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An Empirical Analysis of the Role of Unionization in Variations in Income Inequality Across Selected U.S. Metropolitan Areas in 1990, 2000 and 2010

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An Empirical Analysis of the Role of Unionization in Variations in Income Inequality
Across Selected U.S. Metropolitan Areas in 1990, 2000 and 2010

Qinglin Hu, PhD

University of Connecticut, [2017]

We model the association between the institutional factor of union contract coverage rates among workers and the geographical variation in income inequality, measured as the Gini coefficient of household income, across a set of sixty-four metropolitan areas of the United States for the years 1990, 2000, and 2010. We use social variables of race and gender and market variables of relative skills and relative education as controls in our model. We also specify a model that substitutes right-to-work status for union contract coverage rates. Our primary finding is that, controlling for the social and market variables, union contract coverage rates are temporally consistent and significant negative covariates of income inequality across the metropolitan areas. Further, we find metropolitan areas in right-to-work states have consistently and significantly higher levels of inequality than expected given the control variable effects. Secondly our models indicate that relative skill levels and relative education levels are significant covariates of income inequality in the metropolitan areas, but that our measures of race and gender are not. Our interpretation of these findings is that issues of class play an important role in effecting income inequality in the set of metropolitan areas used in the analysis.

An Empirical Analysis of the Role of Unionization in Variations in Income Inequality
Across Selected U.S. Metropolitan Areas in 1990, 2000 and 2010

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B.A., Capital University of Economics and Business, [2008]

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A Dissertation

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at the

University of Connecticut

[2017]

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Qinglin Hu

[2017]

APPROVAL PAGE

Doctor of Philosophy Dissertation

An Empirical Analysis of the Role of Unionization in Variations in Income Inequality
Across Selected U.S. Metropolitan Areas in 1990, 2000 and 2010

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[2017]

TO

MY PARENTS,

AND MY WIFE

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Chapter I

Introduction

1.1 The Emergence of Income Inequality in Current Society

Everything has its two sides, good or bad. Economic activities are not excluded. With the development of human society and the progress of economies, people became addicted to making more money and getting wealthier. The rapid accumulation of wealth enables us to pursue ambitious goals with much confidence and by any means. Money is the engine that, propels society and economy forward. In the meanwhile, however, a far-reaching and controversial by-product is born – inequality. People who are capable and powerful possess different kinds of resources that help them open the gates of fortune and fantasy, but the whole process is built on the exploitation and oppression of working people. The rich are getting richer while the poor become worse off (Figure 1.1).

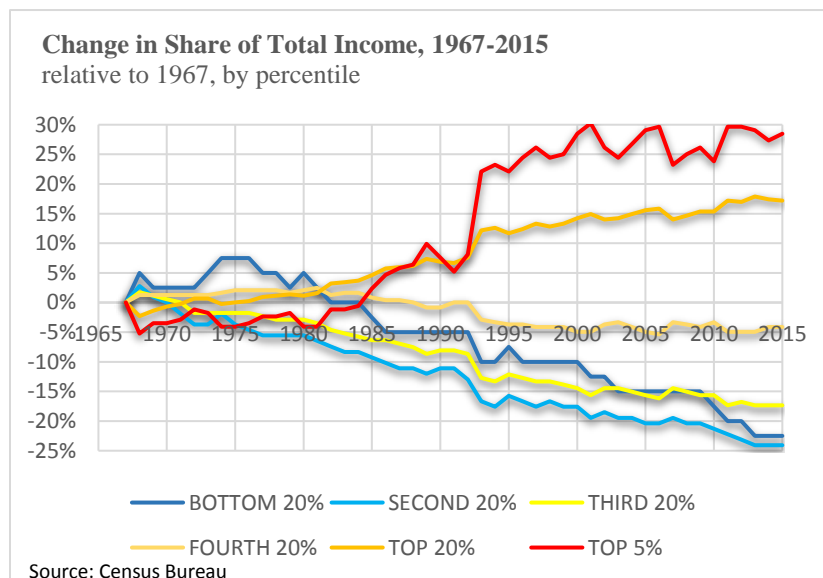


Figure 1.1. Change in Share of Total Income, 1967-2015

(<http://www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-households.html>)

Along with the gap widening between rich and poor, from ancient time till today, countless wars, revolutions and turbulence happened in all historical stages around the world. Inequality, as a root, matters. Income inequality is detrimental to the growth of society in many cases (Dieckmann, 1996). In the past few decades, there has been a fierce debate about the potential impact of income inequality on economic growth that has drawn a great interest among economists. The major question is “Does income inequality matter for growth and sustainability of society”? Voices from various empirical or theoretical perspectives provide diversified answers on this topic. The majority holds a view that there is a negative relationship between income inequality and economic growth (Perotti, 1993, Alesina and Rodrik, 1994; Takahashi, 2005; Murphy et al, 1989; Perotti, 1996; Alesina and Perotti, 1996; Sukiassyan, 2007; Dieckmann, 1996; Acemoglu, 1997; Mo, 2000; Persson and Tabellini, 1994; Panizza, 2002; Iceland, 2003; Helpman, 2004; Ezcurra, 2007; Qin et al, 2009) while others hold the relationship is not so straightforward (Kuznets, 1955; Chen, 2003; Amos, 1988; Barro, 2000; Banerjee and Duflo, 2003; Weil, 2005; Shin et al, 2009).

Step into the new era. In 2013, President Obama pointed out that growing income inequality is “the defining challenge of our time”. At mostly the same time, on another continent, Pope Francis spoke out against widening income inequality. Rising income inequality has become the most potentially disruptive social issue and concern in global societies and economies.

Nowadays, both developed markets and developing markets are trapped in a dilemma that income inequality brought about. A recent report conducted by OECD countries shows that the Gini coefficient (a measure of income inequality that ranges from 0, indicating no inequality to 1.0, indicating maximum inequality) has increased in 16 out of the 21 OECD countries from 1980 to 2012. In the past 30 years, the gap between rich and poor hit a peak whereas the richest

10% of the population earn 9.5 times more than the bottom 10% (in the 1980s it was 7 times more).

This fact is also true for most developing countries and regions that are experiencing the pains and suffering caused by income inequality, such as China, Brazil, Mexico, India, Middle East and Africa, etc. (Lu and Gao, 2011; Delbianco et al, 2014; Stewart and Moslares, 2012; Jihene and Ghazi, 2013). Undoubtedly, income inequality has becoming the toughest global issue at our hands that need to be solved in an efficient and proper way.

A recent report from OECD showed that, compare to other developed countries, by 2014, the United States has the highest levels of income inequality, which associated with less social mobility, means lower equality of opportunities (Table 1.1).

Table 1.1 Gini Index in OECD Countries, 2001-2014														
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<i>Canada</i>	0.317	0.318	0.316	0.322	0.317	0.317	0.318	0.321	0.320	0.319	0.316	0.321	0.322	-
<i>Finland</i>	0.262	0.258	0.261	0.266	0.265	0.268	0.269	0.264	0.259	0.264	0.264	0.260	0.262	0.257
<i>France</i>	0.287	0.284	0.282	0.283	0.288	0.293	0.292	0.293	0.293	0.303	0.309	0.308	0.294	-
<i>Germany</i>	0.270	0.280	0.282	0.285	0.297	0.290	0.295	0.287	0.288	0.286	0.293	0.289	0.292	-
<i>United Kingdom</i>	0.340	0.335	0.335	0.331	0.335	0.339	0.341	0.342	0.345	0.341	0.354	0.351	0.358	-
<i>United States</i>	0.360	0.376	0.374	0.360	0.380	0.384	0.376	0.378	0.379	0.380	0.389	0.389	0.396	0.394

Source: OECD.Stat

In the past few decades, addressing the rising gap between rich and poor has gained the central space not only in academic fields but in policy debates all over the world. Americans, however, do not generally realize the extent of inequality they are facing (Table 1.2 & Figure 1.2).

Everyone knows the U.S. is the richest country in the world, but its wealth is not realized by the poorest 10 percent of Americans. In 2011, 5000 surveyed Americans believed that the richest 20% own 59% of the wealth and the bottom 40% own 9%. However, the reality is different. The top 20% of US household own more than 84% while the bottom 40% only shares 0.3% of the

wealth. According to the 2011 U.S. Census, nearly half million of the population lives below poverty line at the same time, the number had increased gradually.

Table 1.2 GDP Growth vs. Gini Index in US, 1981-2014

<i>Year</i>	<i>GDP Growth</i>	<i>Gini</i>	<i>Year</i>	<i>GDP Growth</i>	<i>Gini</i>
1981	0.122	0.315	1998	0.056	0.357
1982	0.042	0.328	1999	0.063	0.354
1983	0.088	0.336	2000	0.065	0.357
1984	0.111	0.337	2001	0.033	0.360
1985	0.076	0.340	2002	0.033	0.376
1986	0.056	0.339	2003	0.049	0.374
1987	0.061	0.340	2004	0.066	0.360
1988	0.079	0.344	2005	0.067	0.380
1989	0.077	0.348	2006	0.058	0.384
1990	0.057	0.349	2007	0.045	0.376
1991	0.033	0.346	2008	0.017	0.378
1992	0.059	0.352	2009	0.020	0.379
1993	0.052	0.369	2010	0.038	0.380
1994	0.063	0.366	2011	0.037	0.389
1995	0.049	0.361	2012	0.041	0.389
1996	0.057	0.363	2013	0.031	0.396
1997	0.063	0.364	2014	0.041	0.394

Source: U.S. Census

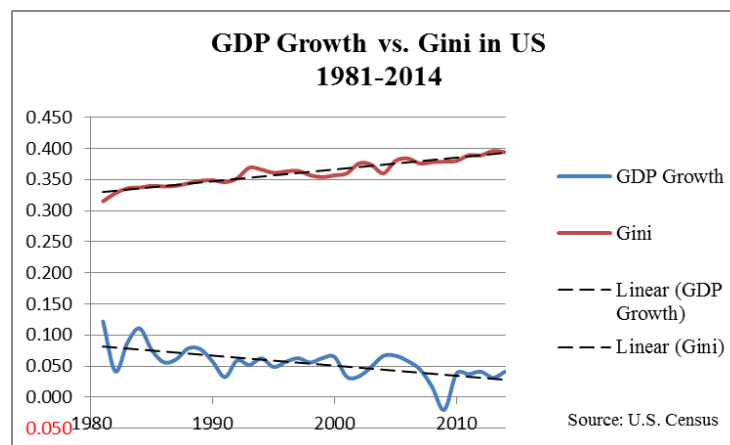


Figure 1.2. GDP Growth vs. Gini in US

This huge disparity has drawn tremendous attention from scholars and policymakers because income inequality is acting as an inevitable force on social activities and economies. Studies on this topic are commonly divided into 3 categories. Some papers focus on the effects of income inequality on social welfare and economic growth, others investigate the major causes of income inequality, while the rest are interested in finding the direct or indirect associations between income inequality and various social characteristics, such as unemployment, mortality, suicide rates and happiness.

Based on the previous studies, this dissertation aims to contribute to the second and third categories of research. It does so by providing a review of the literature on income inequality at the metropolitan level; by providing an overview of the trends in income inequality in 64 selected metropolitan areas from both spatial and temporal perspectives; and by examining the relationship between income inequality and union coverage in the labor force and other social-economic factors to see whether each has a significant association with income inequality at the metropolitan scale.

1.2 Brief History of Income Inequality in the U.S.

The Gilded Age

Recognition of income inequality in the U.S. initially occurred during “the Gilded Age” (Mark Twain, 1873), roughly from the middle of the 19th century to around the mid-1890s. During this period, economic growth of U.S. increased dramatically, especially in Northeast and the West Coast. Millions of immigrants flowed into the US from other continents, due to its higher wages.

Immigration brought not only large amount of skilled laborers, but also capital, equipment, and technologies.

The real wage went up about 60% across the whole work force due to the large and rapid expansion of industrialization (Tregarthen and Rittenberg, 1999). However, the economic framework and conditions at that time determined that only a few monopolists could control the destinies of the whole industries, such as oil, railroad, steel and coal mining. The richest 1% families, such as the Rockefellers, Vanderbilt and Carnegies, owned roughly 51% of the national wealth, but the majority of the population were still living in poverty (Steve, 2015). Labor unions, which are recognized as representatives of workers focusing on collective bargaining, disputes with management, lobbying activities and elections at both state and national level, began forming and became important in the industrial urban areas. Two major national unions emerged during that time, one was The Knights of Labor, the largest and one of the most important American labor organizations in the late 19 century. Another was The American Federation of Labor, the famous organization that helped coordinate and support strikes.

Great Compression (1930s-World War II)

According to economists Thomas Piketty and Emmanuel Saez's analysis, "The Great Depression", which took place during the 1930s, contributed an extraordinary impact in income inequality in that the gap between the rich and poor fell dramatically from its preceding time periods (Piketty and Saez, 2003). That was the most severe worldwide economic depression of the 20th century (Duhigg, 2008). Although it originated in the United State, almost all countries suffered a tremendous economic loss. The worldwide GDP dropped by roughly 15% during that

time, comparing to less than 1% during the Great Recession in 2008 (Lowenstein, 2015). Serious and effective actions were executed by the governments and institutional organizations aiming to alleviate the negative effects of the Great Depression on income inequality, including the progressive New Deal taxation, the upsurge of labor unions, and, eventually, war production (Krugman, 2007). These factors, among others, generated a considerable U.S. middle class with relatively low level of inequality who survived for about three decades (Gilbert, 2002; Bartles, 2004; Johnston, 2005). Scholars named the period “The Great Compression”, after Claudia Goldin and Robert Margo’s work (1992) examining the wage structure in the United States at mid-century. The postwar prosperity eased the extent of inequality in the postwar era (Krugman, 2007). The relatively high wages were protected by government policies as well as lack of foreign competition facing workers, domestic industrial competition, and the strengthening of unions (Krugman, 2007). Unions not only raised the average wages for their membership, but also influenced the non-union workers in similar occupations greatly.

