56 (130)	44 (129)	4 (65)	2 (65)	2 (65)
Popular Determination (PD)	21 (45)	21 (45)	38 (45)	21 (74)	23 (76)	24 (76)	47 (129)	56 (130)	64 (129)	18 (65)	16 (65)	16 (65)
Judicial Determination (JD)	13 (45)	13 (45)	0	8 (74)	8 (76)	15 (76)	8 (129)	11 (130)	13 (129)	0	0	0
Quasi-legislative Determination (QL)	0	0	0	20 (74)	20 (76)	17 (76)	0	0	0	41 (65)	41 (65)	46 (65)
Legislative Determination (LD)	10 (45)	10 (45)	6 (45)	0	0	0	13 (129)	0	0	1 (65)	1 (65)	1 (65)
Annexation Policies with central cities cross states (Diff)	1 (45)	1 (45)	1 (45)	6 (74)	6 (76)	6 (76)	8 (129)	5 (130)	8 (129)	1 (65)	1 (65)	0
N	45	45	45	74[1]	76	76	129[2]	130	129	65	65	65

Note: Standard Deviations are in parentheses for Government Structure variables. Number of MAs in each region is in parentheses for state annexation policy variables.

[1] Two PMSAs, Kenosha, WI PMSA and Milwaukee-Waukesha, WI PMSA are not included in the analysis, because there are more than 50% of tracts in 2000 were not tracted in 1980.

[2.] Danville, VA MSA was dropped from the analysis because of missing data on population.

Figure 4.2 Geographical distributions of annexation policies

Table 4.6 Trend of Human Capital and MA Characteristics by region

Variables	Northeast			Midwest			South			West		
	1980	**1990**	**2000**	**1980**	**1990**	**2000**	**1980**	**1990**	**2000**	**1980**	**1990**	**2000**
Human Capital and Labor												
Percent of population with college + degree	15.44 (4.50)	19.98 (5.75)	23.89 (6.58)	17.10 (6.30)	20.00 (6.72)	24.28 (7.38)	15.45 (5.02)	18.06 (5.59)	21.57 (6.25)	19.48 (5.77)	22.46 (6.76)	25.94 (8.52)
Percent of labor among total population	67.02 (4.00)	64.23 (4.21)	53.26 (11.03)	72.12 (4.55)	66.87 (3.88)	52.52 (3.04)	67.65 (6.14)	63.63 (5.50)	47.35 (4.19)	71.34 (4.87)	66.05 (4.60)	48.62 (4.49)
Annual growth rate of population	.48 (.95)	.46 (.73)	.35 (.69)	.67 (.65)	.32 (.73)	.67 (.68)	2.10 (1.44)	1.31 (1.43)	1.20 (1.04)	2.90 (1.24)	1.85 (1.14)	1.65 (1.03)
MA characteristics												
Area (square miles)	1543 (1107)	1537 (1103)	1291 (1017)	1726 (1504)	1702 (1495)	1701 (1495)	1802 (1255)	1790 (1239)	1804 (1243)	4287 (6303)	3930 (5657)	4289 (6314)
Percent of Black	5.75 (5.84)	6.43 (6.19)	7.08 (6.17)	6.20 (5.39)	6.70 (5.53)	7.43 (5.68)	17.15 (11.03)	17.30 (11.43)	18.22 (12.18)	2.90 (3.05)	3.10 (3.02)	2.98 (2.83)
Percent of Hispanic	1.01 (1.60)	4.21 (5.94)	6.40 (7.53)	.46 (.60)	1.81 (1.71)	3.43 (2.84)	1.46 (3.27)	7.44 (16.31)	9.99 (17.41)	5.07 (4.77)	15.11 (12.90)	20.41 (15.30)
Percent of manufacturing employment	24.16 (7.26)	17.29 (5.81)	14.94 (5.06)	22.74 (9.57)	18.19 (7.83)	18.34 (7.61)	16.26 (7.89)	13.22 (6.69)	13.01 (5.76)	11.16 (5.41)	9.86 (4.65)	10.09 (4.26)
Political homogeneity	11.36 (7.84)	13.77 (10.00)	19.19 (11.77)	10.61 (7.74)	13.77 (11.08)	18.07 (13.61)	13.18 (10.67)	21.46 (12.42)	22.72 (13.89)	9.73 (9.28)	14.25 (11.23)	21.68 (17.51)
N	45	45	45	74[1]	76	76	129[2]	130	129	65	65	65

Note: Standard Deviations are in the parentheses

[1] Two PMSAs, Kenosha, WI PMSA and Milwaukee-Waukesha, WI PMSA are not included in the analysis, because there are more than 50% of tracts in 2000 were not tracted in 1980.

[2] Danville, VA MSA was dropped from the analysis because of missing data on population.

4.2 Variable Selection

In order to describe a clearer and more precise profile of spatial income inequality of metropolitan areas, several indices for each concept were created. For example, the income dissimilarity index and skills dissimilarity index are measurements for income segregation; the ratio of household income in central cities of that in suburbs and poverty concentration are indices for income disparity of central cities and suburbs; and the GINI coefficient and poverty rate are measures for income inequality. Multicolinearity problems will appear if we incorporate all the variables in one testing model. Thus we need to choose one measurement for each concept.

The income dissimilarity index and skill dissimilarity index have same changing trends during 1980-2000 and their correlation coefficient is .55, .66 and .60 in 1980, 1990 and 2000. It means they are measurements for the same concept. I chose skill dissimilarity index for three reasons. First, it fits the theory linking economic segregation and economic growth better. Benabou (1993) states that economic segregation isolates low-skill labor from the high-skill labor, thus high-skill labor cannot attain adequate services from the low skills and ultimately the entire economy grows at a lower rate. Second, the income dissimilarity index is not an accurate measurement for the controversies about the line dividing rich and poor across the country. And third, the income dissimilarity index does not perform well in the testing model.

The correlation coefficients between percent of central-city household income to suburban household income and poverty concentration are .74 and .72 in 1990 and 2000. The former index is a direct measurement for the central city-suburban disparity, and poverty concentration is not developed because of data availability problems. Thus percent of central-city family income to suburban family income is the variable in the testing model.

The GINI coefficient and poverty rate are created to measure income inequality. Their correlation coefficient is .70, .19, and .49 in 1980, 1990 and 2000. GINI coefficient is the

standard index for income inequality and it is more widely used. So the GINI coefficient is incorporated in the testing model[41].

4.3 Correlations

The purpose of this dissertation is to examine the impact of spatial income inequality on economic growth. This section presents correlation coefficients of economic growth and spatial income inequality. As mentioned above, spatial income inequality is measured as racial segregation, income segregation, the disparity between central cities and their suburbs, and government fragmentation on MAs. The correlations provide a preliminary picture of the relationship between economic growth and variables measuring spatial income inequality, and the connections among the spatial inequality variables. Table 4.7, table 4.8, and table 4.9 show the correlation coefficients of these variables in 1980, 1990 and 2000 respectively.

The tables reveal that economic growth is not correlated with spatial income inequality substantially. All the correlation coefficients with economic growth are low, yet the numbers have gotten larger with time, especially in 2000. The coefficients for racial segregation, school segregation by both race and income, and the disparity between central cities and suburban areas are moderate. In addition, the correlation coefficient between economic growth and racial segregation has been growing through two decades consistently, especially in 2000, the sign of correlation coefficients follows the hypothesized direction and the value is much higher than its peers in 1980 and in 1990. And thirdly, racial segregation highly correlates with school segregation by race in 2000. It also correlates with school segregation income and central city-suburban income disparity in 1990 and 2000, although the correlation coefficients are moderate.

The income dissimilarity index and skills dissimilarity index, both measuring income segregation, are highly correlated as we mentioned in last section. The correlation tables convey

[41] I actually tested all the variables in the model, income dissimilarity index, poverty concentration and poverty rate in the testing model. They did produce multicollinearity problems and did not improve the model performance.

the consistent relationship between these two measurements across time periods. In these three tables, neither of the two variables measuring income segregation substantially correlates with racial segregation, which counters the conventional wisdom. It implies that racial segregation and income segregation are two separate social dimensions instead of a single one as many studies suggested. Furthermore, skills dissimilarity index is highly correlated with schools segregation by income and income inequality. It means income segregation, school segregation by income and income inequality are closely related or intertwined.

Racial segregation and income segregation in school are correlated with each other. They also correlate with central city-suburban areas income disparity.

Gini coefficient and poverty rate are highly correlated in 1980. Their relationship is weak in 1990 and the correlation coefficient between these two variables becomes modest in 2000.

Although correlation analyses only provide exploratory evidence for the connections among the main variables of this project, the results suggest hints on their possible relationship. The consistent pattern of the correlation coefficients across three time points, their unique performance in different time period, and their signs and values in 2000 demand further analyses to determine the true relationship between these two important urban phenomena across the U.S. MAs.

Table 4.7: Correlations among economic growth and segregation variables 1980

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Economic growth	1								
(2) Racial segregation	.044	1							
(3) Income segregation	.082	.125	1						
(4) Skills segregation	.149	.251	**.549**	1					
(5) Centralcity-suburban income disparity	-.076	-.139	-.118	-.163	1				
(6) Income inequality	.000	-.007	**.556**	.231	.119	1			
(7) Poverty rate	.073	-.129	.337	.337	.028	**.704**	1		
(8) Total government/10,000 population	-.171	-.220	**-.421**	-.299	-.098	-.368	-.251	1	
(9) Ratio of special districts/general-purpose government	-.253	-.258	-.055	-.207	-.069	.181	-.004	.176	1

Table 4.8: Correlations among economic growth and residential segregation variables 1990

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Economic growth	1										
(2) Racial segregation	-.061	1									
(3) Income segregation	.134	.147	1								
(4) Skills segregation	.025	.296	**.663**	1							
(5) Racial segregation in school	.027	**.697**	.175	.234	1						
(6) Income segregation in school	-.027	**.485**	.369	**.532**	**.553**	1					
(7) Central city-suburban income disparity	-.105	**-.436**	-.223	-.102	**-.426**	**-.405**	1				
(8) Income inequality	-.059	.090	.338	**.555**	-.002	.265	.203	1			
(9) Poverty rate	-.076	.000	.005	.066	-.032	.097	.210	.185	1		
(10) Total government/10,000 population	-.031	-.154	-.336	**-.430**	.051	-.337	.069	-.393	-.251	1	
(11) Ratio of special districts/general-purpose government	-.161	-.295	-.024	-.091	-.208	-.118	.201	.125	.078	.095	1

Table 4.9: Correlations among economic growth and residential segregation variables 2000

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Economic growth	1										
(2) Racial segregation	-.264	1									
(3) Income segregation	-.068	.149	1								
(4) Skills segregation	-.153	.261	**.603**	1							
(5) Racial segregation in school	-.337	**.822**	.201	.245	1						
(6) Income segregation in school	-.274	**.463**	**.514**	**.551**	**.567**	1					
(7) Central city-suburban income disparity	.285	**-.439**	-.228	.002	**-.482**	-.267	1				
(8) Income inequality	-.012	.202	.360	**.588**	.129	**.430**	.127	1			
(9) Poverty rate	.250	-.163	.096	.204	-.180	-.016	.363	**.496**	1		
(10) Total government/10,000 population	.119	-.322	.070	.088	-.231	.101	.145	.132	.120	1	
(11) Ratio of special districts/general-purpose government	.062	-.214	-.380	-.466	-.110	-.390	-.009	-.506	-.111	.044	1

4.4 Evidence from Regression Analyses

In order to examine the effects of spatial income inequality on metropolitan economic growth, three OLS regression analyses were conducted to test the effect of these variables on economic growth per decade. Dependent variables are the annual average growth rate of real personal income per capita from 1980 to 1989, 1990 to 1999 and 2000 to 2005. To identify the long-term effect of spatial income inequality variables, a set of OLS regression estimations was conducted on the long-term economic growth measured by the annual average growth rate of real personal income per capita from 1980 to 2005. This chapter will report results from OLS estimations through ten-year periods, then results about the effects across twenty five years will be described. All results will be summarized at the end which will help to draw the conclusions.