Post-1970 Era

The post-war boom ended by the 1970s. The collapse of the Bretton Woods System, the 1973 oil crisis, and the rise of globalization and neoliberalism seriously hindered the growth path of the US economy. Thousands of factories closed down coinciding with a rise in the relative size of the service sector (Bjork, 1999). With the income level rising more sharply at the top than in the middle and bottom, income disparities began to widen. Data from a variety of sources contribute to the broad picture of the divergence in income that has emerged since that time. Paul Krugman named this period as “The Great Divergence”. The US economy was in a state of stagflation. Productivity stayed very low while interest rates remained high and unemployment rose at a fast

speed. By 2007, the labor market in the U.S. had undergone a series of structural changes that led to the explosion of the incomes of the rich and the erosion of middle class jobs for the rest. (Lazonick, 2015). As a Congressional Budget Office report indicated in 2011, from 1979 to 2007, the after-tax income owned by the top 1% households grew by 275% while the bottom 20% grew only by 18% (CBO, 2011). By 2006, the United State ranked at the highest level of income inequality among the developed countries.

Great Recession 2007-2009

The debates about the role of income inequality in causing the mortgage crisis and the arguments on its subsequent trends have never ended among economists and politicians, even though nearly a decade has passed. Before the Great Recession, income inequality had risen rapidly for three decades. During the administration of President Clinton, middle class incomes grew at a steady pace. However, the trend reversed course when President Bush came to the stage. The share of middle-class income declined by an extremely high proportion while the wealthiest ones still benefited from the capital gains. Stagnant incomes increased the demand for credit which meant a strong impetus for an unsustainable credit bubble. The false prosperity eventually came to an end in late 2007 (Maloney and Schumer, 2010).

The results of the Great Recession were not what most people expected. It has not had a compressive effect on income inequality like the Great Depression brought about. According to the US census report (2007, 2011), the median household income had stagnated for 5 years, from \$50,740 in 2007 to \$50,502 in 2011. During the Great Recession, the richest people lost the most wealth in an absolute term, but the middle class lost more in proportional terms. For example, after a basket of economic recovery policies, by 2011, the top 1% lost 37% of their income

whereas 62% was lost by the middle class. The wealthiest lost income, but the middle class lost both income and housing value (Smeeding, 2012).

Post-Crisis Era – A Widening Gap

It's been several years since the financial crisis. Today, the US economy has largely recovered and the major stock indexes indicate there is a strong rebound in economic growth. Further, by 2015, the unemployment rate dropped to 6.3% compared to 9.9% in 2009 (Figure 1.3). However, the inflation-adjusted wages has stagnated for the vast majority of workers (BLS, 2014)¹. This disparate recovery, to some extent, is further exacerbating income inequality. Piketty and Saez (2015) show that between 2009 and 2012, the top 1% households captured nearly 95% of total income gains while the bottom 90% household lost around 16% of their income. In other words, the majority of households have been left behind. Economists argue that Obama's recovery policies rescued the life of the rich at the expense of the life of millions of workers (Saez 2009). Large increases in investment income (capital gains, dividends and business income) have accrued to the very top class, as the income (wages and salaries) has stagnated for the majority of workers. The upward trend in inequality will remain for the foreseeable future, unless altered by public policy.

¹ Please see Appendix: Median Weekly Earnings, 2004-2014.

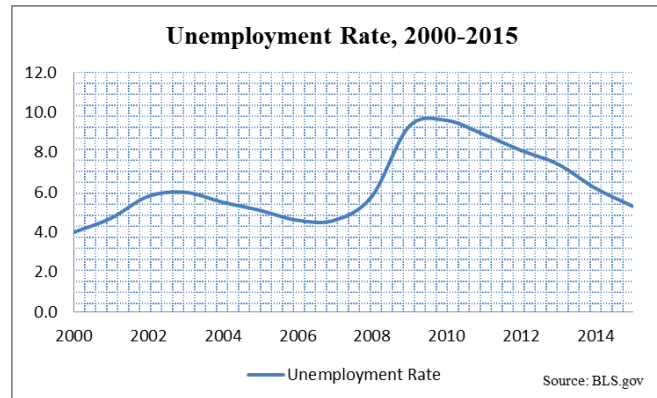


Figure 1.3. Unemployment Rate

The Current Status and Future of Inequality in the U.S.

In the 1970s America had one of the most unequal income distributions in the world. In the following decades, it has become even worse, and the growth rate of income inequality has risen more rapidly than in other developed nations. The Census data (Figure 1.1) show that income inequality for all income distribution groups has been increasing across the entire 1980s, 1990s and 2000s.

Different views on the cause of income inequality since the 1970s have been discussed in recent decades, including: weak unions, the emergence of globalization, increasingly higher educational attainment, competitions among the major domestic industries, skill-based technological innovation, a shift in firm structure, redefinition in the incentive mechanism, rise in low-skilled immigration, stagnant real wages, deregulation, and reductions in taxation for the rich. Some of the factors will be examined and addressed in my dissertation in investigating metropolitan income inequality.

It's a little bit frustrating for the majority of Americans who want to understand what made inequality happen. It matters not only to their life, but also to their children's. Based on past

studies, there is no clear causation between income inequality and social economic factors.

Different studies hold different views and present different results. However, one thing is clear from historical data, that income inequality follows upward trend since the 1970s and it looks likely to be continued, unless shocks or changes in economic or political policy reverse it.

The United States is not the only country facing this severe issue in the world, but it's the country that has suffered the most in the recent past. America used to be the country with famous egalitarianism, but now more people are missing out on the pursuit of the "American Dream", especially for the middle class. The conflict between increasingly inequality and lack of opportunities could bother most of us in the future.

1.3 Statement of Problem and Structure of the Dissertation

There is remarkable degree of income disparity in the American economy. Debates over this issue got heated during the past few years. It received highly focused attention not only from scholars, but in the recent presidential election campaign. This dissertation tries to make a contribution to the analysis of income inequality of the United States, focusing particularly on selected metropolitan areas during the past three decades.

In Chapter Two, I will introduce an extensive background of the income inequality in US, along with the causing factors and the associations between them based on the previous studies.

Among those factors, unionization will be paid special attention. In Chapter Three, I discuss the data and methods that I used in order to address my research questions. My data are mainly from US Census Decennial data and union statistics from the Union Stats from 1980 to 2010. A brief statistical summary and spatial-temporal map analysis and rank comparison will be provided to

draw a picture of the progress of income inequality in Metropolitan area in 1990, 2000, and 2010. In Chapter Four, three hypotheses will be examined using regression models. Initially I use bivariate models regressing inequality on population and on income. Then I use more extensive models that regress income inequality on union coverage and selected control variables. In Chapter Five, I conclude the dissertation with a summary of the results and discussion of the implications of this study for future research and public policy.

Chapter II

Background to the Analysis

2.1 Kuznets Curve

One of the remarkable discoveries about the long-run processes of economic development is the Kuznets curve - an inverted U-shaped relation between income inequality and economic growth. After collecting the statistical indicators of economic performance from 14 countries for 60 years, the American economist, recipient of Nobel Memorial Prize in Economic Sciences, Simon Kuznets found an empirical regularity in economic growth. In undeveloped countries, economic growth increased the income inequality between poor and rich while in developed countries it narrowed the gap. This pattern is that as countries experienced economic growth, income inequality first increases and then decreases, with different countries at different positions. The mechanism behind this pattern is that, along with social progress, countries are forced to shift their economic pattern from labor-intensive to capital-intensive in order to stimulate economic growth. In other words, they switch from agriculture to industrial sectors. Due to the nature of agriculture, there is no significant variation of income between farmers. However, it is not true for the industrial era, different workers with different skills in different industries got different pay. Industrialization led to a huge disparity in income. As the economy keeps moving, people with higher educational degrees and professional qualifications have more opportunities to raise their income and, improve their social status which, in turn, impacts the governmental policies in narrowing the gaps between rich and poor.

The Kuznets curve has been intensively investigated with mixed evidence by using cross-country and time-series data since its first presence in 1955. Researchers have different explanations of the relation between income inequality and economic growth, (Lindert, 1986; Williamson, 1985; Anand and Kanbur, 1993; Acemoglu and Robinson, 2002; Feinstein, 1988; Fields, 1995; Deining and Squire, 1998; Schultz, 1998; Morrisson, 1999; Fields and Jakubson, 1993). Based on the previous historical investigations of different countries, most of them support Kuznets's assumption, with evidence from England, France, Sweden and Germany in Europe as well as China in Asia and Brazil in South America. However, the findings are not uniform; data from Norway, Netherlands, South Korea, Japan and Taiwan follow a monotonically falling pattern in income inequality.

The U.S. is very unusual relative to the other cases discussed here. The initial stage, the colonial era, was much closer to the nineteenth century European countries with relative egalitarianism and stable wealth distribution (Williamson and Lindert, 1980). The inequality was low and the economic growth was fast. When the industrialization began in Europe, more laborers moved to urban areas from the agriculture sector and worked in factories, which resulted in an increase in economic inequality. The mobilizing trend, to a large extent, undermined the foundation of political regimes, brought about social unrest and threatened revolution. In order to eliminate the conflicts between the social elites and public, the government was forced to make reforms such as income redistribution and political change. However, America never experienced such suffering. It is more typical of frontier nations rather than of long-settled nations in Europe due to its unique political regime. After a long period of steeply rising wealth concentration among a few monopolists before the twentieth century, democratization was just around the corner

without much social unrest and inequality dropped sharply in 1930s. (Williamson and Lindert, 1980)

The general pattern of the Kuznets curve incorporates three stages: low growth and low income inequality mark rural economies; intermediate growth and high inequality mark the rural-to-urban transition; and high growth and low inequality should mark modern urban economies (Kuznets, 1955). Unlike most long-settled European countries mentioned above, after the first two stages, the US has continuing increasing income disparity with a more modernized urban economy. This failure has drawn extensive attention from scholars and policy makers (Piketty and Saez, 2003; Song et al., 2015; Ravallion, 2015; Morrill, 2000; Rigby, Kemeny, and Cooke, 2014; Broecke, Quintini, and Vandeweyer, 2016; Murphy and Topel, 2016). Most of them have interests in solving the problem by governmental interventions of income redistribution. Others argue that the sharp reversal of the trend since 1970s is just a return to the previous inverted-U shape, and inequality will decline at some point and more workers will benefit.

2.2 Analysis of Inequality

Global and National Level

Piketty and Saez (2003) built a model for assessing the top shares of pretax income and wages in the United States during 1913 to 1998 by primarily using the annual tax returns data and large micro-files of tax returns published by the Internal Revenue Service (IRS). They argue that the fluctuations of the top wage shares seem to be accounted for only by technical change, but other factors, such as structure changes in labor market, fiscal policy or common social norms may have contributed to the determination of the wage structure that led to income inequality. They

also found interesting results by comparing the U.S. top income share series with that of France (Piketty, 2001) and of the United Kingdom (Atkinson, 2001). In all three countries, the top income share had a dramatic fall during the 1914 to 1945 period and never returned to its previous high point. The fall could be explained by World War I and the Great Depression and the impacts of progressive taxation. After World War II, there was a significant diverging trend of top income between those European nations and the United States, with a sharp rise of income inequality in U.S. versus the extremely stable situation for the others. According to the authors' analysis, these diverging trends can be explained not only by the peaceful period and wage compression during the World War II, but also the relaxation of progressive taxation played an important role in spurring a revival of high wealth concentration and top capital incomes since the 1970s.

In another paper, Grossman et al (2014) concluded that the globalization and technological innovation roughly correspond with the periods of rapid growth of income inequality in the end of the Twentieth Century. Grossman, using an innovation-driven endogenous growth model, demonstrated that individual worker abilities and firm productivity levels derived from the R&D accumulation and subsidies as a product of globalization and technological revolution, along with the spillover effects on other industrial sectors, tend to favor those workers with higher skills and suppress the wages of the lower skilled.

Coincidentally, Rigby et al (2014), responded to the concern of rising inequality since the 1970s, focusing on US import annual data from low-wage countries which cover 459 industrial sectors and 34 years and its impact on wage inequality and concluded that skill-biased technological change was left as the primary factor of growing wage inequality before 1990s due to the

relatively small volume of imports from low-wage countries. However, this trend has been reversed after 1990 because of the upsurge of the import competition.

Several studies in sociology and political science suggest that politics and public policy are important elements of inequality (Brady 2009; Hacker and Pierson 2010; Hibbs and Dennis 1988; Brady and Leicht 2008; Hicks 1999; Bradley et al. 2003; Kenworthy 2004; Moller, Alderson, and Nielsen 2009; Kelly and Witko 2012; Moller et al. 2003). Some suggest that the power balance of labor and capital play an important role in distributing income in a society (Korpi 1983; Kristal 2010; Stephens 1979) while others, based on the recent evidence of the United States in the post-war period, demonstrate that the overall income inequality can be partially explained by changes in policy liberalism and left-wing party power (Bartels 2008; Kelly 2005, 2009).

Volscho and Kelly (2012) present research rooted in a substantial body of work in the social sciences explaining economic inequality and distribution. They used single-equation error correction models estimating the effects of economic factors, politics and policy on top income shares for both short-run and long-run between 1949 and 2008, and found that the congressional shifts to the Republican Party, the shrinking union membership, progressive taxation on top incomes, trade openness and bubbles crises in financial and real estate markets played a strong role in the rise of super-rich.

Although public opinions expects that democracy could increase redistribution and reduce inequality, the fact is this expectation may fail to be fulfilled when democracy is captured by the rich. Acemoglu et al (2013), through systematic reduced-form evidence on the dynamic impact of democracy, found that democracy is associated with secondary schooling and structural transformation. Additionally, evidence in the study showed that inequality tends to increase after

democratization when the economy has undergone significant structural transformation, such as in the United States.

State Level

Consistent with prior Kuznets' work, Williamson (1965) demonstrated that the regional inequality within nations also follows the inverted-U pattern, increasing in the initial stages with economic development and decreasing in the later ones. The initial increase in regional inequality could be accounted for by the concentration of income and income-intensive sectors in specific regions of a nation while the later decrease is explained by spillover effects of the former ones. The changes of regional inequality are referred to as regional divergence and regional convergence, and have been examined by many empirical studies (Perin and Semple 1976; Easterlin 1958; Williamson 1965; Robinson 1976; Smolensky 1961).

Early explanations of the inverted-U in regional income inequality are associated with evolving market preferences and spatial changes. Williamson (1965) argued that labor and capital first came to the more developed North and after the Civil War and industrial revolution the South became more attractive and competitive.

However, the trends of income inequality in the past few decades have not been reversed at either the national or regional level (Amos 1988; Coughlin and Mandelbaum 1988; Braun 1991; Rowley et al. 1991; Danziger and Gottschalk 1993). This unpredictable trend raises much doubt about the validity of the Kuznets hypothesis at the regional level as well.

Fan and Casetti (1994) examine regional inequality in the U.S. In their paper, the initial stage is regional divergence, with manufacturing as the leading sector that results in the formation of a

core region (Pred 1973). The influx of labor and resources into the core region led to a rise in income (Clark 1940; Fisher 1939). As a result, the dramatic growth of the core region was at the expense of peripheral areas and formed the initial regional income inequality (Richardson 1978). The first core region emerged in Northeast and Midwest states in terms of the manufacturing industries and was the national economic center until the late 1960s. Another regional core was formed later in the West due to a large amount of migration. The secondary stage, regional convergence, was characterized by slower growth and decline within the main core and new growth points in the former periphery (Casetti 1984; Peet 1983; Richardson 1980). The spillover effects of the main core, along with surplus labor and lower land costs favored new locations of growth and agglomeration in the periphery (Bluestone and Harrison 1982; Bourne 1980). This reversal, which coincided with the well-known Snowbelt-Sunbelt shifts, happened during the 1960s to 1970s. There was a large wave of the migration of industries, capital and labor from the Northeast and Mideast toward the South and West. The recent trend of increase in regional income inequality has been described from a new perspective. The authors argue that the spatial restructuring, as a result of international competition, played an important role in creating renewed economic stars, such as parts of New England and Silicon Valley, led by high technology industries, education and training systems, and producer services. Additionally, these regions, many in the traditional core, close to the national boundary, have well-designed infrastructure and are connected internationally, which attracts international business operations (Coffey and Bailly 1991; Daniels et al. 1991; Harrington et al. 1991). Therefore, selected regions within the traditional core propelled by the new leading sectors led to another round of increasing regional income inequality.

Morrill (2000) analyzed the geographic variation in change in income inequality among US states through 1970 to 1990. During the time period, richer and larger states with less inequality in 1970, became more unequal in 1990, while many lower inequality, poorer states in 1970 had no big changes. He found that the significant factors that may cause the greater inequality including economic restructuring (skilled-based discrepancy), excess labor (babyboom entry, immigration), deregulation and tax changes, spatial polarization in urban areas, family instability and high proprietary income, and with stagnant manufacturing growth, high female participation in labor force and new economic growth in the South and the Plains.

There has been a great deal of important work on the geographic variability of income inequality among regions or the states. Sale (1974) in his research examined the changes in size distributions of family incomes between 1950 and 1970 and the finding is poor states have a big decline in inequality with progress in development. He also mentioned that proportions nonwhite and elderly, education, and female workers matter in the direction of the trend of inequality. Rothenberg and Stano (1977) showed the simultaneous relation of income and education in reducing inequality by using 1977 Gini coefficients by state. Their results also showed that manufacturing wages suppress inequality and proportions non-white and greater median age increase inequality.

Some studies focus on the recent trends toward greater inequality. Topel (1994) examine the variation in inequality for four census regions and found that economic growth favored a decrease in inequality, while immigration and female participation increased the inequality in male wages. Bishop et al (1992) analyzed the interstate income inequality in 1990 and concluded that higher income states with less inequality, and states with higher educational expenditures, and higher shares of property income tend to have greater inequality.

Following the work of Topel and Bishop et al., Partridge et al. (1996) study a broad version of changes in state inequality. During 1960 to 1990, states with higher level and growth in immigration, with increased amount of metropolitan population, with increasing proportions of female population, with increasing proportions of black population, with stable size of farm population and high level of public assistance had significant inequality; states with more participation in the labor force, with increasing or slowly decreasing manufacturing, and with higher rates of high school graduation tend to have less inequality. A very important contribution to these series of studies is that Partridge et al. (1996) employed the states as dummy variables that could significantly distinguish the differences in state inequality. The result is the state differences were generally above the national average level, which meant that differences may partially influenced by the state-specific policies or culture difference.

Rigby and Wright (2011) illustrate this unexpected trend from a political perspective. Based upon the prior works, they combined data on state parties' ideological positioning with estimates of income-group opinion for 47 states to examine the variation in party positioning and income-based political characteristics across the states, excluding Nebraska, Alaska and Hawaii due to their different limitations. They found that the interests of low-income groups are completely ignored not only in the policymaking process but also by political parties. From the evidence, the interesting findings are that the economic issues draw a large amount attention from both parties, but more significantly for the Democrats in states with high levels of income inequality and less so for Republicans' in states with lower levels of income inequality.

County Level

A well-known problem with cross-country (country/national level) studies is its limited quality and comparability in response to the nation's data. State level (regional) studies, give us a whole picture of the spatial variation in regional income inequality, but might conceal the effects of inequality at further subdivision levels, which makes it hard to tackle core issues that need to be treated specifically (Ravallion 1998). Therefore, to sidestep this problem, the use of county level data (this section) and metropolitan level data (following section) are more comprehensive and meaningful in addressing the inequality of specific public concern at smaller scales.

Using the US county data for the 1990s, Fallah and Partridge (2007) suggest that, within the same US state, urban counties with agglomeration economies, great market potentials and more skilled and specialized works had greater income inequality; conversely, small rural counties with less economic incentives, unskilled workers, weaker social cohesion (personal relationships and lack of anonymity) may yield less inequality. They also argue that different counties should be treated by specific policies. Urban counties could be encouraged by policies that strongly initiate consumption taxes instead of progressive income taxes favored by the rich, and rural settings would benefit more from building human capital, social capital and community capacity.

In Atems (2013) paper, using various model specifications, the results indicate that for the entire 3109 counties, increases in inequality are significantly related to a decline in economic growth. In order to further investigate the magnitude and/or sign of this relationship across all regions of the U.S. Atems split the sample into the eight major regions of the U.S.: the Far West, the Great Lakes, the Mideast, New England, Plains, Rocky Mountain, the Southeast, and the Southwest and into metropolitan/nonmetropolitan counties. He found the South and Midwest are negative on inequality, and the Mideast, the Rocky Mountains, the Great Lakes and New England are

positive on inequality. He further examined the relationship in counties in six non-overlapping economic-dependent classes and counties located in states with different political parties. He found greater inequality in federal and state government-dependent, services-dependent, and non-specialized counties as well as in counties in blue and independent states, and lower inequality in red states and manufacturing and mining dependent counties.

Instead of emphasizing the geographical variations in income inequality, other economists pay more attention to the determinants of inequality during the more recent upswing. Nielson and Alderson (1997) examine the determinants of inequality in the distribution of family income from 3100 counties of the United States during 1970 to 1990. The results reveal that urbanization, labor-force shifts from agriculture to other sectors, natural increase in population, educational attainment, racial dualism (Blacks and Whites), female labor-force participation, female-headed households and manufacturing employment, to different extents, have impacts on income inequality. Levernier et al (1998) use the county-level data in 1990 to examine the differences between metro counties and non-metro counties within MSAs and found that central MSA counties and single-county MSAs had more income inequality than non-metro counties, while counties in suburban areas had the least. The results also revealed that counties that experienced recent structural changes in industry composition have greater income inequality, but only for a short term (two to five years).

Metropolitan (City) Level

Recently, a large amount of the research on income inequality has focused on inequality at the aggregate geographical level, such as cross-country or regional level. Yet most people live in

metropolitan areas and they experience the inequality in a local environment. Therefore, there is a pressing need to study income inequality in metropolitan areas (cities) as well as other administrative units.

Metropolitan areas are defined as multi-county agglomerations surrounding a city that form a core urban area with over 50,000 in population. Metropolitan areas are favored by economists in investigating the mechanisms of income inequality because of their unique characteristics in modern economies. Large labor forces, both from urban and suburban places; market potentials among large population; innovative technology firms and financial companies; residents with more education and skill endowments; easy, efficient accessibilities; etc. All of these make metropolitan areas exceptional compared to other geographical levels.

Metropolitan-scale analyses of income inequality in the US include that by Baun-Snow and Pavan (2013). They found a city-size association with income inequality greater in larger cities than in smaller ones, and its more rapid increase in larger cities was the source of much of the national change in inequality that occurred in the US in the 1990s.

Glaeser et al., (2009) examined the economic causes of metropolitan area income inequality by using the micro-samples (IPUMS) for the 1980 and 2000 Censuses. The income inequality differentials in urban areas can be explained well by both differences in the skill distribution and differences in the return to skill, whereas the latter one appears to be more significant in explaining the variation in income inequality across entire metropolitan areas. The differences in the skill distribution are mainly caused by the historical factors that include more skilled residents and different immigration patterns while differences in return to skill are attributed to higher educated people in specialized sectors. The results also showed that area with high inequality associated with higher murder rates and social unrest as well as slow growth rates

when controlling for the skill pattern. Based on the results, they suggest that the metropolitan level income inequality cannot be tackled with as same policies as at the national level because more homogeneity at the nation level does not imply that it reflects the urban context.

It is not surprising that different metro areas show different patterns in income inequality. Some areas experience faster rise in the level of inequality than others. Choi and Green (2016) argue that the income inequality in sample metros showed different pattern not only spatially but also temporally. Based on the data from the Decennial Census and the American Community Survey (ACS), from 1980 to 2000, they found that both the bottom and the top increased their income, but not middle class. However, from 2005 to 2011, the income shares of both of them decreased, but the poor loss more. After investigating the recent trend, they argued that the change of the labor market best explains the increase of income inequality between the rich and poor because the bottom is more likely to lose their jobs during the economic turns. Additionally, evidence shows less inequality in metropolitan areas with higher wage minimums and higher union membership.

Following the seminal work of Kuznets (1955) and Glaeser et al (1995), Bhatta (2001) re-examines the relations between income inequality and economic growth at the metropolitan level and found that, in contradiction to many prior studies based on aggregate data analysis, the results show a position relationship between initial (1980) MSA income inequality and subsequent MSA growth rate. The results also show that MSAs with higher growth rates have lower end-of-period inequality.

Using data from US metropolitan areas, Fallah et al. (2011) investigate the income distribution in terms of market access. Based on the New Economic Geography, they found a positive relationship between skill premium and market access which means greater shares of high-

skilled workers are much favored by market potential and higher wage premium in metropolitan areas. The data also show that metropolitan areas with higher market access tend to have greater average wages and also unequal wage differentials. Another paper (Wheeler, 2006) claimed that as urban sprawl increases it is more likely to yield greater residential segregation of household by income. Lynch et al. (1998) turn their eyes to the associations between income inequality and mortality in 282 US metro areas by using National Center for Health Statistics data. The results are astonishing in that higher income inequality is associated with increased mortality at all income levels. And they also mentioned that the magnitude of the mortality difference between poor areas (with high inequality, low income) and rich areas (with low inequality, high income) is almost equal to the total loss of life from lung cancer, diabetes, motor vehicle crashes, HIV infection (human immunodeficiency virus), suicide and homicide in 1995.

In summary, metropolitan areas, due to complex spatial-economic features, are becoming the study frontier when addressing inequality at the local level and there is no sign in recent data that the increasing disparity trend has slowed. Therefore, a full understanding of how metropolitan characteristics are associated with metropolitan income inequality is an important foundation for any public policy to promote social and class equality.