4.4.1 Economic Effects of Spatial Income Inequality per Decade

This section presents the results from three sets of OLS estimation across ten years. Because data in 2000 is in the best shape, I report the results based on data in 2000 first, followed results in 1990 presented in table 4.11; and results from 1980 are shown in table 4.12 and discussed last. Model one tests the effects of residential segregation variables on economic growth. Model two identifies the economic effects of income disparity between central cities and their suburbs. Model three studies the effects of government structure of state annexation policies. Model four tests school segregation variables[42], model five is about income inequality and model six is the full model including all major independent variables.

Results from data in 2000

Table 4.10 contains all the results from six models based on data in 2000. Most of the results support the theoretical hypotheses developed in Chapter two very well. Model one shows both racial segregation and skills segregation in 2000 have a significantly negative effect on

[42] Because data are not available to develop the measurements for school segregation in 1980, model four is only available in the analyses of 1990 and 2000.

Table 4.10: OLS estimation of spatial income inequality on average annual growth of personal income per capita in 2000-2005

Variables	Model 1		Model 2		Model3		Model4		Model 5		Model 6	
Intercept	6.039 (.747)	***	3.368 (1.047)	**	2.345 (.806)	**	5.610 (.770)	***	7.922 (1.257)	***	3.00 (1.967)	
Residential segregation												
Racial segregation	-.025 (.005)	***									-.017 (.006)	***
Skills segregation	-.027 (.015)	*									-.027 (.015)	*
Central city-suburban disparity												
Central city-suburban income disparity			.017 (.006)	**							.018 (.006)	***
Poverty concentration			-.185 (.173)								-.084 (.184)	
Institutions and policies												
Total government/10,000 population					.072 (.033)	**					-.018 (.032)	
Ratio of special districts/general-purpose government					.027 (.014)	*					.034 (.013)	**
Municipal Determination (MD)					-.004 (.197)						.038 (.124)	
Popular Determination (PD)					.157 (.137)						.021 (.195)	
School Segregation												
Racial segregation in school							-.019 (.006)	***				
Income segregation in school							-.012 (.007)	*				
Income Inequality												
GINI coefficient									-.127 (.026)	***	.004 (.037)	
Poverty rate									.056 (.018)	***		

Instrumental variables												
Percent of Black families without cars (log)	-.308 (.141)	**	-.587 (.143)	***			-.283 (.146)	*			-.291 (.154)	*
Population Density			-.017 (.058)								.021 (.056)	
Human capital and labor												
Percent of College+ education	.017 (.012)		.026 (.011)	**	.005 (.012)		.024 (.011)	**	.026 (.012)	**	.029 (.012)	**
Percent of Labor	-.044 (.015)	**	-.040 (.016)	**	-.016 (.017)		-.048 (.016)	***	-.037 (..016)	**	-.033 (.016)	**
Average population growth rate	-.405 (.061)	***	-.412 (.064)	***	-.310 (.069)	***	-.437 (.065)	***	-.328 (.065)	***	-.409 (.066)	***
MA characteristics												
MA Size	.498 (.181)	**	.274 (.181)		.263 (.189)		.456 (.190)	**	.248 (.184)		.485 (.177)	**
Percent of Black	.008 (.006)		.003 (.006)		-.004 (.007)		.004 (.007)		.001 (.007)		.011 (.008)	
Percent of Hispanic	.001 (.005)		-.009 (.005)	*	.001 (.005)		.000 (.005)		-.001 (.006)		-.004 (.006)	
Percent of employment in Manufacturing	-.041 (.010)	***	-.043 (.011)	***	-.040 (.011)	***	-.042 (.011)	***	-.056 (.010)	***	-.026 (.011)	**
Political Homogeneity	.004 (.003)		.007 (.004)	*	.004 (.004)		.005 (.004)		.004 (.004)		.005 (.003)	
Northeast	-.335 (.184)	*	-.040 (.217)		-.839 (.206)	***	-.229 (.192)		-.667 (.184)	***	-.044 (.233)	
Midwest	-.506 (.163)	**	-.501 (.173)	**	-.855 (.198)	***	-.339 (.183)	*	-.793 (.176)	***	-.395 (.207)	*
West	-.730 (.172)	***	-.531 (.182)	**	-.572 (.230)	**	-.472 (.197)	**	-.468 (.177)	**	-.760 (.230)	**
F	14.33	***	12.72	***	7.07	***	13.46	***	11.92	***	9.02	***
Adjusted R Square	.419		.418		.275		.426		.354		.436	
DF	14		15		15		14		13		22	

Note: * <.1, **<.05, ***<.001

metropolitan economic growth from 2000 to 2005. One unit of increase in racial segregation in 2000 is associated with 2.7% of decrease in economic growth rate in 2000-2005. And one unit of increase in skills segregation in 2000 slows down metropolitan economic growth rate in 2000-2005 by 2.7%. It means that if black and white population, high-skill and low-skill labor of a metropolitan area are segregated into different residential communities, the personal income growth rate of this metropolitan area will be lower.

The log value of the variable testing the spatial hypothesis mismatch, percent of black family without a car, is significantly negative. It posits that by living in segregated poor communities, black families, as the main low-skill labor sources, without a car have difficulties accessing employment opportunities which will finally slow down the real personal income growth. The significance of this variable reveals that complementary-effect between high-skill and low-skill labor and the spatial mismatch hypothesis combine together to provide the theoretical rationale that residential segregation decreases metropolitan economic growth. This result makes this study very interesting because it provides strong support for the theoretical hypotheses that integrates the complementary-effect perspective and spatial mismatch hypothesis.

Model two tests the effects of the income disparity between central cities and their suburbs economic growth across MAs. It reveals that a larger income gap between these two urban areas is associated with slower subsequent metropolitan economic growth. And the more poverty concentrates in the urban center, the slower the MA grows. It means that if income is distributed unequally among the population of a metropolitan area, the economic growth rate is lower than the areas with more equal income distributions. The results support the theoretical hypothesis very well, yet it does not inherently support the agglomeration effect which directly develops the hypothesis. Population density tests the agglomeration effect and does not significantly explain the variance of metropolitan growth in 2000-2005. However, the percent of black families without a car is negatively significant. It indicates that the linkage of the economies of central cities and their suburbs might be through the spatially mismatched urban labor market, instead of

agglomeration effect. In other words, central city-suburb income disparity and the MA economic performance might be tied by urban labor market, instead of knowledge spillover effect. Yet this argument desires further research, probably through better indicator to test the agglomeration effect, to a robust conclusion.

Model three is a test of government structure and state annexation polices. The total number of governments including general-purpose government, special districts and school districts per 10,000 population has a positive effect[43]. As a traditional indicator for government fragmentation, this result contradicts the conventional wisdom. Yet given general-purpose governments and school districts have been declining through 1980 to 2000, and there are more special districts compared with general-purpose governments, the positive sign might reflect the positive effect of special districts on metropolitan growth rather than the effect of local government fragmentation. The positive sign of the ratio of special districts to general-purpose governments provides supportive evidence for this interpretation. Yet whether the positive sign of the ratio of special districts to general-purpose governments signals the positive effect of governmental regionalism, or the effect of functional fragmentation is an open question in urban governance research.

State annexation policies measured by Municipal Determination policy (MD), Popular Determination policy (PD), Judicial Determination policy (JD), Quasi-Legislative determination policy (QL) and Legislative determination policy (LD) following Sengstock's topology were all tested. This model focuses on MD and PD for two reasons: one, they are the most liberal policies suggested by the literature for positive effects on growth; two, to simplify the model. Surprisingly, neither of these two policies has significant effect. Previous research has widely acknowledged the effects of state annexation policies on state-level annexation activities and state population growth. Yet their effects are not maintained when tested on economic growth on the metropolitan level.

[43] Number of general-purpose governments/10,000 population, number of special districts/10,000 population, and number of school districts/10,000 were tested and none of them contribute the model significantly.

Model four contains school segregation variables by race and income. Their hypothesized negative signs were confirmed in this model and the percent of black families without a car is negative and significant. As the results from model one, results from model four strongly support the theories documented in Chapter Two.

Model five works on income inequality. The GINI coefficient is negative as hypothesized, yet the poverty rate has a positive sign. It yields a problem to interpret the contrasted results. Probably the negative GINI coefficient reveals the negative effect of income inequality broadly argued and examined by researchers. Yet the poverty rate might be an indicator for low-skilled population in the low-paid occupations. The positive sign on the poverty rate might reflect the complementary effect of the low-skill labor to the high-skill labor, given the 21st century economy is service-oriented, and poverty rates increase with technology development and with the income increase of the upper middle classes, this interpretation might be reasonable.

[44]Model six includes all the variables from each model and tests the robustness of the results. It shows most results from each model are kept in Model six. That is, the negative effect of racial segregation, income segregation, central city-suburban income disparity, income inequality, percent of black families with a car, and the positive sign of the ratio of special districts to general-purpose government were the same. Annexation policies maintain their silent role in explaining metropolitan economic growth. Yet the power of income inequality waned in the model with segregation variable. It might convey the following ideas. First, income inequality and spatial income inequality composed of residential segregation, central city-suburban income disparity and government fragmentation are intertwined as suggested in Chapter two. Second, spatial income inequality has a stronger power in explaining economic growth across the metropolitan areas in the US than income inequality.

The effects of human capital and labor are consistent across the testing models. Human capital measured by percent of population with four-year college education in 2000 positively

[44] Because of multicollinearity problem, school segregation variables are not included.

contributes metropolitan economic growth in 2000-2005. Yet the percent of population in the labor force in 2000 and the average annual growth rate of population from 1995 to 2000 have negative signs. The traditional view of economic growth attributes labor and population growth as important factors for driving economic growth. The negative signs of these two variables raise questions to explain their roles. Given the immigration trend since late 1990s, might the population growth rate and the percent of population in labor force reflect the flushing-in immigrants?

Of the metropolitan characteristics, percent of employment in manufacturing industries 2000 show a negative effect on economic growth in 2000-2005. It means an MA relying more on manufacturing industries associates with lower economic growth rate. Larger MAs perform better. Given the regional growth pattern, compared to the South, Northeast, Midwest and West grow more slowly. Demographic diversity, measured by percent of Black and percent of Hispanic, does not claim a role in explaining economic growth in this period. Political homogeneity is not significant either.

Results from data in 1990

Results of OLS estimation on average annual growth rate of real personal income per capital from 1990 to 1999 are presented in table 4.11. Generally speaking, the results provide puzzles rather than answers to the research questions. First of all, the exactly same testing model does not explain the dependent variable in 1990-1999 well. Compare the values of F and R square with those from the models based on data in 2000, the difference is obvious. Second, most primary independent variables are not significant, or not in the hypothesized direction. Third, no MA characteristics variables significantly contribute the models.