2.3 Determinants of Income Inequality

There is no doubt that income inequality in the United States has increased rapidly over the last three decades. Most prior studies show that income inequality is high in regions (e.g., New England, the Midwest, the South), states (e.g., New York, Connecticut, Michigan, California, Florida), and cities (e.g., New York City, Detroit, Las Vegas, Cleveland) which have suffered a loss from the industrial structure change, technological innovation, labor market transition,

economic recession, financial crisis and housing bubble, etc. The turn point of income inequality in the United State has not come, and the economy has come apart. The recent unexpected failure of the last stage, as depicted in Kuznet's work, has led to increased scholarly, popular, and political interest. Most popular and political interest has simply led to a focus on the solution to the problem in the institutional factor of government-directed income redistribution - nowhere more visible in the US than in the surprising popularity of Bernie Sanders candidacy for the Democrat's nomination for president in the 2016 campaign.

Scholarly interest has been more concerned with explanations for the failure of the trend of decreasing income inequality with increasing levels of income to continue, and for such inequality to actually increase after years of decrease in many places where incomes are high. Explanations of rising income inequality in the US vary across the scholarly literature². Piketty and Saez (2003) argued that increasing marginal income rates on increasingly high incomes among top earners is a significant underlying factor in growing income inequality in the US. Other explanations include the argument that income inequality has grown due to changing wage patterns across, but not within, firms (Song et al. 2015); it has partially grown because of increasing differences in effort among workers (Ravallion 2015); because of a variety of race, gender, deregulation, and economic restructuring effects (Morrill 2000); and trade completion/import penetration (Rigby, Kemeney, and Cooke 2014). Perhaps the most common market-based reason given for increasing income inequality, however, is based on an increasing skill differential gap (e.g. Broecke, Quintini, and Vandeweyer 2016; Murphy and Topel 2016). The argument is that income inequality has been increasing in the US because of an increasing

² The scholarly literature considers inequality of wealth and inequality of income, as well as their interaction, e.g. Jones (2014) and Stiglitz (2015). The focus in this dissertation is on income inequality alone.

gap between labor skills in hand and labor skills in demand. Too many members of the labor force have unattractive skills that either keep them underemployed or employed at low wages, and too few in the labor force have skills in high demand, which allows them to earn very high wages.

The research reported in this dissertation focuses on an institutional-based explanation for increasing income inequality. Progressive taxation reform (Piketty and Saez 2003) could be an example of an institutional explanation for increasing income inequality in the US, but perhaps the most commonly cited institutional explanation are the decline in labor union membership (e.g. Card 2001; Volscho and Kelly 2012; Western and Rosenfeld 2011) and policy preferences (Acemoglu et al 2013; Kelly 2005; Scheve et al 2009; Rigby et al, 2011; Faricy 2016; Jacobs and Skocpol 2005; Bartels 2008; Enns and Wlezien 2011; Gilens 2012; Erikson 2015; Temin 2015).

The decline of unionization is not, of course, the sole cause of growing income inequality. Several socio-economic factors, such as the industrial structure shifts which induced globalization and domestic rigorous trade competition (Vachon and Wallace 2013), the dramatic growth of high-tech innovation (Fallah, Partridge and Rickman 2013), the widely spread trend of higher college education (Gottschalk and Danziger 2010; Florida, Mellander and Stolarick 2012; Pontusson 2013; Töngür and Elveren 2014; Autor 2014), and the demographic changes (Defreitas 1993; Milkman 2000) etc., have all served to magnify income inequality and erode real incomes among workers.

Labor Union Decline

Labor Unions, as a crucial aspect of U.S. economy, played a vital role in buoying the industries and improving people's welfare throughout the 20th century. However, during the past half century, nearly most developed countries are unable to avoid the process of de-unionization and its related effects on their own economy (Acemoglu and Aghion, 2001; Acemoglu, 2002; Töngür and Elveren, 2013). Economists have put much effort into finding the association between unionization and income inequality (Dickens and Leonard 1985; Freeman 1988; Jones 1992; Moore and Newman 1975; Ellwood and Fine 1987; Koeller 1994; Brady and Wallace 2000; Jacobs and Dixon 2010; Griffin, McCammon, and Botsko 1990; Western, 1997; Scruggs and Lange 2002).

Union decline was treated by most scholars as a key factor in causing wage inequality due to a loss in labor's ability. Unions reduce wage inequalities because they raise wages more at the bottom and in the middle of the wage scale than at the top, and also strive for universal health and retirement benefits for unionized members. However, since the 1970s the trend of the decline of organized labor has led to a large increase in wage inequality (Western and Rosenfeld 2011).

Vachon and Wallace (2013) note that the peak union density in the US labor force was reached in 1954, at 35 percent of workers. By 1985 that proportion had dropped to 18 percent. By 2015 only 11.1 percent of workers belonged to labor unions, although 12.3 percent of workers were represented in collective bargaining agreements. In the mid-1950s, and before, labor unions were associated with natural resource extraction and manufacturing, but by the mid-1980s union density was much higher in the public sector than in the private sector. In 1985, about 14.5 percent of the private sector labor force belonged to unions, while nearly 36 percent of public

sector employees were union members. By 2015, the public sector number was nearly the same as in 1985, at more than 35 percent, but private sector union density dropped to 6.7 percent (Bureau of Labor Statistics 2016). The number of union members in each sector was roughly equal in 2015 with 7.2 million of the 20.6 million workers in the public sector and 7.6 million of the 113.15 million workers in the private sector. There are several explanations for the decline of union membership proportions in the private sector, ranging from the competitive pressures and unemployment attributed to neo-liberal globalization, structural change, union ineffectiveness, labor de-skilling, computerization, cultural change, and a changing political climate, especially on the left as race overtook class as the foundation of liberal activism in the US (Clawson and Clawson 1999; Kristal 2013; Vachon and Wallace 2013; Hogler, Hunt, and Weiler 2015). At the same time that total and private union density was decreasing, income inequality in the US was rising. The Gini coefficient for household income was 0.371 in 1954, when union density was at its peak in the U.S. In 1985 it was 0.389; in 1990 it was 0.396; in 2000 it was 0.433; and in 2010 it was 0.440; in 2014 (the last year of the series available) it was 0.452 (U.S. Department of Commerce 2016).

The negative association between union membership and income inequality has given rise to a number of analyses attempting to determine whether their divergent tracks are meaningful or simply coincidental. Fortin and Lemieux (1997) provide an accessible comparison of the market-based, demand-driven, foundation for wage/income inequality and an institutional foundation that includes factors such as unionization densities. On the demand side, for example, differential demand for the labor skills of those workers with little education and those with higher education can account for a wage differential between members of the two groups. If demand for the skills of only one group increases faster than the supply of those skills, then the wage differential

increases so that inequality increases. Many analyses seem to bear out this basic relationship, at least to some degree (e.g. Glaeser, Resseger, and Tobio 2009; Murphy and Topel 2016).

Theory, aside, however, institutional factors are easily seen as having an impact on wages, and therefore, potentially inequality. Minimum wage laws, for example, provide a floor price for all labor skills, and collective bargaining often sets wages as fixed across a variety of skill levels.

Fortin and Lemieux (1997) note that differences in the strength of collective bargaining between Germany and France, where it was high, and the US, where it was low, may be the reason that the former two countries did not experience increasing inequality in the 1980s while it rose in the US, even though all three countries were subject to the same external conditions and technological changes that could give rise to increasingly uneven demands for labor skills.

Fortin and Lemieux (1997) conducted an empirical analysis of the change in wage inequality in the U.S. in the 1980s and found that de-unionization could account for about a third of the increase in inequality for men, but was trivial in its effect on wage inequality for women, who were more affected by minimum wage changes. Card (2001) analyzed changes in wage inequality between the early 1970s and 1993 in the US. He also found that the change in women's wage inequality was much less affected by unionization than was men's wage inequality. He also found that unionization was effective in slowing inequality among workers in the public sector, with its increasing union density, and that it also slowed the growth in inequality for low-skilled workers.

With respect to declining unionization, according to Harrison and Bluestone (1990) deindustrialization can cause an increase in earning inequality, mainly by the unionization effect, as the structural change led to a reduction in the relatively high-paid manufacturing jobs and an increase in the unprotected service jobs. Western and Rosenfeld (2011) found that the decline of

organized labor explained about the same proportion of American growth in wage inequality as did differences in education. They argue that unionization has a spillover effect that raises wages among non-union workers, so that even their wage inequality is dampened in highly unionized regions.

Card, Lemieux, and Riddell (2004) and Koeniger, Leonardi, and Nunziata (2007) found the same differential effect for males in females in their comparative analyses of the US and UK, which both experienced declining union densities in the 1990s. Volscho and Kelly (2012) found decreasing union memberships to be a significantly negative predictor of the increase in the top one percent income share in the US between 1949 and 2008, while Freeman et al. (2015) provide evidence that the diminishing size of the middle class in the US is correlated with declining union membership because offspring of unionized parents earn higher wages than do the children of non-unionized parents.

Globalization

In earlier studies investigating the deterministic factors of income inequality, globalization is viewed as a vital component that cannot be ignored. In the past half century, the world economy has changed dramatically through the progressive globalization of trade and finance. The pulse of globalization has never been halted and impacted the economic well-being of people in all regions and among all income groups. Most scholars insist that globalization plays an important role in income distribution and every class or group in a society obtains an earning enhancement in absolute term through globalization (IMF 2008). Globalization improves the whole society's well-being, but that does not mean everyone in the society could share the benefits equally.

Past research found that increasing trade and financial globalization have had separately identifiable and opposite effects on income distribution (IMF, 2007). Evidence shows that globalization and labor market transformation have negative effects on union density on balance, but business cycle and labor market structure variables which derive from globalization are weak determinants of union density (Vachon and Wallace, 2013). A recent study also states that a number of developed countries have reformed their industries and labor markets in the past two decades as a response to globalization.

From 2000 to 2010 income inequality grew not because of stagnating wages for less-skilled workers, but because of the rapid income gains by the top 0.1%. Noah (2010) argues that increases in imports account for 10% of the rise in income inequality. The price of products of low skilled labor decreased relative to the price of products made by skilled labor due to competition by imports. This shift forced domestic firms to produce skill-intensive goods, which led to a decrease in real income for the majority of work force – the unskilled labor (Fontana, 1998; Rama 2003). Along with the large-scale technological developments and direct foreign investment which favored the highly skilled workers, there is a dramatic decline in the demand for unskilled workers. Surowiecki (2013) noted that in the past 50 years, a large shift has occurred from former pillar industries such as manufacturing, mining, steel, and major retailers, which provided the most employment in the U.S., to the sectors with high profit margins and average salaries – like high-tech – and relatively few employees.

Accompany this phenomenon, highly skilled workers have largely benefited from worldwide opportunities while American workers suffered a lot from the global competition, such as high unemployment, wages stagnate and union decline that indirectly influenced the inequality.

Galbraith (1998) provided a study of recent changes in income distribution in the US. His results

indicate that most variation in U.S. wage dispersion during this period can be explained by macroeconomic variables such as unemployment rates, trade and exchange rates, and changes in minimum wages. He states that the unemployment rate alone explains 70% of the variation in inter-industry wage dispersion. Slaughter and Swagel (1997) found that the US relative wages of less skilled workers have fallen sharply since the late 1970s. At the same time, the average real wage in the US has grown only slowly since the early 1970s and the real wage for unskilled workers has fallen. Evidence from FRED (St. Louis Federal Reserve) database show that, real wages for all workers, corrected for inflation, have actually declined since the 1970s and dropped by nearly 34% compared to the peak. Even considering real median family income that includes many couples there still exists a roughly 9% decrease from 1999 to 2012.

Most studies examine the effect of globalization and its derivatives (deindustrialization, unemployment, wage stagnation, union decline, etc.) on the distribution of wages and incomes in the United States. The underlying reason for harming low-skilled U.S. workers is that globalization lowering the wages of U.S. less-skilled workers, but favoring the highly-skilled professions, that widen the disparities of income distribution. One argument contrary to this hypothesis by comparing the variation across countries, Saez (2014) found that Japan, Sweden and France did not experience the significant increase in income inequality during 1979 to 2010 that the U.S. did. The richest income group had a relatively low proportion income gain over this period, while in the U.S. it rose a lot.

Education and Skill-Biased Technological Change

Although other factors including deunionization and globalization have played some roles in enhancing income inequality, some economists now believe that the major drivers in changing

the wage structure are higher education (e.g., cognitive ability) and skill-biased technological change. The notion behind this argument is more skilled (educated) workers are more likely to undertake high technological work than unskilled workers. A consensus among economists is that technical change in the United States and the OECD over the past decades, or even over the past century, has been skill-biased. That is because there was a large increase in the supply of more educated workers, yet returns to education have risen (Acemoglu, 2003). Evidence from another study shows that technological change and education play important roles in increasing income inequality (Autor, 2014). Statistics from 1999 to 2008 show that regional wage premium to these types of skills has increased (Florida et al., 2012). Analytical and social intelligence skills are also positively correlated with regional population, and thus concentrate in larger metros while physical skills are negatively correlated with wages, and that the wage return to these skills has declined. Physical skills are more abundant in small metros (Florida, Mellander, Stolarick and Ross 2012). An interesting study conducted by Marrocu and Paci (2012) revealed that highly educated people working in creative occupations are the most relevant component in explaining production efficiency. Moreover, a significant influence is exerted by technological capital, cultural diversity, and industrial and geographic characteristics, thus providing robust evidence that a highly educated, innovative, open, and culturally diverse environment is becoming more central for productivity enhancements.

Higher wages come from highly-skilled jobs that usually require a significant level of education. Since the 1980s, the college wage premium has grown sharply, as the annual growth of the college-educated workforce (2%) cannot meet the pace with the rising demand from the labor market (3.5%) driven by technological change. Additionally, in recent years the median earnings of workers with bachelor degrees were 65% higher than those with high school degrees; holders

of professional degrees (MD, JD, MBA) even reached the unbelievable level of 161%, according to the Current Population Survey by U.S. BLS (Bureau of Labor Statistics) in 2015 (Figure 2.1). People with higher degrees and certified qualifications can be placed in professional occupations which, in turn, lead to a greater income gain (Levine and Zervos 1998).

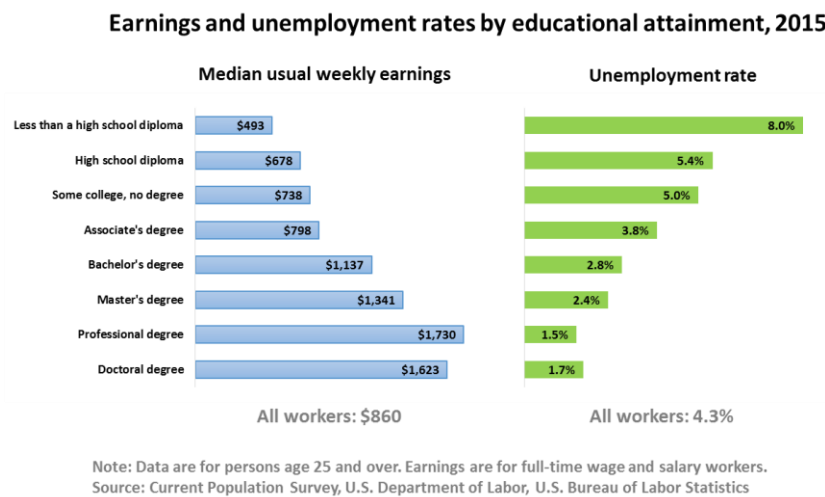


Figure 2.1. Median Weekly Earnings vs. Unemployment Rate, 2015

When the United States stepped into a post-industrial society, the manufacturing sectors required more and more expertise with amounts of certification that they did not decades ago. As a result, the income disparity between the working class and the professional with higher academic degrees were growing gradually. A recent study shows that households in upper class are generally better educated and earn high pay: 62% of those householders were college graduates, 80% full time workers and 76% were working couple (US Census 2006). The data indicate an upward relation between education achievement and income.

However, college degrees do not necessarily mean good jobs any more. Evidence from 1980 to 2005 showed that the demand for college-educated workers has exceed the supply. Due primarily

to the rapid progress in computerization and automation, there is a huge drop in demand for college educated workers. Other economists argue that the increasing returns to education account for 60% of the rise in inequality during 1973 and 2005 (Goldin and Katz 2007). The annual tuition at public and private universities averaged 4% and 20% respectively of the annual median family income from 1950s to 1970s, and changed to 10% and 20% by 2005 (Noah 2012). Autor (2014) argues that almost two-thirds of the rise in income inequality between 1980 and 2005 can be explained by the increased premium in education. Meanwhile, there is an increasing discrepancy between graduates with college degrees and advanced degrees. Although the premium for college graduates has been flat since 2000, the premium for advanced graduates has continued to grow.

Similar to education, skill-biased technological change (SBTC) was viewed as a common explanation for income inequality from the early 1970s to the 2000s. This shift in production technology favors skilled over unskilled labor due to its relative productivity was accused of being responsible for over 40% of the increase in income inequality by economists. Other factors, such as globalization, de-unionization, wage premium and immigration, only take 10%-15% shares of each (Economic Report of the President 1997).

A widely held view is that the introduction of technologies that increase the demand for more skilled workers and the subsequent growth on education together contributed to divergence in household income. Although most scholars insist that education and skill-biased technological change play an important role in addressing income inequality over the last 50 years, few have opposite opinions. Bernstein (2013) found that there is little evidence for SBTC's role in increasing inequality. Noah (2010) argues that the great technological change in the 20th century does not match the timing of the growth of income inequality. James K. Galbraith, in his book

“Inequality and Instability” (2012), refutes the notion that the inequality is being driven by education, technological change and demand for highly skilled labor, but rather by factors such as financial stresses and the credit crisis.

Race and Ethnicity

The United States is becoming a more diverse country. However, at the same time, it's becoming more racially and ethnically unequal. According to a recent study, the typical black household has just 6% of the wealth of the typical white household (Demos and IASP 2015). And in 2011, the median white household had \$111,146 in wealth, in absolute terms, compared to \$7,113 for the black household (Survey of Income and Program Participation 2012). Another report examined the economic data for 70 metro areas for blacks and found that it is hard to find a region in the United States where blacks were more likely to be employed than whites (National Urban League 2016). This economic gap between blacks and whites, which is a major component of the gap between the rich and the working class, is a continuing problem us.

The economic gap between blacks and whites has existed since early America. But after the ending of legal segregation in the mid-1970s, the gap tended to narrow. The grace period did not last for a long term. Between 1968 and 1979, the wage gap between blacks and whites had an average 1.2% drop annually; however, it turned to increase about 0.24% per year during the 1980s. In 1990s, the gap had a slightly narrow down at 0.59% each year, but it was accompanied by a decline in real wages of blacks (Couch and Daly 2002).

By 2015, the US Census reported that the number of black Americans were 40 million, 12.6% of the total population compared to 73.1% whites in US. The median black household income was

\$36,544, compared to the median white non-Hispanic household income of \$59,698 (US Census 2015).

Another research shows that even when blacks have the same education and occupation as whites, they still tend to have less wealth. Oliver and Shapiro (2006) examine samples of blacks and whites with similar academic background and found that whites control four times as much wealth as do blacks with the same degrees. They add that, with the similar characteristics, an incredible difference of \$43,143 in home equity and financial assets between blacks and whites still remains. Partridge, and Olfert (2011) used a mix of control variables, largely measuring race/ethnicity and education, and conclude that black population is associated consistently with higher levels of wage inequality. Choi and Green (2015) found that labor market conditions are the strongest predictor of income inequality across metropolitan areas of the US in their analysis. Other studies focus on wages. Grodsky et al. (2001) found that blacks tend to make \$3.65 less per hour than whites in the private sector and \$2.85 less per hour in the public sector. They also found that human capital, region, and marital status play a key role in widening the wage difference which also could be explained by occupational distributions between blacks and whites. Coleman (2003) reported that the racial wage differences tend to increase rather than decrease when black men and white men are in the similar competitive environment, in addition, black wages are much likely lower than white's in the same industry.

Gender (Female Population)

The role of female workers in the labor market is another factor with possible implications for income inequality. Female workers are the half of the labor force in the United States. However, on average, they still tend to earn considerably less than men. Based on median annual income,

in 2015, a full-time female worker typically earns 79% of what a male worker earns, about \$10,800 less per year. If we add up this yearly difference over a career, that would be a half million dollars. (United States Congress Report 2016)

According to 2007 ACS (American Community Survey) by the U.S. Census, the national ratio of female to male earnings was 78%. The Northeast and the Midwest had higher ratios than the South and the West based on the Survey. The largest income gap between female and male in industry was in finance, based on weekly earning data by gender and by industry in 2009.

Median weekly earnings of females were only 70% of males in that industry. Construction was the most equal one with female earnings 92% of male earnings. The gap of median earnings between men and women has decreased gradually since the 1970s, when women first entered the labor market in great numbers. However, as predicted by IWPR (The Institute for Women's Policy Research 2015), the pay gap will not be closed until 2059.

The income disparities by gender can be explained by various characteristics, such as education, work experience, occupation and even an “invisible” reason, discrimination. A large number of working women leaving their working place because of having a baby or taking care of their family, but when they return to work, many of them are confronted with a “working penalty” – earning less than women who are not mothers or wives. Occupational segregation often leads women to work in lower-paying fields or have lower-paying jobs. Some economists have found that as much as 40% of gender gap cannot be explained, except by discrimination (Blau and Kahn 2007). Similarly, Goldin and Rouse (2000) found that the human resource officers tend to select male applicants instead of female applicants with the equal performance and characteristics. There are state and federal laws to advance and protect women's rights in

working places, however, the pace toward income equality is slow and employers still depresses women's earnings, fueling gender income inequality and pushing women into poverty.

Political Climate

Besides the above aspects, there are large numbers of studies examining the relationship between politics and income inequality in recent decades. Most of them concluded that political dynamics have a systematic and predictable influence on income distribution in the United States. Since the late 1970s, the shift of macroeconomic policies has a deeper structural impact on income distribution that favored the relative rich of the U.S. at the expense of the poor, and this trend never stopped. (Apel 2015; OECD 2011b.)

Piketty (2014) found a high correlation between top tax rates and pre-tax income inequality. From 1950 to 2011, the top marginal income tax rate steadily decreased from 80% to 35% in the United States. The reduction of top tax rates benefit high income individuals, and was based on the argument that less taxes induce higher investment and higher growth in the economy. However, the wonderful expectation never comes to true, according to Piketty, Saez and Stantcheva (2014).

Another example of such policies is the diminishing corporation income tax accompanied by growing corporate profits that stimulated the rapid wealth accumulation among the top 1% families. Evidence from Piketty and Saez (2006) shows that the progressive tax rate for the top has declined dramatically since the 1960s while the average tax rate for the middle class remained constant. This dramatic drop was due primarily to a drop in corporate taxes. And this

trend, according to the data in 2014 (Norris 2014), led to a situation in which corporate profits reached its peak in at least 85 years and employee compensation hit its bottom in 65 years.

During the Reagan and Bush administration period, the policies which were called “union-hostile and business-friendly” had a major impact on income distribution. During the period of 1980 to 2007, the share of corporate profits experienced a steady increase at 2%-5% annually while union membership faced a sharp decrease, from 23% to 12% of the labor force. Declining power of labor can be one reason for pushing the lower-end of the income distribution downwards which further contributed to the stagnant minimum wage (Park 2013).

Scholarly attention directed at examining issues of politics within the context of the rising income inequality in the United States has increased recently. Bartels (2008) argues that the role of politics in policy formation, to some extent, benefits the rich and erodes the programs that help the poor. For example, he found that Republican presidents produce policies that led to lower economic growth and higher levels of inequality. He also found that the Republican legislators disproportionately favored the policy based on the demands of the wealthy. Gilens (2012) found that when there is a divergence of preference between the rich and everyone else, policy changes follow the desires of the rich.

Additionally, the largest field of study in the politics of income inequality in US relates to the issues of representational inequality. Faricy (2015) examines the relationship among parties, social expenditures and income inequality and finds that the federal control by Republicans results in less social spending and higher levels of inequality. Flavin (2011) analyze the class differences in representation at the state level. The result shows that voters from low-income households receive less representation than the wealthier ones. Rigby and Wright (2013) examine the state level representation at early stages of the policy process. They suggest that

both political parties are much more responsive to the needs of the wealthy, and states with higher inequality tend to have the least responsive Democratic Parties. Volscho (2012) use time-series analysis to find that higher income inequality correlates with more Republican control, shrinking union power, lower marginal tax rates and frequent economic bubbles. Enns et al. (2014) claims that the structure of the U.S. Senate, along with policy preference, contributes to the rise of inequality in the U.S. Hibbs (1987) concludes that Republicans grow inequality while Democrats lower inequality.

2.4 Conclusion

This chapter has provided a brief review of research on income inequality from two perspectives: scale of analysis and contributing factors. The chapter was intended to provide a summary background to the research presented in the dissertation, which focuses on the metropolitan scale of analysis and examines institutional factors – especially labor union coverage - as contributors to, or at least co-variates of income inequality. The decline in labor union membership is perhaps the most commonly cited institutional explanation for increasing income inequality in the U.S. (e.g. Card 2001; Volscho and Kelly 2012; Western and Rosenfeld 2011).

Specifically, I examine the association of collective bargaining coverage and income inequality in three time periods: 1990, 2000, and 2010, across a set of metropolitan areas in the US that are consistently bounded over those years. Using regression models that also consider variables of race, gender, relative skills, and relative education, I examine the covariation between rates of collective bargaining coverage and income inequality across the metropolitan areas for the years

considered. Given potential, but unlikely, issues of endogeneity, a-right-to-work variable is substituted for the collective bargaining coverage variable in additional regression analyses.

The next chapter continues the development of background by describing the data used in the regression models that are the primary means of analysis of institutional-based variation in income inequality at the metropolitan scale in the United States.

Chapter III

Data and Map Analysis

3.1 Data and Variable Description

The data used in this dissertation mainly come from two sources (Table 3.1): The Decennial Census Summary File/American Community Survey³ (U.S. Bureau of the Census 1990, 2000, 2010) and the CPS (Current Population Survey) ORG (Outgoing Rotation Group) Earnings files⁴ from Unionstats⁵ (Hirsch and Macpherson 2016) database (1990, 2000 and 2010). Data from the Decennial Census Summary File contain household income (mathematic base of Gini Coefficient), median income, population, sex, industrial classification and education attainment. Data from the CPS ORG Earnings files is collective bargaining coverage. In order to keep the consistency of data, several processing steps have been taken before the data are being used in our analysis (see table 1 footnote).