In model one, neither racial segregation nor income segregation is significant. In addition, percent of black families without a car which tests the spatial mismatch hypothesis is surprisingly

Table 4.11 OLS estimation of spatial income inequality on average annual growth of personal income per capita in 1990-1999

Variables	Model 1	Model 2	Model3	Model4	Model 5	Model 6
Intercept	-.114 (.600)	.590 (.647)	.531 (.472)	.289 (.660)	-.131 (1.043)	-1.435 (1.390)
Residential segregation						
Racial segregation	-.000 (.003)					-.000 (.004)
Skills segregation	-.010 (.008)					-.016 (.009) *
Central city-suburban disparity						
Central city-suburban income disparity		-.008 (.003) **				-.007 (.003) **
Poverty concentration		-.265 (.111) **				-.189 (.120)
Institutions and policies						
Total government/10,000 population			.000 (.002)			-.001 (.002)
Ratio of special districts/general-purpose government			-.037 (.020) *			-.039 (.020) **
Municipal Determination (MD)			.126 (.095)			.076 (.097)
Popular Determination (PD)			.044 (.078)			.049 (.078)
School Segregation						
Racial segregation in school				-.002 (.004)		
Income segregation in school				-.000 (.004)		
Income Inequality						
GINI coefficient					.017 (.018)	.049 (.024) **
Poverty rate					-.031 (.033)	

Instrumental variables												
Percent of Black families without cars (log)	.244	**	.290	**			.080				.274	**
	(.116)		(.116)				(.144)				(.118)	
Population Density			-.000								.000	
			(.000)								(.000)	
Human capital and labor												
Percent of College+ education	.030	***	.025	***	.024	***	.016	*	.023	***	.022	**
	(.007)		(.007)		(.007)		(.008)		(.007)		(.008)	
Percent of Labor	.019	**	.020	**	.015	*	.015		.021	**	.031	**
	(.008)		(.008)		(.008)		(.009)		(.009)		(.010)	
Average population growth rate	-.041		-.010		-.015		-.017		-.025		.004	
	(.031)		(.031)		(.032)		(.037)		(.032)		(.036)	
MA characteristics												
MA Size	.136		.114		.079		.066		.099		.064	
	(.116)		(.113)		(.115)		(.120)		(.115)		(.121)	
Percent of Black	.003		.000		-.001		.002		-.003		-.001	
	(.005)		(.004)		(.004)		(.005)		(.004)		(.005)	
Percent of Hispanic	-.001		-.002		-.003		-.001		-.004		-.003	
	(.003)		(.003)		(.003)		(.010)		(.003)		(.004)	
Percent of employment in Manufacturing	.008		.007		.007		.006		.009		.007	
	(.005)		(.005)		(.006)		(.006)		(.005)		(.006)	
Political Homogeneity	-.003		.003		.002		.003		.002		.002	
	(.003)		(.003)		(.003)		(.003)		(.003)		(.003)	
Northeast	-.439	***	-.350	**	-.336	**	-.225		-.397	***	-.393	***
	(.117)		(.131)		(.126)		(.173)		(.115)		(.114)	
Midwest	.047		.056		.091		.292	**	.051		-.144	
	(.108)		(.107)		(.114)		(.132)		(.105)		(.122)	
West	-.139		-.126		.073		.358	**	-.141		-.048	
	(.111)		(.111)		(.149)		(.177)		(.110)		(.150)	
F	5.81	***	5.82	***	5.26	***	3.72	***	5.77	***	4.56	***
Adjusted R Square	.182		.195		.175		.196		.170		.208	
DF	14		15		15		14		13		22	

Note: * <.1, **<.05, ***<.001

positive, contradicting the hypothesis and the traditional wisdom. Results from model four testing school segregation are the same. School segregation variables are not significant, although percent of black families without a car is not significant either. No variables are significant in model five testing income inequality.

The percentage of household income in central cities to their suburbs and the poverty concentration in central cities, the measures for the income disparity between central cities and suburbs, are significant in model two. Yet the sign of the former variable is in the wrong direction. It indicates that larger central city-suburban income disparity of an MA associates with faster economic growth. And again, percent of black families without a car is positive.

Percent of special districts to general-purpose government is negative in model three testing government structure and state annexation policies. Again, no state annexation policy variables are significant.

In the full model, racial segregation is not significant. Skills segregation surprisingly turns to be negatively significant. It is the result from the suppression effect of GINI coefficient. Without the GINI coefficient, it is not significant. Income disparity between central cities and their suburbs are positive. Percent of black families without a car maintains positive.

Human capital is consistently positive across the models. It seems human capital plays a stronger role in the models of 1990 than it does in 2000. The percent of labor force in the population 16 years older positively contributes to economic growth from 1990 to 1999. Population growth does not have a significant role though.

No MA variables significantly explain the variance of the personal income growth during 1990-1999.

It is very hard to interpret the results from the OLS estimation based on data in 1990s, since the model does not fit the data well. Why should larger income disparity between central cities and suburbs be associated with higher personal income growth across metropolitan areas? Why the variable, percent of black families without a car, which is an indicator for spatial mismatch

hypothesis and have a good reason to be negative, consistently shows a positive sign? Why, compared with more general-purpose governments, should more special districts in 1990 slow down metropolitan economic growth during 1990-1999? I have to leave these questions open at this stage in this project.

Results from data in 1980

Table 4.12 contains the results from OLS regressions on the average annual growth rate of real personal income per capital from 1980 to 1989. As the results from the data in 2000, racial segregation is significantly negative, which means an MA with higher racial segregation in 1980 is associated with slower economic growth during 1980-1989. Income segregation is not substantial in 1980, thus its effect has not showed up yet. Central cities dominate urban growth in 1980s. Suburbanization has not been the prominent urban growth pattern and urban areas have not have been divided artificially as the consequences of high-tech development. Thus the income disparity between central cities and suburbs are not significant in model two. It is a pity that data are not available to test the role of percent of black families without a car for the spatial mismatch hypothesis. Yet population density plays a significant role in this period. It posits the role of agglomeration effect or knowledge spillover effects when a city grows as suggested in Chapter two.

The total number of governments per 10,000 population is significantly negative in model three. Because it is a conventional measurement for government fragmentation, it supports the argument that municipal competition is a zero-sum game and thus government fragmentation is associated with slower economic growth. The ratio of special districts to general-purpose government is not significant. This might be rooted in the fact that special districts were not predominantly more than the general-purpose governments in the 1980s.

Contrary to the hypothesis, municipal determination (MD) annexation policy negatively affects metropolitan economic growth in 1980. This result might help to explain the diminishing

MD annexation policies from 1980 to 2000. Yet it desires more research to gauge the interpretation of its negative sign.

Income inequality performs a positive sign in model five, which is consistent with the results from Bhatta (2001).

All the results held in the full model, which means they are robust. The negative role of racial segregation, the negative sign of total number of governments per 10,000 population, the negative sign of MD annexation policy, and the positive effect of population density are maintained in the full model. Income inequality loses its role in the model together with the spatial income inequality variables, which is the same with the results based on data in 2000. The consistent results across different time period might reveal the fact that spatial income inequality has a stronger power to explain metropolitan economic growth than income inequality.

Human capital and population growth claimed their significant roles for metropolitan economic growth, which confirmed the traditional view of economic growth.

Of the MA characteristics, manufacturing industries in 1980 contributes metropolitan economic growth significantly. It indicates manufacturing industries were the driving force for economic growth, although it became a burden in the first decade of the 21st century. The percent of black population has a significant positive sign, yet percent of Hispanics shows a negative effect. How to explain these variables with conflicting signs is worthy of more studies for insight. Political homogeneity shows its role in 1980s. The higher value of this variable, the more homogeneous is a MA. The negative sign implies that party competition is good for metropolitan growth in 1980s.

Table 4.12 OLS estimation of spatial income inequality on average annual growth of personal income per capita in 1980-1989

Variables	Model 1		Model 2		Model3		Model4	Model 5		Model 6	
Intercept	3.797 (.889)	***	2.125 (.793)	**	1.823 (.761)	**		-.532 (1.647)		1.686 (1.789)	
Residential segregation											
Racial segregation	-.011 (.004)	**								-.015 (.004)	***
Skills segregation	.003 (.012)									-.009 (.013)	
Central city-suburban disparity											
Central city-suburban income disparity			.033 (.200)							-.066 (.216)	
Poverty concentration											
Institutions and policies											
Total government/10,000 population					-.006 (.003)	**				-.007 (.003)	**
Ratio of special districts/general-purpose government					-.009 (.031)					-.010 (.031)	
Municipal Determination (MD)					-.480 (.133)	***				-.474 (.133)	***
Popular Determination (PD)					-.105 (.106)					-.160 (.109)	
School Segregation											
Racial segregation in school											
Income segregation in school											
Income Inequality											
GINI coefficient								.062 (.034)	*	.049 (.032)	
Poverty rate								.012 (.019)			
Instrumental variables											
Percent of Black families without cars (log)[1]											

[1] Data is not available in 1980.

Population Density			.111 (.058)	*					.113 (.058)	*
Human capital and labor											
Percent of College+ education	.067 (.012)	***	.056 (.013)	***	.048 (.013)	***	.057 (.013)	***	.041 (.014)	**
Percent of Labor	-.039 (.013)	**	-.020 (.013)		-.005 (.013)		-.017 (..014)		-.013 (.016)	
Average population growth rate	.110 (.045)	**	.154 (.045)	***	.136 (.043)	**	.110 (.044)	**	.136 (.046)	***
MA characteristics										
MA Size	.000 (.168)		-.106 (.166)		-.212 (.165)		-.063 (.180)		.020 (.184)	
Percent of Black	.030 (.006)	***	.024 (.006)	***	.019 (.006)	**	.019 (.007)	**	.016 (.007)	**
Percent of Hispanic	-.049 (.005)	**	-.053 (.015)	***	-.044 (.015)	**	-.074 (.018)	***	-.052 (.018)	**
Percent of employment in Manufacturing	.022 (.007)	***	.020 (.007)	**	.014 (.007)	**	.024 (.007)	***	.022 (.007)	**
Political Homogeneity	-.009 (.005)		-.009 (.005)	*	-.009 (.005)	*	-.009 (.005)	*	-.011 (.005)	**
Northeast	.930 (.178)	***	.814 (.193)	***	.867 (.188)	***	1.047 (.188)	***	.824 (.215)	***
Midwest	-.028 (.159)		-.119 (.161)		-.114 (.164)		-.003 (.162)		.038 (.180)	
West	-.458 (.165)	**	-.466 (.172)	**	-.600 (.204)	**	-.302 (.166)	*	-.735 (.221)	***
F	15.66	***	13.24	***	14.57	***	14.95	***	10.67	***
Adjusted R Square	.385		.354		.401		.378		.403	
DF	13		13		15		13		20	

Note: * <.1, **<.05, ***<.001

School segregation data is not available to run model 4 which is testing the effect of school segregation on economic growth.

4.4.2 Summery of OLS Estimations from data in 1980, 1990 and 2000

Table 4.13 summarizes the signs of major variables from three OLS estimations. It portrays basic attributes of these variables in explaining metropolitan economic growth in three decades. Yet we need to be cautious when we map the trend of the signs from 1980 to 2000. As it shows in table 4.11, the testing model does not fit the data in 1990s well. It provides the possibility that testing models that fit the data very well might produce different signs on the variables. Thus there is a good chance to question the validity of the results from the OLS estimation based on data in 1990s. But still, results from these three OLS estimations, especially the good model performance from data in 1980 and 2000, shed light on a better understanding of the connection between the geographical distribution of socioeconomic attributes of the population and the macroeconomic growth across the metropolitan areas in the U.S.