In the following analysis, I will use metropolitan areas (MSAs) as a geographic unit. A metro area contains a core urban area of 50,000 or more population which consists of one or more

³ The Decennial Census is conducted every 10 years from the national level down to the block level by the U.S. Census Bureau. Summary File contains the data compiled from the survey that questions asked of all people and about every housing unit. The Decennial Census is actually composed of two parts—the Census of Population counts numbers of persons and selected social & economic characteristics, the Census of Housing counts numbers of residential units and selected physical & financial characteristics. In 2010, detailed socioeconomic data was no longer collected by the Decennial Census and is now found in the annual American Community Survey (ACS). (U.S. Census Bureau)

⁴ Current Population Survey (CPS) is a monthly based household survey conducted by the Bureau of Labor Statistics to measure labor force participation and employment. The Annual Earnings File is extracted from the CPS Surveys monthly since 1979 and fifty or more variables each month are selected for continuity across years.

⁵ Unionstats is an internet data resource providing private and public sector labor union membership, coverage, and density estimates compiled from monthly CPS survey. The economy-wide estimates are provided beginning in 1973 and estimates by metropolitan area begin in 1986. The Database, constructed by Barry Hirsch (Andrew Young School of Policy Studies, Georgia State University) and David Macpherson (Department of Economics, Trinity University), was created in 2002 and is updated annually.

counties and includes the counties containing the core urban area, as well as any adjacent counties that have a high degree of social and economic integration with the urban core⁶.

Metropolitan areas have the advantage of local labor markets which provide a certain measure of statistical precision (Glaeser et al., 2009)

The data cover a total of 64 US metropolitan areas, including 21 Consolidated Metropolitan Statistical Areas (CMSAs) and 43 Metropolitan Statistical Areas (MSAs) and Primary Metropolitan Areas (PMSAs) across the entire country⁷ (Figure 3.1). All metropolitan areas in this dissertation will be simply referred as metro areas (MSAs). All the metro areas used here are defined according to the definition of delineation of the county composition of MSAs used in 2010 Decennial Census.

The construction of a dataset with the consistent MSA boundary for 1990, 2000 and 2010 is one of the contributions of this dissertation. The sample of metropolitan areas was drawn on an overlap of data availability with respect to union contract coverage and the ability to hold constant the metropolitan area boundaries across the three time periods with respect to county components. That is, where counties were added over time, their data were added so that all boundaries used in the analyses for 1990 and 2000 conform to the 2010 metropolitan area boundaries. That allows for comparability with respect to the explanatory variables used in the analyses over time.

⁶ Metropolitan area definitions follow the Census Bureau's definitions as of July, 2015. They were accessed at <http://www.census.gov/population/metro/>.

⁷ Alaska metro areas are excluded in this analysis due to the lack of union data.

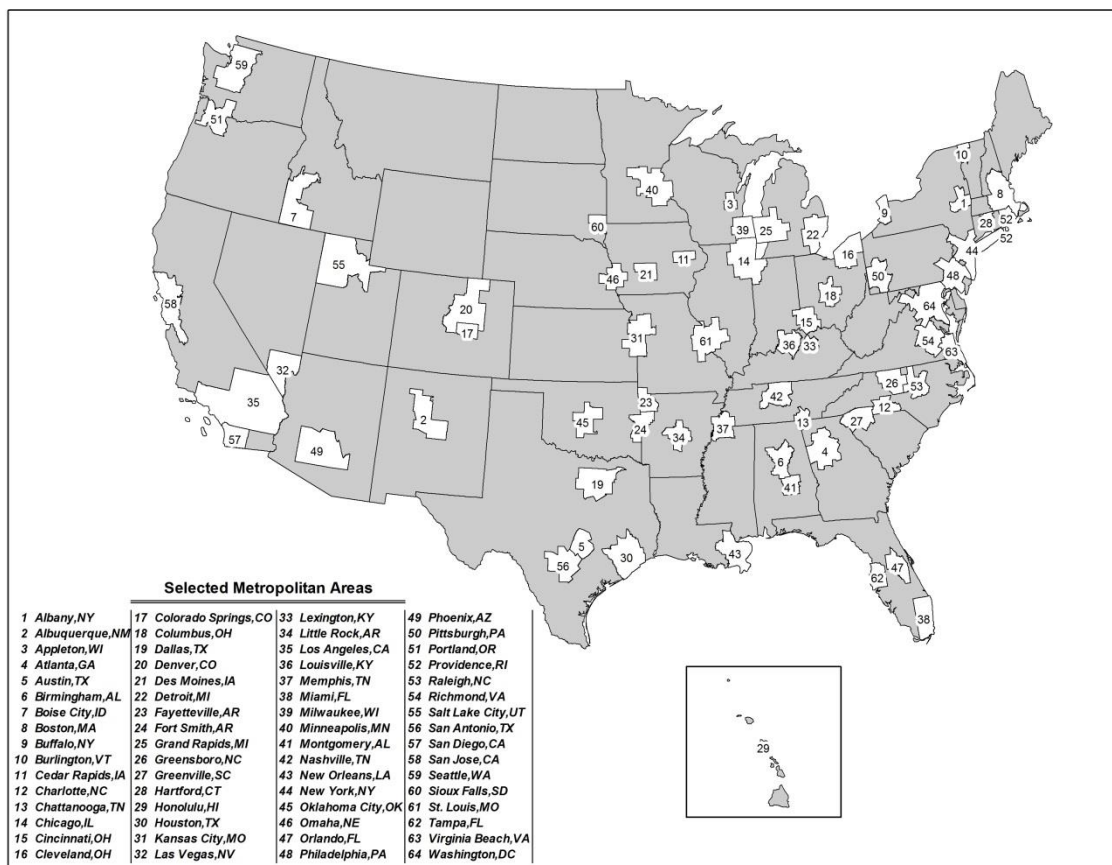


Figure 3.1. Metropolitan Areas Selected for the Analysis

Table 3.1: Data Sources

Variable	Variable Type	Data Source			Geographical Level ⁸
		1990	2000	2010	
Household Income (Gini Coefficient) ⁹	Dependent	Decennial Census STF 3 - Sample-Based Data	Census 2000 Summary File 3 - DP3	ACS** DP3 CPS ORG Earnings Files*	County
Unionization Rate	Independent	CPS ORG Earnings Files*	CPS ORG Earnings Files*		MSA/CMSA
Median Income	Independent	Decennial Census STF 3 - Sample-Based Data	2000 Census: SF 3a - Sample-Based Data	ACS** S1903	MSA/CMSA
Population	Independent	Decennial Census STF 1 - 100% Data	Census 2000 Summary File 1 - DP1	ACS** DP5	County
Age & Sex	Independent	Decennial Census STF 1 - 100% Data	Census 2000 Summary File 1 - DP1	ACS** DP5	County
Industry Classification	Independent	Decennial Census STF 3 - Sample-Based Data	Census 2000 Summary File 3 - DP3	ACS** DP3	County
Education Attainment	Independent	Decennial Census STF 3 - Sample-Based Data	Census 2000 Summary File 3 - DP2	ACS** DP2	County

* Current Population Survey (CPS) Outgoing Rotation Group (ORG) Earnings Files

** American Community Survey (ACS)

⁸ County level data were aggregated to the MSA level when necessary in order to maintain consistent MSA boundary definitions over the time periods.

⁹ Gini Coefficient was generated based on the "Household Income" data of three census years. In 1990, the top income segment is "\$150,000 or more" while this top income interval in 2000 and 2010 are changed to "\$200,000 or more". In order to keep the consistency of the data, I combine the "\$150,000 or more" income interval with "\$200,000 or more" in 2000 and 2010 to conform to statically format of 1990.

3.1.1 Gini coefficient – Dependent Variable

The Gini coefficient is the most widely used standard measure of income inequality for all population groups in an economy (De Maio 2007). It's usually defined mathematically based on the Lorenz curve¹⁰, which describe the proportion of the total income (y axis) that is cumulatively earned by the proportion of the population (x axis). In this analysis, I compute the Gini coefficients at the metropolitan level, which is another contribution of this dissertation, by calculating how many households are assigned to each income segment group to see the household income equality of each metropolitan area respectively. The method is mainly based on the Lorenz Curve. As an illustration, a Lorenz curve is presented in Figure 3.2. The Gini coefficient is the area between the Lorenz curve and the 45 degree line as a proportion of the area that is below the 45 degree line.

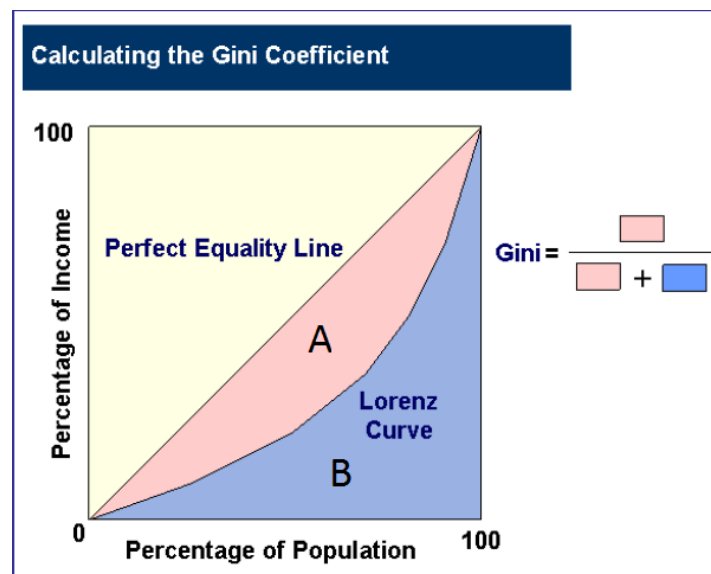


Figure 3.2. Gini Coefficient Calculation

(Source: https://en.wikipedia.org/wiki/Gini_coefficient)

¹⁰ In economics, the Lorenz curve is a graphical representation of the distribution of income or of wealth. It was developed by Max O. Lorenz in 1905 for representing inequality of the wealth distribution.

In practice, the Gini coefficient is a ratio with values between 0 and 1 where 0 corresponds to perfect income equality (i.e. everyone has the same income) and 1 corresponds to perfect income inequality (i.e. one person has all the income while others have nothing).

The household income data in the Census Summary files only include the number of household in different income segments, and does not contain the income of each individual household.

Thus, the computation of the Gini coefficient for household income requires that the households in each income group should hold the same income level. The common way to make the work easier and effective is to assign the mid-value of the income range to all the households in a group, but it is not applicable for the highest income group because of the number of income groups in all three research periods from Census is different. Notice that the Gini coefficient is determined by the number of the income groups and the income level which each group holds. Therefore, midpoints of the income level were used as the relevant data points in estimating the income for the relevant populations proportions, but an arbitrary point was used for the highest classification which is unbounded (e.g. “\$200,000 or more”).

Since the Gini coefficient is defined as a ratio of the areas on the Lorenz curve. If we assume the area between the line of perfect equality and the Lorenz curve is A and the area under the Lorenz curve is B, then the Gini coefficient is $A/(A+B)$. Because the $A+B$ is equal to 0.5 that means that the Gini coefficient, $G = 2A = 1 - 2B$. If the Lorenz curve function is expressed as $Y = L(X)$, the value of B can be found by integration:

$$G = 1 - 2 \int_0^1 L(X) dX$$

The Gini coefficient can be calculated with reference to a Lorenz curve in the following way.

For a population with values y_i , $i = 1$ to n , that are indexed in non-decreasing order ($y_i \leq y_{i+1}$):

$$G = \frac{1}{n} \left(n + 1 - 2 \frac{\sum_{i=1}^n (n + 1 - i) y_i}{\sum_{i=1}^n y_i} \right)$$

For a discrete probability function $f(y)$, where y_i , $i = 1$ to n , are the points with nonzero probabilities and which are indexed with increasing order ($y_i < y_{i+1}$):

$$G = 1 - \frac{\sum_{i=1}^n f(y_i) (S_{i-1} + S_i)}{S_n}$$

Where:

$$S_i = \sum_{j=1}^i f(y_j) y_j \text{ and } S_0 = 0$$

Due to the structure of the Census household income dataset, Bhatta (2001) used a trapezoidal approximation for the area under the Lorenz curve which also be employed in our analysis. The formula for the computation of the Gini coefficient (G) follows:

$$G = 1 - \sum_{i=0}^{m-1} \left(\frac{Y_i + Y_{i+1}}{Y} \right) \left(\frac{n_{i+1} - n_i}{N} \right)$$

Where m represents the number of income segments, n_i is the aggregate number of households in that segment i or lower, Y_i is the total income of all households in segment i or lower, N is the total number of households in that MSA, and Y is the total income of all the household in that MSA. Each income segment i is assigned to an income level y_i and y_i is in non-decreasing order.

I could not use a continuous function for calculating the Gini coefficients because the Census only reports household income by broad classes. In my dataset I have 9 household groups by different income levels. So the question is how to better estimate the area A. If I chose the highest income of each group segment, that would minimize the area A, which would be an underestimate. Conversely, if I chose the lowest point of each segment, I would overestimate area A. So the only way to avoid that bias is taking the average of the highest bound and lowest bound.

The logical computation procedures for each MSA are as follows (Figure 3.2):

Step 1 - Calculate the Area B

- The Area B under the “Less than %10,000” income segments group is calculated by

$$Area\ B^{<\$10,000} = \frac{(CumInc\% \text{ of Income } 0 + CumInc\% \text{ of Income } 10,000)}{2} * \%pop \text{ in that segment}$$

- Sum up each Area B under different income segments to get the whole Area B

$$Area\ B = \sum Area\ B_i$$

Where i is the number of income segments.