Table 4.13 Impacts of major variables from three OLS estimations

Variables	**1980**	**1990**	**2000**	**Trend**
Racial segregation	--	ns	--	Negative
Skills segregation	ns	--	--	Emerging Negative
Income disparity of central cities and suburbs	ns	+	--	Inconsistent
Total government/10,000 population	--	ns	+	positive trend
Ratio of special districts/general-purpose government	ns	ns	+	Emerging positive
Municipal Determination policy (MD)	--	ns	ns	Diminished effect
Popular Determination policy (PD)	ns	ns	ns	No effect
GINI coefficient	+	ns	--	Negative trend
Percent of Black Families without cars	na	+	--	Inconsistent
Population Density	+	ns	ns	Diminished effect
Percent of College+ education	+	+	+	Consistently positive
Percent of Labor	+	ns	--	Negative trend
Average population growth rate	+	ns	--	Negative trend
Percent of employment in Manufacturing	+	ns	--	Negative trend

Racial segregation maintains a negative sign in models of both 1980 and 2000. Although it is not significant in 1990, the results provides strong signal for the negative effect of racial segregation on economic growth. The negative sign of skills segregation is in the model of 1990 and 2000. Skills segregation or income segregation was low in 1980s. It might be the reason for

the insignificance of this variable. Although its negative effect is highlighted under the suppression effect of GINI coefficient in 1990, the negative effect emerged. In 2000, the negative effect of skills segregation is robustly significant. Thus with skills segregation rising to a certain level, it will slow down the subsequent economic growth.

The performance of the income disparity between central cities and suburbs is tough to interpret. It is obvious that central cities dominate urban growth in 1980s and they are the real urban cores. With the income gap between these two areas enlarging, its negative impact turns significant in 2000s. The negative sign of percent of black families without a car provides evidence to form the story that spatial mismatch is the mechanism through which income disparity drives down the economic growth. Yet the positive signs of this variable and the percent of black families with a car in 1990 present a hard question. The suburbanization progress was triggered by the internet and telecommunication technology development from mid-1990s. Thus the positive sign of the income disparity between central cities and their suburbs might reflect the development of high-tech industries. Yet the positive sign of the percent of black families without a car questions the plausibility of this story about high-tech development. Again, this project has to leave it as an open question for further exploration.

The effect of the number of total governments per 10,000 population turns from negative supported by the traditional view, to positive. As I elaborated in the last section, the negative sign confirms the argument that over-competition among municipals is a zero-sum game and a waste of public resources. Thus government fragmentation has a negative impact on metropolitan economic growth. However, this index might represent the rapidly growing number of special districts in 2000. Since special districts can provide public services region wide, externalities are internalized and economies of scale is exploited. Thus special districts are beneficial to economic growth especially in a service-oriented economy, when the demand of professional service provision is substantially raised by the public. The positive sign of the ratio of special districts to general-purpose governments supports this interpretation.

The negative sign of municipal determination annexation policy in 1980 contradicts the conventional wisdom. There is a consensus in the literature that liberal annexation policy increases municipal annexation activities and also urban growth. The results show that empirical results about annexation policies across the states might not hold for metropolitan-level analyses. Yet this result provides insights for us to understand the diminishing number of metropolitan areas with this type of annexation policy. Compared with the shrinking trend of municipal determination annexation policy, popular determination annexation policy has expanded across the metropolitan areas substantially. Yet it does not contribute to income growth significantly in the models of 1990 and 2000. If economic growth was not the consequence for the expansion of popular determination policy, is it the cause? Or other concerns dominated the policy-making process in this case?

Human capital has been contributing to economic growth consistently and substantially, as suggested by the traditional view of economic growth. Yet the percent of population in labor force, average annual growth rate of population, and percent of employment in manufacturing industries have changed from positive to negative through two decades. The deteriorating manufacturing industries indicate that the economic structure transformed from a manufacturing economy in 1980 to a service-oriented arena in 2000. With the booming of high-tech and professional service industries, human capital nurtured by higher education is more important to the economy than the general labor. Labor with lower education is important in the economy where manufacturing industry plays a large role. In an economy that highly relies on human capital and a large part of low-skills have difficulties to access their jobs, the large labor force might add service costs to the society through re-distributive policies. Thus the signs of labor and population growth can be negative. This explanation hints that providing channels for the poor to be employed might be really beneficial to macroeconomic performance.

In sum, these three OLS estimations provide evidence about the negative effect of racial segregation and skills segregation, although it desires more study to strengthen the robustness of

the results. The OLS estimations also provide insights for us to understand metropolitan economic growth. Yet these analyses only test the effects on decennial economic performance, which is a relatively short time. How about the effects of the variables on the long-term economic growth, say, from 1980 to 2005? Evidence about the long-term effects might enhance our understanding about the metropolitan growth. The following section reports the effects of spatial income inequality in 1980 on the metropolitan economic growth in 25 years.

4.4.3 Long-term Economic Effects of Spatial Income Inequality

Table 4.14 shows the effects of spatial income inequality on economic growth in 1980-2005 from the OLS estimation. Racial segregation in 1980 negatively impacted metropolitan economic growth in the following 25 years. Skills segregation and the central city-suburban income disparity do not show their destructive effects. That might because in the 1980s, urban areas were not divided into two isolated societies, and were not segregated by income or skills yet, although residential communities were symbolized strongly by race.

The performance of the institutional variables is a little surprising. The ratio of special districts to general-purpose government in 2000 positively contributes economic growth from 2000 to 2005. It does not explain the income growth in 1990s and in 1980s. Yet results from model three convey to us the message that government structure might have a long-term effect. And although it helps increase income growth in a short time, it might negatively impact economic growth in a long run.

And both of the state annexation policies, municipal determination policy and popular determination policy show their negative signs too, although their explanatory power does not show up in the decade-long models.

Income inequality measured by the GINI coefficient seems insignificant for the long-term economic growth, yet the poverty rate has a positive sign.

Human capital not only contributes short-term income growth consistently, it contributes the long-term economic growth too, which is consistent with the traditional wisdom of economists.

Population growth rate also increases income growth although it might slow down economic growth in a short time, such as from 2000 to 2005.

Manufacturing industries does not affect 25-year income growth at all. Percent of black population show a positive sign and percent of Hispanics show a negative sign.

Although it is controversy to interpret all the OLS estimation results about the effect on 25-year economic growth, the results convey the information that racial segregation not only deters short-term economic growth, but also hinders long-term economic growth across metropolitan areas. The insignificance of skills segregation and central city-suburban income disparity cannot be taken as that they are not harmful. Their deleterious effects might not show up yet since in 1980s, residential segregation by income and city decay is not substantial. The negative sign of skills segregation the model of 1990s and 2000s implies it is destructive effect on urban growth. Thus policies should provide incentives for building more integrated residential communities both by race and by income.

Table 4.14: OLS estimation of spatial income inequality variables on average annual growth rate of real personal income per capita 1980-2005

Variables	Model 1		Model 2		Model3		Model 4		Model 5	
Intercept	2.190 (.460)	***	.928 (.429)	**	1.152 (.409)	**	-.491 (.887)		1.943 (.970)	*
Residential segregation										
Racial segregation	-.009 (.002)	***							-.011 (.002)	***
Skills segregation	.000 (.006)								-.006 (.007)	
Central city-suburban disparity										
Central city-suburban income disparity			.067 (.110)						-.012 (.117)	
Institutions and policies										
Total government/10,000 population					-.002 (.001)				-.003 (.002)	**
Ratio of special districts/general-purpose government					-.033 (.017)	*			-.028 (.017)	*
Municipal Determination (MD)					-.160 (.073)	**			-.152 (.072)	**
Popular Determination (PD)					-.125 (.158)	**			-.153 (.059)	**
Income Inequality										
GINI coefficient							.003 (.019)		.015 (.017)	
Poverty rate							.026 (.010)	**		
Instrumental variables										
Population Density			.046 (.032)						.060 (.031)	*
Human capital and labor										
Percent of College+ education	.022 (.007)	**	.017 (.007)	**	.013 (.007)	*	.018 (.007)	**	.012 (.008)	
Percent of Labor	-.004 (.007)		.007 (.007)		.009 (.007)		.009 (.007)		.001 (.009)	
Average population growth rate	.102 (.029)	***	.119 (.031)	***	.127 (.030)	***	.110 (.031)	***	.123 (.031)	***
MA characteristics										

MA Size	.047		-.152		-.206	**	-.155		.120	
	(.092)		(.093)		(.093)		(.100)		(.103)	
Percent of Black	.013	***	.009	**	.007	**	.006		.008	**
	(.003)		(.003)		(.003)		(.004)		(.004)	
Percent of Hispanic	-.033	**	-.038	***	-.035	***	-.049	***	-.037	***
	(.009)		(.008)		(.008)		(.010)		(.010)	
Percent of employment in Manufacturing	.002		-.001		-.004		.000		.000	
	(.004)		(.004)		(.004)		(.004)		(.004)	
Political Homogeneity	-.001		-.001		-.001		-.002		-.002	
	(.003)		(.003)		(.003)		(.003)		(.003)	
Northeast	.284	**	.222	**	.287	**	.310	**	.260	**
	(.093)		(.106)		(.101)		(.010)		(.116)	
Midwest	.002		-.086		-.048		-.020		.043	
	(.083)		(.088)		(.088)		(.086)		(.096)	
West	-.319	***	-.276	**	-.206	*	-.200	**	-.317	**
	(.089)		(.095)		(.113)		(.090)		(.121)	
F	11.78	***	9.29	***	9.61	***	10.75	***	8.72	***
Adjusted R Square	.314		.270		.297		.296		.348	
DF	13		13		15		13		20	

Note: *<.1, **<.05, ***<.001

4.5 Summary and Discussion

Results from the analyses show that the MA economic growth rate has been declining through these two and half decades. The economic growth center moved from the Northeast to the Midwest and then the South and the West. At the same time, the metropolitan communities are more integrated by race, but more segregated by income. As for metropolitan governance, special districts which focus on region-wide service provision have grown substantially, while the proportion of traditional general-purpose governments has declined.

Three OLS estimations based on decennial data show metropolitan areas more segregated by race are associated with slower economic growth measured by the average annual growth rate of real personal income per capita. The negative impact of income segregation has been emerging from 1990s with its rising trend. The results follow the theoretical hypotheses very well. In addition, the negative sign of percent of black families without a car supports the theory that connects residential segregation and economic growth together by combining spatial mismatch hypothesis and the complementary effects argument. Low-skill labor and high-skill labor are complementary inputs for production. If it is hard for poor minorities to access their jobs, the return to their education cannot compensate the costs. It will drag down the education investments from the poor, and ultimately the entire investments for human capital of the whole MA. As shown by the results and suggested by the traditional view of economists, human capital serves as the driving force for innovation and production; the reduction of education investments then slows down income growth.

The performance of the income disparity between central cities and their suburbs does not follow the hypothesis this well. Its negative sign from the model in 2000 follows the theoretical hypothesis. However, because percent of black families without a car is negative and population density is not significant, it indicates the negative impact of this variable on income growth might be through the spatially mismatched labor market instead of knowledge spillover effect. Since

population density might not be a good indicator of agglomeration effects, more research is desired to identify the underlying rationale. The positive signs of both the central city and suburban disparity and percent of black families without a car in 1990s create a puzzle for us. Since the testing model does not fit the data quite well in 1990s, this project leaves this task at this stage for more exploration.

The analyses also reveal metropolitan areas with more governments per 10,000 governments are associated with slower subsequent economic growth in 1980s. Yet with the growth of special districts, its sign turns positive. It might reflect the fact the special districts are more efficient for public service provision on the metropolitan areas because the economics of scale is take advantage. The positive sign on the ratio of special districts to the general-purpose governments supports the interpretation.

Although it is widely suggested by the literature that liberal annexation policies increase city annexation activities, this study does not find significant impact of annexation policies. It is hard to explain the diminishing trend of municipal determination policies and the substantial expansion of popular determination. One possibility is that liberal state annexation policies might affect state-level growth, but their effects are not that significant on metropolitan level.

Since the economy transformed from the manufacturing dominated structure to a service-oriented arena during this period, the manufacturing industries turn from a major contributor in 1980s to income growth to a burden of the metropolitan growth in 2000. At the same time, the signs on labor and population growth have the same change. It can be interpreted as that the current economy more relies on human capital instead of the general labor.

Long term OLS estimation on 25-year growth confirms the negative impact of racial segregation in 1980 on the income growth from 1980 to 2005. Although income segregation and central city and suburban income disparity are not significant in the model, it does not mean they do not affect the long-term growth. It is possible that because the urban communities are integrated by income, and central cities are still the urban cores dominating urban growth, their

negative impact has not shown up yet. The negative sign on income segregation in the 1990s and 2000s support this explanation.

Results from the analyses convey valuable ideas and insights about the connections between metropolitan socioeconomic attributes and metropolitan growth. Yet the puzzling results from the model based on data in 1990s create an obstacle for us to confidently argue the negative impact of residential segregation on both short-term and long-term income growth.

Since the structure of economy transformed from during the study period, it might be possible that the 1990s contains the structural change point(s) due to the massive progress of internet and high-tech industries. Thus it is desirable to conduct empirical research to identify whether there is (are) structural change point (s). That might help us to understand the linkage between these two very important urban phenomena.

CHAPTER 5: CONCLUSION

Economists have developed theories about the impact of income inequality on economic growth, yet they have not integrated unequal income distributions across space into their equality. Sociologists well documented the destructive impact of residential segregation on employment opportunities, access to public services and other aspects of life of poor minorities. Yet they have not examined its impact on the entire population, both the poor and non-poor. Economic geographers have provided theories and empirical evidence about the negative impact of central city and suburban income disparities on economic growth, yet they have not studied the connection between segregation at the neighborhood level and economic growth.

Integrating studies from these disciplines together, this study developed three hypotheses. First, residential segregation by race and by income has a negative impact on metropolitan economic growth. Second, metropolitan areas with higher income disparity between central cities and suburbs are associated with slower economic growth. Third, metropolitan areas with higher governmental fragmentation grow slower.

The first hypothesis was developed based on the combination of the complementary effect perspective between high-skill labor and low-skill labor and the spatial mismatch hypothesis. With low-skill labor and high-skill labor segregated into distinct communities, it is hard for the low-skill labor concentrated in high poverty communities to access job opportunities. It will lead to negative returns of education investment for the poor and reduce the supply of the low-skill labor. Since these two types of labor are complementary inputs for production, reduction in low-skill labor decreases the demand for high-skill labor. Then, the education investments in the whole society decrease and ultimately macroeconomic growth slows down.

Agglomeration effects and spatial spillover effects are the theoretical foundation for the second hypothesis for the natural linkage between central cities and suburbs and the inevitable deteriorating effect of the distressed central city on the economic performance of a metropolitan area. The third hypothesis was developed based on the debate between the public choice perspective on government fragmentation and the regionalism.

Generally results from the analyses support the hypotheses. Racial segregation impacts both 10-year economic growth and the long-term economic growth from 1980 to 2005. The negative impact of income segregation emerged in 1990s with its rising level and it is robust and significant in the first five years of 21st century. The negative impact of central city and suburban income disparity did not show up in the model until data in 2000 were used. The variable testing spatial mismatch hypothesis follows the hypothesized direction in 2000, which supports the theory this study proposed to connect residential segregation and income growth. The results from the model testing the impact of income disparity between central cities and suburbs shows that these two metropolitan components might be tied together through the labor market rather than through agglomeration effects. The positive effect of regional-wide special districts and negative effect of government fragmentation are demonstrated by the results. And quite a surprise, liberal annexation policies have no effect on short term growth, but they show a negative impact on long term economic growth. The results provide empirical evidence for the shrinking trend of Municipal Determination policies but create a puzzle to explain the substantial expansion of Popular Determination annexation policies.

5.1 Future Research and Policy Implications

The fact that the model does not fit the 1990s data well and the puzzling results from it provide room to improve the analysis. It might be possible that massive technological progress created structural change during the 1990s, which makes the model unable to explain urban growth. Thus analysis needs to be conducted to examine weather a structural break point existed

in the 1990s. Another possibility is that the income data quality of 1990 might be affected by the high-tech and internet bubbles and bubbles in the real estate market. Testing whether bubbles existed at that time and then tease them out will be definitely worth investigating to improve this project. In addition, 15 PMSAs were excluded in the analysis because of overlapped county boundary issues. Thus the results can only be generalized to the remaining 318 MAs.

Controlling for the availability of public transit, and interaction items between public transit and the Northeast region might be a good way to strengthen the causal relationship between spatial income inequality and economic growth. In addition, panel data analysis including data from the 1970s will provide more information and solidify causal relationships. If results from the model based on data in 1970s and panel data analysis based on data from four decades are consistent with the results we get from the analysis in this project, we will have much more confidence in the conclusions we draw. Thirdly, plugging in the average values of the spatial income inequality variables in the extreme cases (or outliers) is a valuable way to estimate the effect of independent variables for a particular case. It will also be helpful to evaluate the relative contributions of the spatial income inequality variables to economic growth. Fourth, this project does not incorporate spatial statistics in the analyses. Thus checking the possible autocorrelation between adjacent MAs can improve the precision of the estimation. If autocorrelation does exist, spatially lagged regression can be applied instead of simple OLS estimation.

Urban government structure and policies are one important component of spatial income inequality. Yet this project missed some important literature to discuss, such as Elinor Ostrom, Roger Parks, and Gordon Whitaker starting in mide-1970s. This literature is for decentralization and efficiency. Incorporating them in this project will enhance our understanding on this issue.

Although more research is needed for rigorous conclusions, this project has implications for public policy. Since the early 1990s, federal housing policies have been ambitious to improve the quality of public housing, to increase the housing choices for the poor, and to provide opportunities to access jobs and other public services (e.g. HOPE VI issued in 1992, Moving to

Work (MTW) authorized in 1996 as part of the welfare reform and Moving to Opportunities (MTO) demonstrated in five cities in 1995). These policies were found to have substantially improved the living conditions of the poor and helped them live in lower poverty communities, although these policies confronted the underfunding problem. Yet no adequate evidence shows that the latter two policies are effective in helping the poor to access jobs and opportunities. In other words, moving to better communities does not help the assisted families share the benefits of the social network in the communities. At first glance, the interpretation might be that housing policy alone is not enough; comprehensive policies are needed to convert physical existence in better communities into social capital.

However, results from this study indicate that residential segregation is the origin rooted in urban problems. These policies attempt to solve the problems by mediating the mechanism, instead of eliminating the root. A basket of strategies including strongly anti-discrimination social policies and financial policies, education policies providing opportunities for poor children, and housing and planning policies encouraging mix-race and mix-income communities need to be considered simultaneously. Politically it might be hard and it is a long journey to walk. Yet it should be encouraged to initiate the first step instead of continually investing public resources in ineffective ways.

REFERENCES

Adams, Carolyn.T. 1997. The Philadelphia experience. *Annals of the American Academy of Political and Social Science* 551: 222-234.

Adelman, Irma. 1961. *Theories of Economic Growth and Development*. Stanford, CA: Stanford University Press

Adelman, Robert M. 2004. Neighborhood opportunities, race and class: the Black middle class and residential segregation. City & Community 3: 43-63.

Aghion, Philippe and Peter Howitt. 1998. *Endogenous Growth Theory*. Cambridge, MA: MIT Press.

Aghion, Philippe and Peter Howitt. 1992. A model of growth through creative destruction. *Econometrica* 60 (2): 323-351.

Alesina, Alberto and Dam.Rodrik. 1994. Distributive politics and economic growth. *Quarterly Journal of Economics* 109: 465-90.

Andrews, Marcellus. 1994. On the dynamics of growth and poverty in cities. *Cityscape* 1 (1): 53-73.

Aponte, R. 1996. Urban employment and the mismatch dilemma: Accounting for the immigration exception. *Social Problems* 43: 268–283.

Armor, David and William A. V.Clark. 1995. Housing segregation and school segregation. P128 In Dvaid Armor *Forced Justice: School Segregation and the Law*. New York: Oxford University Press.

Baker, Sunny, and Kim Baker. 1992. *Market Mapping: How to use revolutionary new software to find, analyze and keep customers*. New York: McCraw-Hill.

Barlow, I.M. 1991. *Metropolitan Government*. London: Routledge.

Barnes, William R. and Larry C. Ledebur. 1998. *The New Regional Economies: The U.S. Common Market and the Global Economy*. Thousand oaks, CA: Sage Press.

Barro, R. J. 1999. Inequality, growth and investment. *National Bureau of Economic Research working Paper* 7038.

Benabou, Roland. 1993. Working in a city: Location, education and production. *The Quarterly Journal of Economics* 108 (3): 619-652.

Benabou, Roland. 1994. *Education, income distribution, and growth: The local connection*. National Bureau of Economic Research, working paper 4798.

Benhabib, Jess and Mark M. Spiegel. 1994. The role of human capital in economic development evidence from aggregate cross-country data. *Journal of Monetary Economics* 34: 143-173.

Bernhardt Annette, Martina Morris, Mark S. Handcock, and Marc A. Scott. 2001. *Divergent Paths: Economic Mobility in the New American Labor Market*. Russell Sage Foundation.

Berry, Brian J.L. 1975. The Decline of the Aging Metropolis: Cultural Bases and Social Processes, in G. Sternlieb and J. Hughes (ed.) *Post-Industrial America: Metropolitan Decline & Inter-Regional Job Shifts*, Rutgers: Center for Urban Policy Research, p. 175-185.

Berry, D. M. and D.L. Kaserman. 1993. A diffusion model of long-run state economic development. *Atlantic Economic Journal* 21 (4): 39-54.

Bhatta, S. 2001. Are Inequity and Poverty Harmful for Economic Growth: Evidence from the Metropolitan Areas of the United States. *Journal of Urban Affairs* 23 (3&4): 335-359.

Bickers, Kenneth N., Lapo Salucci and Robert M. Stein. 2006. Assessing the micro-foundations of the Tiebout model. *Urban Affairs Review* 42: 57-80.

Bifulco, Robert and Helen F.Ladd. 2006. School choice, racial segregation and test-score gaps: evidence from North Carolina's Charter School Program. Presented at *Annual meeting of Allied Social Science Associations*. Boston, MA.

Blair, John. and Robert Premus 1987. Major Factors in Industrial Location: A Review. *Economic Development Quarterly*, 1(1): 72-85.

Blomquist, William and Roger B.Parks. 1995. Fiscal, service, and political impacts of Indianapolis-Marion County's Unigov. *Publius: The Journal of Federalism* 25: 37-54.

Bluestone, Barry and Bennett Harrison. 1982. *The De-Industrialization of America*. New York: Basic Books.