Step 2 - Calculate the Area A

- Obtain the Area A by subtracting the Area B from the area that under the Perfect Equality Line which is 0.5.

$$Area\ A = 0.5 - Area\ B$$

Step 3 - Gini Coefficient

$$Gini = \frac{Area\ A}{Area\ A + Area\ B}$$

Because the Gini coefficient is a closed number system (0 ~ 1), its logit transform (log(G/1-G)) is used in the regression analyses.

The Gini coefficient’s main advantage, as a measure of inequality by means of a ratio analysis, is that it represents all the income groups of the population. It can be used to compare income

distributions across different population groups as well as regions or countries, for example the difference of the Gini coefficient between different metro areas, and it also can be used to indicate how the distribution of income has changed within a geographical area over a certain period, thus it is possible to see if inequality is increasing or decreasing. The main drawback of the Gini coefficient is that, as a measure of aggregate inequality, it cannot grasp the changes within the underlying income distribution. For example, even there may be an income transfer between the middle-income households and the poor households or between the rich and the middle-income households, the Gini coefficient may remain unchanged which could mislead our understanding when investigating the within-group inequality variations. Some economists, such as Bhatta (2001) and Deininger and Squire (1996), suggest using income shares by quintiles to overcome this problem. This consideration would also be taken in a future analysis. Other measuring error may lead to consistency problem when using data by individuals instead of households, or by countries instead of regions or metro areas respectively.

3.1.2 Covariates – Independent Variables

Potential covariates were selected based on the theoretical and empirical literature. Expectations with respect to sign and significance in the regression models are given in Chapter 4. The selected covariates are (shorthand designations in parentheses):

The natural log¹¹ of median household income (*lnI*)

The natural log of population (*lnP*)

¹¹ Because the independent variables are either proportions or real value, in order to keep the prediction of the models in the correct range, I make log transformations. The exception is the right-to-work state dummy variable.

The natural log of union contract coverage ($\ln U$)

The natural log of percent black population ($\ln B$)

The natural log of the percent female population ($\ln F$)

The natural log of the ratio of professional to retail employment ($\ln S$):

The natural log of the ratio of bachelor's degree holders to those who did not graduate from high school ($\ln E$)

MSAs located in Right-to-Work states (RTW)

Maps of the continuous variables (excluding RTW) are below (Figures 3.3 -3.5) for 1990, 2000, and 2010.

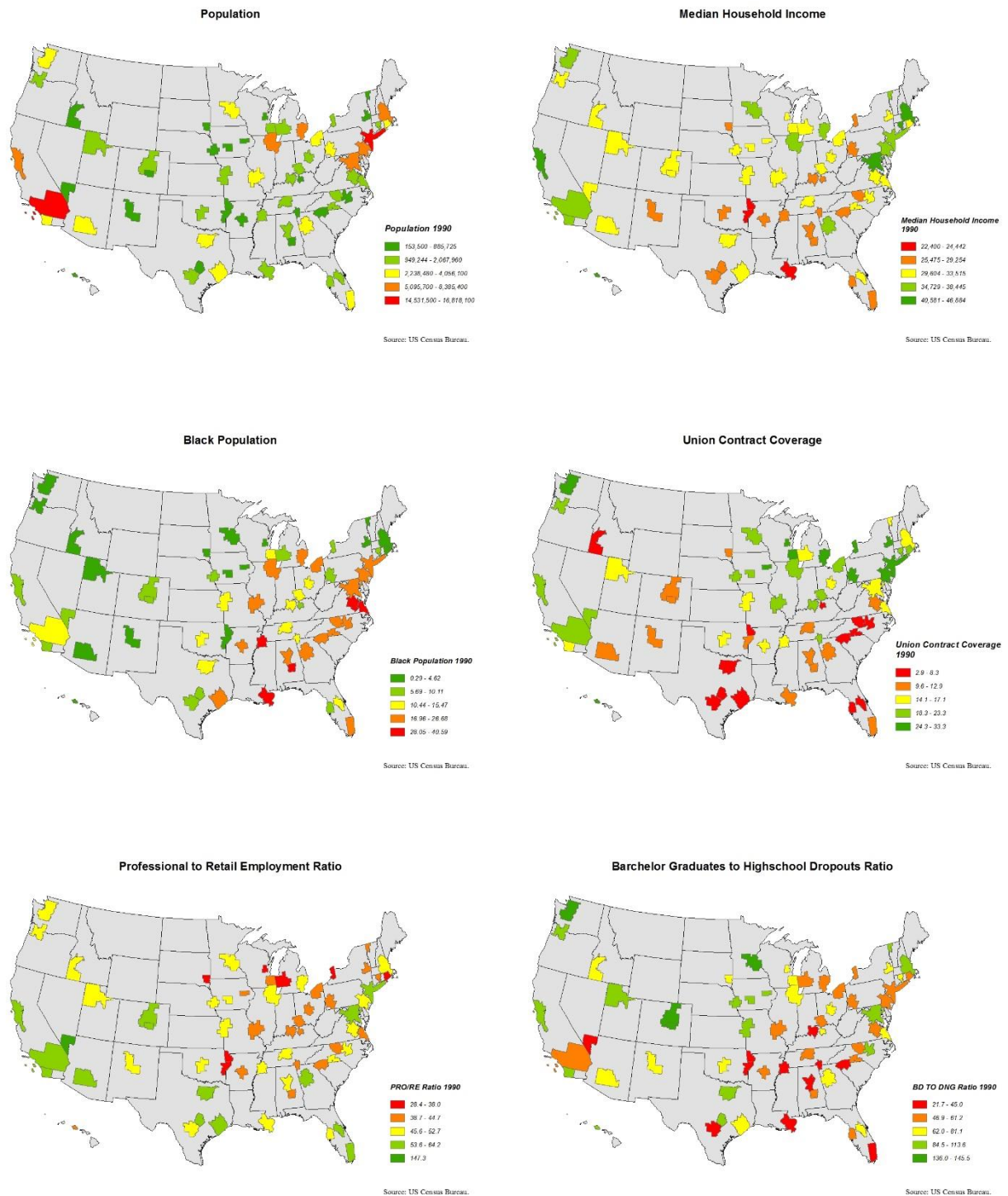


Figure 3.3. Socioeconomic factors among US MSAs in 1990

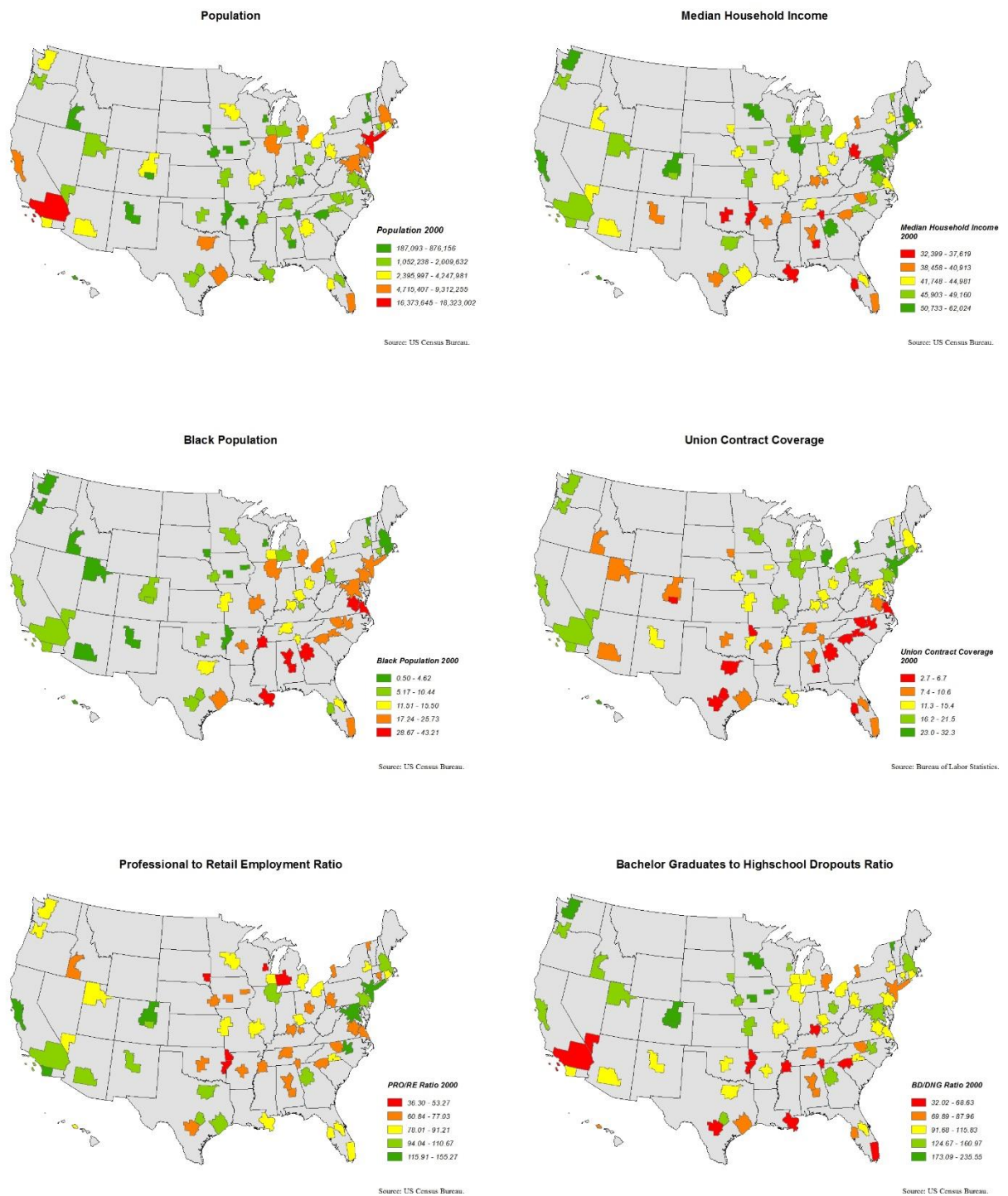


Figure 3.4. Socioeconomic factors among US MSAs in 2000

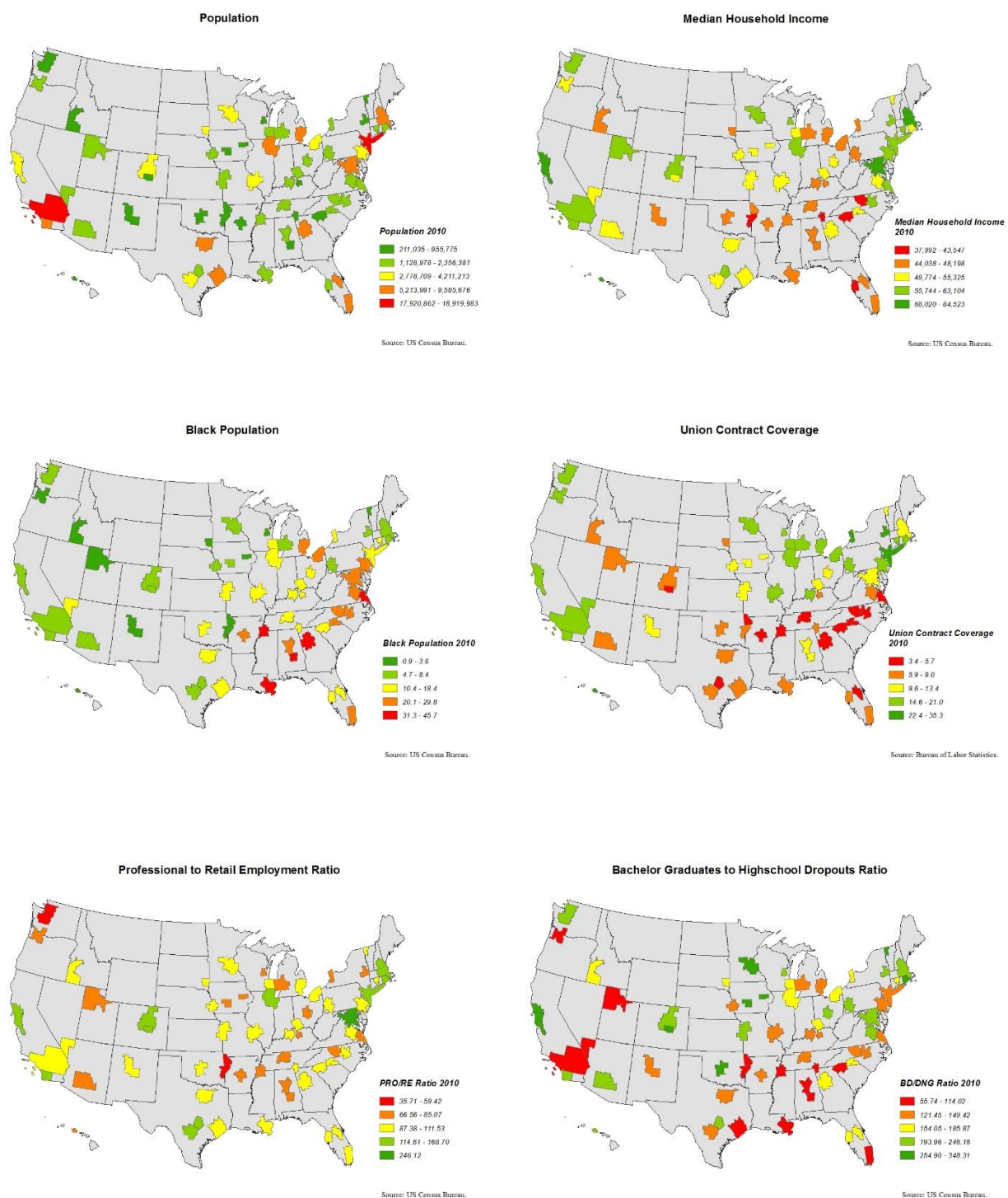


Figure 3.5. Socioeconomic factors among US MSAs in 2010

3.2 Map Analysis and Descriptive Evidence

This section provides an exploratory, descriptive assessment of the relationship between income inequality and other socioeconomic factors in the MSAs over the study period.