Boger, C. 2005. The socioeconomic composition of the public schools: A crucial consideration in student assignment policy. Chapel Hill, NC: Center for Civil Rights.

Bollens, A. Scott 1997. Fragments of regionalism: the limits of Southern California governance. *Journal of Urban Affairs* 19: 105-122.

Bollens, John C. 1949. Annexation of fringe areas. *Public Management*: 98-102.

Bowles, Samuel, David M.Gordon and Thomas E. Weisskopf. 1990. After the Waste Land: A Democratic Economics for the Year 2000. Armonk, N.Y.: M.E. Sharpe, Inc

Braddock, J. H. 1980. The perpetuation of segregation across levels of education: a behavioral assessment of the contact-hypothesis. *Sociology of Education* 53: 178-186.

Briggs, Xavier de souza. eds 2005. *The Geography of Opportunities*. The Brookings Institution, DC: Washington.

Bromley, David G. and Joel Smith. 1973. The historical significance of annexation as asocial process. Land Economics 49 (3): 294-309.

Brown, Marilyn A. Modelling the spatial distribution of suburban crime. Economic Geography 58 (3): 247-261.

Bryan, N. S. 1993. GIS helps produce Clinton's victory. *Business Geographics* 1 (2): 28-32.

Bullard, Robert D. 1996. *Unequal Protection: Environmental Justice and Communities of Color*. San Fransisco, CA: Sierra Club Books.

Campbell, Alan K. & Seymour Sacks. 1967. *Metropolitan America: Fiscal patterns and governmental systems*. New York: The Free Press.

Carlino, Gerald. A. 1995. Do education and training lead to faster growth in cities? *Business Review (Federal Reserve Bank of Philadelphia) (*Jan/Feb*)*: 15-23.

Carlson V and N.Theodore. 1997. Employment availability for entry-level workers: An examination of the spatial mismatch hypothesis in Chicago. *Urban Geography* 18: 228–242.

Carr, Jered B. and Richard C. Feiock. 2001. State annexation "constraints" and the frequency of municipal annexation*. Political Research Quarterly* 54 (2): 459-470.

Chakravorty, Sanjoy. 2006. *Fragments of inequality: social, spatial, and evolutionary analysis of income distribution*. New York: Toutledge taylor & Francis Group.

Chakravorty, Sanjoy. 1996. A measurement of spatial disparity: the case of income inequality. *Urban Studies* 33 (9): 1671-1686.

Charles, Camille Zubrinsky. 2003. The dynamics of racial residential segregation. *Annual Review of Sociology* 29: 167-207.

Clarke, G.R. G. 1995. More Evidence on Income Distribution and Growth. *Journal of Development Economics* 47: 403-427.

Coleman, James. 1966. *Equality of Educational Opportunity*. U.S. Government Printing Office.

Connaughton, John E. and Ronald A. Madsen. 2004. Explaining per capita personal income differences between states. *The Review of Regional Studies* 34(2): 206-220.

Cooke, Thomas and Sarah Marchant. 2006. The changing intrametropolitan location of high-poverty neighborhoods in the US 1990-2000. *Urban Studies* 43 (11): 1971-1989.

Coulton, C. J., Chow J. Wang and M. Su. 1996. Geographic concentration of ffluence and poverty in 100 metropolitan areas, 1990. *Urban Affairs Review* 32 (2): 186-216.

Coutes, B.E., R.J. Johnston and P.L. Knox. 1977. *Geography and Inequality*. Walton Street, Oxford: Oxford Press University.

Cowell, Frank A. 1995. *Measuring Inequality*. New York: Prentice Hall/Harvester Wheatsheaf.

Crain, R. L. 1970. School integration and occupational achievement of Negroes. *The American Journal of Sociology* 75: 593-606.

Danielson, Michael N. and Jame-son W. Doig. 1982. *New York: The politics of urban regional development*. Berkeley: University of California Press.

Dawkins, Casey J.2007. Space and the measurement of income segregation. *Journal of Regional Science* 47 (2): 255-272.

Dawkins, Casey J. 2004. Measuring the special pattern of residential segregation. *Urban Studies* 41: 833-851.

Dawkins, M.P. 1991. Long-term effects of school desegregation on African Americans: Evidence from the national survey of black Americans. Unpublished papers.

Deininger, K., and L.Squire. 1997. Economic growth and income inequality: Reexamining the links. *Finance and Development* (March): 38-41.

Denters, Bas and Karen Mossberger. 2006. Building blocks for a methodology for comparative urban political research. *Urban Affairs Review* 41: 550-571.

Dinoupolous, Elias and Peter Thompson. 1998. Schumpeterian growth without scale effects. *Journal of Economic Growth* 3 (4): 313-335.

Downs, A. 1994. Links Between Central Cities and Suburbs, in *New Visions for Metropolitan America*, Washington, DC: The Brookings Institution, p. 45-59.

Dreier, Peter, John Mollenkoph and Todd Swanstrom. 2002. Place Matters: *Metropolitics for the Twenty-first Century*. Lawrence, Kansas: University of Press of Kansas.

Duncan, Beverly, Georges Sabagh, and Maurice D. Van Arsdol, Jr. 1962. Patterns of city growth. *The American Journal of Sociology* 67 (4): 418-429.

Duncan, G. J., R, Coe, M. Corcoran, M. Hill, S. Hoffman and J.N. Morgan. 1984. *Years of Poverty, years of plenty*. Institute for Social Research. Ann Arbor: University of Michigan.

Dunleavy, Patrick 1979. The urban basis of political alignment: social class, domestic property ownership and state intervention in consumption processes. *British Journal of Political Science* 9: 409-443.

Dusenbury, Patricia J. 1980. *Suburbs in the city: Municipal boundary changes in the southern states*. Research Triangle Park, NC: The Southern Growth Policies Board.

Dye, Thomas R. 1990. *American federalism: competition among governments*. Lexington, MA: Lexington Books.

Dye, Thomas R. 1964. Urban political integration: Conditions associated with annexation in American cities. *Midwest Journal of Political Science* 8: 430-466.

Eaton, Susan. 2001. If You Can Use Them: Flexibility Policies, Organizational Commitment, and Perceived Productivity. *John F. Kennedy School of Government, Faculty Working Papers Series*. Boston, MA: Harvard University.

Edwards, Pat K. and James Bohland. 1991. Reform and economic development: attitudinal dimensions of metropolitan consolidation. *Journal of Urban Affairs* 13: 461-478.

Engels, Friedrich. 1969. *The condition of the working class in England*. St. Albans: Panther.

Evans, Alan W. 1973. *The Economics of Residential Location*. New York: Macmillan & Co. Ltd.

Facer II, Rex L. 2006. Annexation activity and state law in the United States. *Urban Affairs Review* 41 (5): 697-709.

Farley, Reynolds and William Frey.1994. Changes in the segregation of Whites from Blacks during the 1980s: Small steps towards a more integrated society. *American Sociological Review* 59: 23-45.

Feiock, Richard C. and Jered B.Carr. 1997. A reassessment of city/county consolidation: economic development impacts. *State and Local Government Review* 29: 166-171.

Fernandez, Roberto and Celina Su. 2004. Space in the study of labor markets. *Annual Review of Sociology* 30: 545-69.

Fischer, Mary J. 2003. The relative importance of income and race in determining residential outcomes in U.S. urban areas, 1970-2000. *Urban Affairs Review* 38: 669-96.

Forstall, R. L. 1972. Changes in land areas for larger cities, 1950-1970. Pp. 84-87 in *The Municipal year Book* 1972. Washington, DC: International City Management Association.

Foster, Kathryn A. 1993. Exploring the links between political structure and metropolitan growth. *Political Geography* 12: 523-547.

Foster, Kathryn A. 1997. Regional Impulses. *Journal of Urban Affairs* 19: 375-403.

Foster, Kathryn A. 2000. Regional Capital. Chapter 5 in *Urban –Suburban Interdepences* ed. by Rosalind Greenstein and Wim Wiewel. Cambridge, Massachusetts: Lincoln Institute of Land Policy.

Frisken, Frances.1991. The contributions of metropolitan government to the success of Toronto's public transit system: an empirical dissent from the public choice paradigm. *Urban Affairs Quarterly* 27: 268-292.

Frisken, Frances. 2001. The Toronto story: Sober reflections of fifty years of experiments with regional governance. *Journal of Urban Affairs* 23: 513-541.

Frisken, Frances and Donald F.Norris. 2001. Regionalism Reconsidered. Journal of Urban Affairs 23: 467-478.

Fry, Richard. 2007. *The Changing Racial and Ethnic Composition of U.S. Public Schools*. PewReserchCenter Project. Pew Hispanic Center.

Gabriel, S and S. Rosenthal. 1996. Commutes, neighborhood effects and earnings: An analysis of racial discrimination and compensating differentials. *Journal of Urban Economics* 40: 61–83.

Galloway, Thomas D. and John Landis. 1986. How cities expand: does state law make a difference? *Growth and Change* 17: 25-45.

Galster, George 2007. Neighbourhood Social Mix as a Goal of Housing Policy: A Theoretical Analysis. *European Journal of Housing Policy*, Taylor and Francis Journals, vol. 7(1): 19-43.

Garofalo, Gasper and Michael S. Fogarty.1979. Urban income distribution and the urban hierarchy-equality hypothesis. *The Review of Economics and Statistics* (Aug.): 381-388.

Geary, R. C.1954. The contiguity ratio and statistical mapping. *The Incorporated Statistician* 5: 115-145.

Gerston, Larry and Peter Haas.1993. Political support for regional government in the 1990s: Growing in the suburbs? *Urban Affairs Quarterly* 29: 154-163.

Gieryn, Thomas F. 2000. A Space for Place in Sociology. *Annuals Review of Sociology* 26: 463-96.

Glaeser, Edward L., Hedi Kallal, Josė A. Scheinkman and Andrei Shleifer. 1992. Growth in Cities. *Journal of Political Economy* 100: 1126-52.

Glaeser, Edward L. 2000. The New Economics of Urban and Regional Growth, pp.83-98 in G. Clark, M. Feldman, M Gertler, eds. *The Oxford Handbook of Economic Geography*, Oxford: Oxford University Press.

Glaeser, Edward L., Jed Kolko, and Albert Saiz. 2001. Consumer City. *Journal of Economic Geography* 1: 27-50.

Goss, Jon. 1995. "We know who you are and we know where you live": the instrumental rationality of geodemographic systems. *Economic Geography* 71 (2): 171-198.

Gottlieb, Paul D. 2000. The Effects of poverty on metropolitan area economic performance: A policy-oriented research review, in *Urban-Suburban Interdependencies*, R. Greenstein and W.Wiewel, eds., Cambridge: The Lincoln Institute of Land Policy, p. 21-46.

Grande, D. 1992. Computer zeroes in on cities. *Marietta Times*, 15-16 August 3.

Green, K.C. 1982. Integration and educational attainment: A longitudinal study of the effects of integration on black educational attainment and occupational outcomes. Unpublished Doctoral dissertation, University of California-Los Angeles.

Grossman, Gene and Elhanan Helpman. 1991. *Innovation and growth in the global economy*. Cambridge, MA: MIT Press.

Grutter v. Bollinger. 2003. 123 S.Ct. 2325.

Gyourko, Joseph 1998. Place-Based Aid vs. People-Based Aid and the Role of an Urban Audit in a New Urban Strategy. *Cityscape*, 3(3):205-229.

Hamilton, David K. 2000. Organizing government structure and governance functions in metropolitan areas in response to growth and change: A critical review. *Journal of Urban Affairs* 22: 65-84.

Hanson Susan and Pratt Geraldine. 1995. *Gender, work, and space.* Routledge, New York

Haughwout, Andrew. 1997. Central city infrastructure investment and suburban house values. *Regional Science and Urban Economics* 27: 199-215.

Hawley, Amos H. 1950. *Human Ecology: A Theory of Community Structure*. New York: Ronald Press.

Helpman, Elhanan. 1992. Endogenous macroeconomic growth theory. *European Economic Review* 26: 237-267.

Henderson, Thomas A. and Walter A. Rosenbaum 1973. Prospects for consolidating local government: The role of elites in electoral outcomes. *American Journal of Political Science* 17: 695-719.

Hendrick, Rebecca, Yonghong Wu and Benoy Jacob. 2007. Tax competition among municipal governments: exit versus voice. *Urban Affairs Review* 43: 221-255.

Hill, Richard Child.1974. Separate and unequal: governmental inequality in the metropolis. *American Political Science Review* 68: 1557-1568.

Hill, Edward W. and John Brennan. 2005. America's Central Cities and the Location of Work. *Journal of American Planning Association* 71 (4): 411-422.

Holzer, Harry J. 1991. The spatial mismatch hypothesis: what has the evidence shown? *Urban Studies* 28 (1): 105-22.

Holzer, Harry J. and Keith R. Ihlanfeldt. 1996. Spatial factors and the employment of blacks at the firm level. *New England Economic Review* May/June: 65-82.

Iceland, John. 2004. Beyond Black and White: Metropolitan residential segregation in multiethnic America. *Social Science Research* 33: 248-71.

Ihlanfeldt, Keith R and D. L. Sjoquist. 1998. The spatial mismatch hypothesis: A review of recent studies and the implications for welfare reform. *Housing Policy Debate* 9 (4): 849-892.

Ihlanfeldt, Keith R. 1995. The importance of the central city to the regional and national economy: A review of the arguments and empirical evidence. *Cityscape* 1 (2): 125-150.

Izraeli, O. and K. Murphy. 1997. Convergence in state and real per capita income: empirical evidence. *Public Finance Review* 25: 555-577.

Jargowsky, Paul A.1996. Take the money and run: economic segregation in U.S. metropolitan areas. *American Sociological Review* 61: 948-998.

Johnson, Ron, Michael Poulsen and James Forrest. 2007. Ethnic and racial segregation in U.S. metropolitan areas, 1980-2000. *Urban Affairs Review* 42 (4): 479-504.

Jones, Charles. 1995. R&D –based models of economic growth. *Journal of Political Economy* 103 (4): 759-784.

Jones, Charles. 1999. Growth: with or without scale effects? The American Economic Review 89 (2): 139-144.

Kain, John F. 1968. Housing Segregation, Negro Employment and Metropolitan Decentralization. *Quarterly Journal of Economics*, 82(2): 175-197.

Kain, John F. 1992. The spatial mismatch hypothesis: three decades later. *Housing Policy Debate* 3 (2): 371-460.

Kain, John F. 2004. A pioneer's perspective on the spatial mismatch literature. Urban Studies 41 (1): 7-32.

Kane, Thomas J.2001. College-Going and Inequality: A literature review. Working paper. Russell Sage Foundation.

Kantor, Paul. 2006. regionalism and reform: A comparative perspective on Dutch urban politics. Urban Affairs Review 41: 800-829.

Kasarda, J. 1990. Structural Factors Affecting the Location and Timing of Urban Underclass Growth. *Urban Geography*, 11(3):234-264.

Kasada, John. 1995. Industrial restructuring and the changing location of jobs. In *State of the Union: America in the 1990s*. vol.1, *Economic Trends*, edited by Reynolds Farley. PP.215-68. New York: Russell Sage.

Kasinitz P and Rosenberg J .1996. Missing the connection: Social isolation and employment on the Brooklyn waterfront. *Social Problems* 43: 180–196

Kaufman, Ira and Leo. F. Schnore. 1975. Municipal annexation and suburbanization, 1960-1970. *Working Paper* 75-4. Madison: Center for Demography and Ecology, University of Wisconsin.

Kaufman, J.E., and J.Rosenbaum. 1992. The education and employment of low income black youth in white suburbs. *Education Evaluation and Policy Analysis* 14: 229-240.

Keating 1995. Size, efficiency and democracy: Consolidation, fragmentation and public choice. In *Theories of Urban Politics*. London: Sage, 117-134.

Keiser, Richard A. 1997. *Subordination or empowerment? African American leadership and the struggle for urban political power*. New York: Oxford Univ. Press.

Kelleher**,** Christine A., and David Lowery**.** 2004. "Political Participation and Metropolitan Institutional Contexts. *Urban Affairs Review* 39 (6): 720-757.

Kenworthy, Lane.2004. *Egalitarian Capitalism: Jobs, Incomes, and Growth in Affluent Countries*. New York: Russell Sage Foundation.

Kenyon, Daplme A. & John Kincaid. 1991. Introduction. In *Competition Among States and Local Governments* pp.1-33. Washington, DC: Urban Institute Press.

Kirschenman J and Neckerman. K. 1991. We'd love to hire them, but *: : :* The meaning of race for employers. In: Jencks C, Peterson P (eds) *The Urban Underclass***.** Brookings Institution, Washington, pp. 203–232

Klaff, Vivian Z. and Glenn V. Fuguitt. 1978. Annexation as a factor in the growth of U.S. cities, 1950-1960 and 1960-1970. *Demography* 15 (1): 1-12.

Klinenberg, Eric. 2002. *Heat Wave: A Social Autopsy of Disaster in Chicago*. Chicago, IL: University of Chicago Press.

Kortum, Samuel. 1997. Research, Patenting, and Technological Change. *Econometrica* 65 (6): 1389-1419.

Krugman, Paul. 1991a. Increasing Returns and Economic Geography. *Journal of Political Eoconomy* 99: 483-499.

Krugman, Paul. 1991b. *Geography and Trade*, MIT Press.

Kuznets, Simon.1955. Economic Growth and Income Inequality. *The American Economic Review* 1: 1-28

Ladd, H. and J.Yinger. 1989. *America's Allying cities: Fiscal Health and the Design of Urban Policy*. Updated ed. Baltimore, MD: Johns Hopkins University Press.

Ledebur, Larry C. and William R.Barnes.1992. *City Distress, Metropolitan Disparities, and Economic Growth*, 5-8. Washington, DC: National League of Cities.

Lee, Chungmei. 2004. *Racial Segregation and Educational Outcomes in Metropolitan Boston*. Cambridge: The Civil Rights Project at Harvard University.

Lenski, Gerhard E. 1966. *Power and Privilege: A Theory of Social Stratification*. New York: McGraw-Hill Inc.

Lewis, Paul G. 1996. *Shaping suburbia: How political institutions organize urban development*. Pittsburgh: University of California Press.

Liner, Gaines H. and Rob Roy Mcgregor. 1996. Institutions and the market for annexation land. *Growth and Change* 27: 55-74.

Liner, Gaines H. 1993. Institutional constraints and annexation activity in the U.S. in the 1970s. *Urban Studies* 30 (8): 1371-1380.

Liner, Gaines H. 1990. Annexation rates and institutional constraints. *Growth and Change* 21: 80-94.

Logan & Molotch 1987. Urban Fortune: The political economy of place. Berkeley: University of California Press.

Long, Norton.1972. *The Unwalled City*. New York: Basic Books.

Lubell, Mark, Richard C. Feiock and Edgar Ramirez. 2005. Political institutions and conservation by local governments. *Urban Affairs Review* 40: 706-729.

Lucas, Robert E. 1988. On the mechanics of economic development. *Journal of Monetary Economics* 22 (1): 3-42.

MacManus, Susan A. and Robert D. Thomas. 1979. Expanding the tax base: Does annexation make a difference? *The Urban Interest* 1 (2): 15-28.

Madden, Janice Fanning. 2003. The changing spatial concentration of income and poverty among suburbs of large US metropolitan areas. *Urban Studies* 40 (3): 481-503.

Mankiw,Gregory, David Romer and David Weil. 1992. A contribution to the empirics of economic growth. Quarterly Journal of Economics 106: 407-437.

Massey, Douglas S. and Nancy A. Denton.1988. The dimensions of residential segregation. *Social Forces* 67: 281-315.

Massey, Douglas and Nancy A. Denton. 1993. *American Aparteid: Segregation and the making of the underclass*. Cambridge, MA: Harvard University Press.

Massey, Douglas S. 1996. The age of extremes: concentrated affluence and poverty in the twenty-first century. *Demography* 33 (4) : 395-412.

Massey, Douglas S. and Mary J. Fischer. 2006. The geography of inequality in the United States, 1950-2000. *Brookings-Wharton Papers on Urban Affairs*

Mayer, C. 1996. Does location matter? *New England Economic Review* May/June: 26–40.

Mayer, Susan. 2001. How growth in income inequality increased economic segregation. *Working Paper 230*. Chicago: Joint Center for Poverty Research.

McCall, Leslie. 2001. *Complex Inequality: Gender, Class and Race in the New Economy*. New York: Routledge.

McCarville, Sean. 2004. Metropolitan fragmentation and economic competitiveness: exploring the relationship. *Working Paper Series* #1, Center of Economic Development.

McKenzie, Robert. 1933. *The Metropolitan Community*. New York: McGraw-Hill Book Company.

Mills, Edwin. 1990. Do metropolitan areas mean anything? A research note. *Journal of Regional Science* 30 (3): 415-419.

Mills, Edwin. 1992. Sectoral Clustering and Metropolitan Development, Ch.1 in *Sources of Metropolitan Growth*, Rutgers: The State University of New Jersey, pp.3-18.

Mo, P.H. 2000. Income inequity and economic growth. *Kyklos* 53: 293-316.

Monkkonen, Eric H.1988. *America Becomes Urban: the development of US cities and Towns, 1780-1980.* Berkerly, CA: University of California Press.
Moran, P.A.P.1950. Notes on continuous stochastic phenomena. *Biometrika* 37: 17-23.

Morrill, Richard L. 1991. On the measure of segregation. *Geography Research Forum* 11: 25-36.

Mumphrey, Anthony and Krishna Akundi. 1993. *City-suburb interdependencies in the urban mosaic*. New Orleans: National Center for the Revitalization of Central Cities, College of Urban and Public Affairs, University of New Orleans, working paper 11.

Nathan, Richard and Charles Adams. 1989. Four perspectives on urban hardship. *Political Science Quarterly* 104 (3): 482-508.

Nelson, Richard and Edmund Phelps. 1966. Investment in humans, technological diffusion, and economic growth. American Economic Review: Papers and Proceedings 61: 69-75.

Nelson, M. Arthur. 1990. Decentralization of the subnational public sector: an empirical analysis of the determinants of local government structure in metropolitan areas in the U.S. *Southern Economic Journal* 57: 443-457.

Nelson, Arthur and Kathryn A. Foster. 1999. Metropolitan Governance Structure and Income Growth. *Journal of Urban Affairs* 21 (3): 309-324.

Nice, David C. 1983. An intergovernmental perspective on urban fragmentation. *Social Science Quarterly* 64: 111-118.

Nielsen, Francois. 1994. Income Inequality and Industrial Development: Dualism Revisited. *American Sociological Review* 59: 654-677.

Nielsen, Francois and Arthur S. Alderson. 1997. The Kuznets Curve and the Great U-Turn: Income Inequality in U.S. Counties, 1970-1990. *American Sociological Review* 62: 12-33.

Nunn, Samuel, Drew Klacik and Carl Schoedel 1996. Strategic planning behavior and interurban competition for airport development. *Journal of the American Planning Association* 62: 427-441.

Olin, Spencer C. 1991. Intraclass confict and the politics of a fragmented region. In *Postsuburban California: The transformation of Orange County since World War II* pp.223-253. Berkeley: CA: University of California Press.

Oliver, Eric J. 2001. *Democracy in Suburbia*. Princeton, NJ: Princeton University Press.

Olson, Mancur, Jr. 1965. The Logic of Collective Action. Cambridge, Mass.: Harvard University Press.

Orfield 1997. Metropolitics: *A regional agenda for community stability*. Washington, DC: Brookings Institution.

Orfield, Gary and Chungmei Lee. 2005. *Why Segregation Matters: Poverty and Educational Inequality*. Civil Rights Project. Harvard University.

O'Regan, Katherine M. 1993. The Effect of Social Networks and Concentrated Poverty on Black and Hispanic Youth Unemployment," *Annals of Regional Science*, 27, 1993: 327-342.

O'Sullivan, Arthur. 1993. *Urban Economics*. Homewood II: Irwin.

Pack, Janet Rothenberg. 1998. Poverty and urban public expenditures. *Urban Studies* 35 (11): 1995-2019.

Paddison, Ronan.1983. *The fragmented state: The political geography of power*. New York: St. Martin's Press.

Palmer, Jamie L. and Greg Lindsey. 2001. Classifying state approaches to annexation. *State and Local Government Review* 33 (1): 60-73.

Parks, Roger B. and Ronald Oakerson. 1989. Metropolitan organization and governance: A local public economy approach. *Urban Affairs Quarterly* 25: 18-29.

Pastor, Dreier, Grigsby & Lopez-Garciz 1997. *Growing Together: Linking regional and community development in a changing economy*. Los Angeles: Occidental College, International & Public Affairs Center.

Peirce, Neal, Curtis W. Johnson and John Stuart Hall. 1993. Citistates: *How urban America can prosper in a competitive world*. Washington, DC: Seven Locks Press.

Peretto, Pietro. 1998. Technological change and population growth. Journal of Economic Growth 3 (4): 283-311.

Perotti, Roberto. 1996. Income distribution, democracy and growth. What the data say. *Journal of Economic Growth* 1 (2): 149-187.

Persson, T and Tabbelini, G. 1994. Is Inequality Harmful for Growth. *American Economic Review* 84, 600-621.

Powell, John a. 2000. How sprawl makes us poor. *The Albuquerque Tribune*. http://www1.umn.edu/irp/announce/

Preston, Valerie and Sara Mclafferty. 1999. Spatial mismatch research in the 1990s: progress and potential. *Papers in Regional Science* 78: 387-402.

Rauch, J.E. 1993. Productivity gains from geographic concentration of human capital: evidence from the cities. *Journal of Urban Economics* 34: 380-400.

Rauch, James E. 1991. Productivity gains from geographic concentration of human capital: evidence from the cities. National Bureau of Economic Research *Working Papers* 3905.

Reardon, Sean F. and David O'Sullivan's 2004. Measures of spatial segregation. *Sociological Methodology* 34: 121-62.

Reardon, Sean F. and Glenn Firebaugh 2002. Measuring segregation: Measures of multi-group segregation. *Sociological Methodology* 32: 33-68.

Reynolds, Laurie. 1992. Rethinking municipal annexation powers. *The Urban Lawyer* 24 (2): 247-303.

Ribeiro, Maria-Joao. 2000. A nonscale growth model with R & D and human capital accumulation. *Warwick Economic Research Papers,* No.574.

Romer, Paul M. 1990a. Endogenous Technical Change. *Journal of Political Economy* 98 (5): S71-S102.

Romer, Paul. 1990. Human capital and growth; theory an evidence. Carnegie Rochester Conference Series on Public Policy 32: 251-285.

Romer, Paul M. 1990b. Capital, Labor and Productivity. In M.N. Baily & C. Winston (Eds.), *Brookings Papers in Economic Activities: Microeconomics* (pp.317-367). Washington, DC.

Romer, Paul M. 1986. Increasing Returns and Long Run Growth. *Journal of Political Economy* 94: 1002-1036.

Rothstein, R. 2004. *Class and schools: Using social, economic, and educational reform to achieve the black-white gap*. Washington, DC: Economic Policy Institute.

Rusk, David. 1993. *Cities Without Suburbs*. Washington, DC: Woodrow Wilson Center Special Studies.

Rusk, David. 1995. *Cities Without Suburbs(2nd)*. Washington, DC: Woodrow Wilson Center Special Studies.

Sassen, Saska. 1991. The Global City. Princeton, NJ: Princeton University Press.

Savitch, H.V., D. Sanders, and D.Collins. 1992. The regional city and public partnership. In *The National Interest: The 1990 Urban Summit with Related Analysis, Transcripts, and Papers*, R. Berkman, J.Brown, B.Goldberg, and T.Mijanovitch, eds. New York: the Twentieth Century Fund.

Savitch, H.V., D.Sanders, and J.Markham. 1993. Ties that bind: Central cities, suburbs, and the new metropolitan region. *Economic Development Quarterly* 7 (4): 341-357.

Savitch, H.V. and Ronald Vogel. 2004. Suburbs without a city: power and city-county consolidation. Urban Affairs Review 39: 758-790.

Schattsneider, E.E. 1960. *The Semisovereign People*. New York: Holt, Rinehart and Winston.

Schneider, Mark. 1989. *The competitive city: the political economy of suburbia*. Pittsburgh: University of Pittsburgh Press.

Schumpeter, J.A. 1939. *Business Cycles, Vol. 1* New York McGraw-Hill.

Segerstrom, Paul, S. 1998. Endogenous growth without scale effects. *The American Economic Review* 88 (5): 1290-1310.

Sengstock, Frank S. 1960. *Annexation: A solution to the metropolitan area problem*. Ann Arbor: University of Michigan.

Shorrocks, Anthony and Guanghua Wan. 2005. Spatial decomposition of inequality. *Journal of Economic Geography* 5: 59-81.

Skinner, Curtis. 2004. The changing occupational structure of large metropolitan areas: implications for the high school educated. *Journal of Urban Affairs* 26 (1): 67-88.

Sowell, T. 2000. Census facts shatter leftists Beliefs. *Human Events* 56 (48): 18-19.

Squires, Gregory D. and Charis E. Kubrin. 2005. Privileged Places: Race, uneven development and the geography of opportunity in urban America. *Urban Studies* 42 (1): 47-68.

Stegman, Michael A. 1997. The rationale for a national urban policy. Papers in Regional Science. *The Journal of the RSAI* 76 (1): i-vi.

Stephens, Ross G. and Nelson Wikstrom 2000. *Metropolitan government and governance: theoretical perspectives, empirical analysis, and the future.* New York & Oxford: Oxford University Press.

Stone, Clarence N. 2005. Looking back to look forward: reflections on urban regime analysis. *Urban Affairs Review* 40: 309-341.

Swanstrom, Todd. 2006. Regionalism, equality, and democracy. Urban Affairs Review 42: 249-257.

Swanstrom,Todd, Peter Dreier and John Mollenkopf. 2002. Economic inequality and public policy: the power of place. *City and Community* 1 (4): 349-372.

Teaford, Jon C. 1979. *City and Suburb: the political fragmentation of metropolitan America, 1850-1970.* Baltimore: johns Hopkins University Press.

Theil, Henri.1972. *Statistical Decomposition Analysis*. Amsterdam: North Holland Publishing Co.

Theil, Henri.1967. *Economics and Information Theory*. Amsterdam: North Holland Publishing Co.

Thomas, Robert D. 1984. Metropolitan structural development: the territorial imperative. *Publius* 14 (2): 83-115.

Thorns, David. 1981. The implications of differential rates of capital gain from owner-occupation for the formation and development of housing classes. International *Journal of Urban and Regional Research* 5: 205 - 217.

Tiebout, Charles M. 1956. A pure theory of local expenditures. *Journal of Political Economy* 64: 416-424.

Teitz, M and K. Chapple. 1998. The Causes of Inner-City Poverty: Eight Hypotheses in Search of Reality. *Citiscape* 3(3): 33-70.

U.S. Census Bureau: www.census.gov

U.S. Department of Education 2004

U.S. Department of Housing and Urban Development 2000
U.S. Department of Justice. 2001. *Criminal Victimization 2000: Changes 1999-2000 with Trends 1993-2000*. Washington, DC: US Department of Justice.

Van Dyne, L. 1997. Job Wars. *Washingtonian* 88-91: 138.

Vicino, Thomas. 2008. The quest to confront suburban decline: political realities and lessons. *Urban Affairs Review* 43: 553-581.

Voith, Richard P. 1992. "City and Suburban Growth: Substitutes or Complements?" *Business Review*, (September/October), pp. 21–33. Federal Reserve Bank of Philadelphia.

Voith, Richard P. 1996. The suburban housing market: The effects of city and suburban job growth. *Business Review* (Nov./Dec.): 13-25. Federal Reserve Bank of Philadelphia.

Voith, Richard P. 1998. Do suburbs need cities? *Journal of Regional Science* 38 (3): 445-464.

Voith, Richard. 2000. The determinants of metropolitan development patterns. Chapter 4 in *Urban –Suburban Interdepences* ed. by Rosalind Greenstein and Wim Wiewel. Cambridge, Massachusetts: Lincoln Institute of Land Policy.

Ward, R.C.1987. The impact of metropolitan fragmentation on economic development. *Urban Resources* 4: SL1-SL4.

Warren, Robert O. 1966. *Government in Metropolitan regions: A reappraisal of fractionated political organization*. Davis, CA: Institute of Government Affairs, University of California.

Watson, Tara. 2006. Metropolitan growth, inequality, and neighborhood segregation by income. *Brookings-Wharton Papers on Urban Affairs*.

Weiss Michael J. 1988. *The Clustering of America*. New York: Harper & Row Publishers

Weiher, Gregory R. 1991. *The fragmented metropolis: political fragmentation and metropolitan segregation.* Albany, NY: State University of New York Press.
Weiss Michael J. 1988. *The Clustering of America*. New York: Harper & Row Publishers

Wells, Amy Stuart and Robert L. Crain. 1994. Perpetuation theory and the long-term effects of school desegregation. *Review of Educational Research* 64 (4): 531-555.

Wheeler, Raymond H. 1965. Annexation Law and Annexation Success. *Land Economics* 41 (4): 354-360.

White, Michael J. 1983. The measurement of spatial segregation. *American Journal of Sociology* 88: 1008-1018.

Williamson, Oliver. 1981. The Economics of Organization: The Transaction Costs Approach. *American Sociological Review* 87: 548-577.

Wilson, W.J. 1987. *The truly Disadvantaged: The Inner City, the Underclass, and Public Policy*. Chicago: University of Chicago Press.

Wingo, Lowdon. 1972. Introduction: Logic and ideology in metropolitan reform. *Reform of metropolitan governments* pp.1-6. Washington, DC: Resources for the Future.

Wyly, E., N. Glickman and M. Lahr. 1998. A Top 10 List of Things to Know About American Cities. *Cityscape* 3(3): 7-32.

Young, Alwyn. 1998. Growth without scale effects. *Journal of Political Economy* 106 (1): 41-63.