3.2.1 Patterns of Inequality in 1990

Based on the Gini coefficient calculated by the household income, we derive geographical patterns for Gini coefficient for our study period. Figure 3.3 show the income inequality for MSAs among US in 1990.

Figure 3.3 provides an overall grasp of the level of inequality across the selected MSAs. It shows that income inequality is highly dense in South and the Mid-West areas and less dense in East Coast and West Coast.

According to the Gini coefficients by MSAs given in Table 3.2, the 10 MSAs with the highest income inequality are from Arkansas, Oklahoma, Missouri, Tennessee, Georgia, Louisiana, South Dakota, Texas, Alabama, Florida, mostly located in the South. The bottom 10 (Table 3.3) in income inequality are either large metropolitan areas (Chicago-Naperville-Michigan City, Atlanta-Sandy Springs-Marietta) or coastal (San Diego-Carlsbad-San Marcos, Honolulu) or both (Los Angeles-Long Beach-Riverside, Boston-Worcester-Manchester, Hartford-West Hartford-East Hartford, New York-Northern New Jersey-Long Island, Washington-Baltimore-Northern Virginia). When we compare the top 10 MSAs and the bottom 10 MSAs, one interesting evidence we found is that MSAs with higher inequality are located in small developing and emerging regions while MSAs with lower inequality are located in more developed and

industrial regions. Based on this hypothesis, we look into our independent variables to investigate the associations with income inequality.

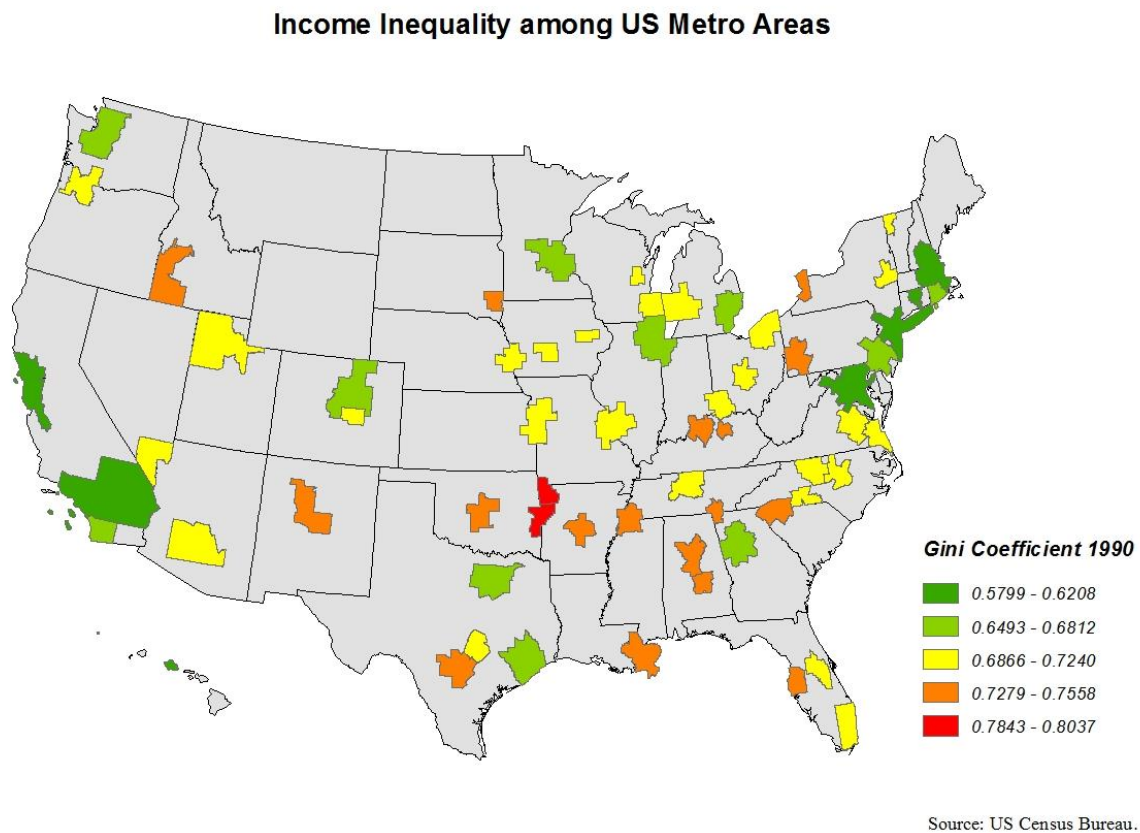


Figure 3.6. Income Inequality among sampled MSAs in 1990¹²

¹² Alaska is excluded in our analysis due to the lack of Census data.

Table 3.2. Top 10 MSAs Gini Coefficients, 1990

<i>MSAs Name</i>	<i>Rank</i>	<i>Gini</i>
<i>Mean.</i>		<i>0.7009</i>
Fort Smith, AR-OK	1	0.8037
Fayetteville-Springdale-Rogers, AR-MO	2	0.7843
Chattanooga, TN-GA	3	0.7558
New Orleans-Metairie-Kenner, LA	4	0.7545
Sioux Falls, SD	5	0.7530
Little Rock-North Little Rock-Conway, AR	6	0.7500
San Antonio-New Braunfels, TX	7	0.7492
Montgomery, AL	8	0.7491
Tampa-St. Petersburg-Clearwater, FL	9	0.7471
Oklahoma City, OK	10	0.7444

Source: US Census.

Table 3.3. Bottom 10 MSAs Gini Coefficients, 1990

<i>MSAs Name</i>	<i>Rank</i>	<i>Gini</i>
<i>Mean.</i>		<i>0.7009</i>
Atlanta-Sandy Springs-Marietta, GA	55	0.6544
San Diego-Carlsbad-San Marcos, CA	56	0.6501
Chicago-Naperville-Michigan City, IL-IN-WI	57	0.6493
Los Angeles-Long Beach-Riverside, CA	58	0.6208
Boston-Worcester-Manchester, MS-NH-CT-ME	59	0.6147
Hartford-West Hartford-East Hartford, CT	60	0.6117
New York-Northern New Jersey-Long Island, NY-NJ-PA	61	0.6026
Honolulu, HI	62	0.5951
San Jose-San Francisco-Oakland, CA	63	0.5821
Washington-Baltimore-Northern Virginia, DC-MD-VA-WV	64	0.5799

Source: US Census.

Table 3.4 is contains the socioeconomic statistics for the metro areas listed in Tables 3.2 and 3.3.

Two things that stand out in Table 3.4 are that lower inequality MSAs tend to have higher population and more households with higher income while higher inequality MSAs tend to have less population and lower income households. It also appears that the lower inequality cities tend to have higher union coverage than do the higher inequality MSAs. Further those MSAs with

higher levels of inequality tend to have lower ratios of professional to retail employment and of bachelor degree holders to those who did not graduate from high school. Those associations are illustrated in Figure 3.4. The proportion of black population seems more associated with geography, with larger proportions in southern MSAs, and the distribution of proportion female is effectively uniformly distributed.

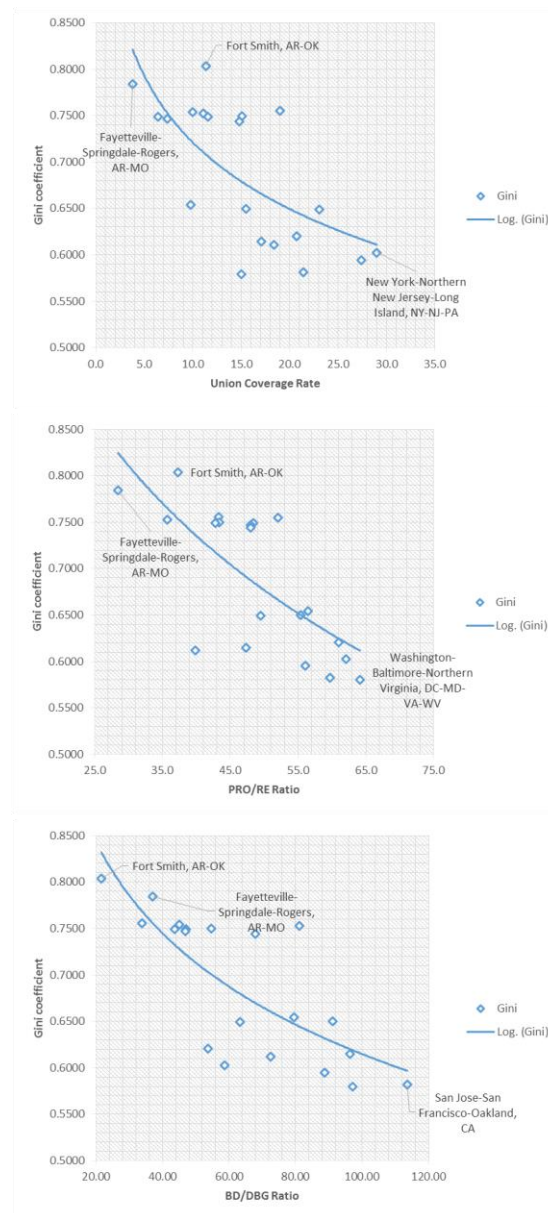


Figure 3.7. Gini Coefficient with Union Coverage Rate, PRO/RE and BD/DBG Ratio, 1990

Table 3.4. MSA Soci-Economic Statistics ranked by Gini Index, 1990

<i>CSA Name</i>	<i>Ran k</i>	<i>Total Population</i>	<i>Median Income</i>	<i>UnionCov% 13</i>	<i>Black% 14</i>	<i>Female% 15</i>	<i>PRO/RE 16</i>	<i>BD/DBG 17</i>
Fort Smith, AR-OK	1	223,119	22,400	11.4	3.84	51.4	37.3	21.70
Fayetteville-Springdale-Rogers, AR-MO	2	239,464	23,124	3.8	0.84	50.9	28.4	37.14
Chattanooga, TN-GA	3	433,210	25,475	19.0	13.67	52.3	43.3	33.91
New Orleans-Metairie-Kenner, LA	4	1,264,391	24,442	10.0	34.46	52.3	52.0	45.00
Sioux Falls, SD	5	153,500	27,764	11.1	0.55	51.6	35.7	81.09
Little Rock-North Little Rock-Conway, AR	6	535,034	26,501	15.1	19.80	51.9	43.4	54.68
San Antonio-New Braunfels, TX	7	1,407,745	26,092	6.4	6.45	51.4	48.4	43.69
Montgomery, AL	8	305,175	26,685	11.6	35.84	52.2	42.8	47.08
Tampa-St. Petersburg-Clearwater, FL	9	2,067,959	26,036	7.4	8.77	52.3	48.1	46.89
Oklahoma City, OK	10	971,042	26,883	14.8	10.44	51.3	48.1	67.85
<i>Sample MSA's Mean</i>		<i>2,272,509</i>	<i>31,466</i>	<i>16.07</i>	<i>12.38</i>	<i>51.33</i>	<i>48.79</i>	<i>70.53</i>
Atlanta-Sandy Springs-Marietta, GA	55	3,069,425	36,051	9.8	25.09	51.3	56.5	79.54
San Diego-Carlsbad-San Marcos, CA	56	2,498,016	35,022	15.5	6.00	49.0	55.4	91.11
Chicago-Naperville-Michigan City, IL-IN-WI	57	8,385,397	35,918	23.1	19.01	51.4	49.5	63.31
Los Angeles-Long Beach-Riverside, CA	58	14,531,529	36,711	20.7	10.55	50.0	61.0	53.74
Boston-Worcester-Manchester, MS-NH-CT-ME	59	5,282,198	40,666	17.1	4.62	51.7	47.3	96.50
Hartford-West Hartford-East Hartford, CT	60	1,655,252	41,440	18.4	8.03	51.2	39.9	72.52
New York-Northern New Jersey-Long Island, NY-NJ-PA	61	16,818,080	38,445	29.0	23.24	52.3	62.1	58.74
Honolulu, HI	62	836,231	40,581	27.4	2.96	49.1	56.0	88.88
San Jose-San Francisco-Oakland, CA	63	6,290,008	41,459	21.4	7.35	50.2	59.7	113.62
Washington-Baltimore-Northern Virginia, DC-MD-VA-WV	64	6,589,254	46,884	15.0	25.03	51.4	64.2	97.25

Source: Compiled by Author.

¹³ UnionCov% (Union Contract Coverage): percent of employees covered by a union contract.

¹⁴ Black%: percent black population.

¹⁵ Female%: percent female population.

¹⁶ PRO/RE: the ratio of professional to retail employment.

¹⁷ BD/DBG: the ratio of bachelor's degree holders to those who did not graduate from high school.

3.2.2 Patterns of Inequality in 2000

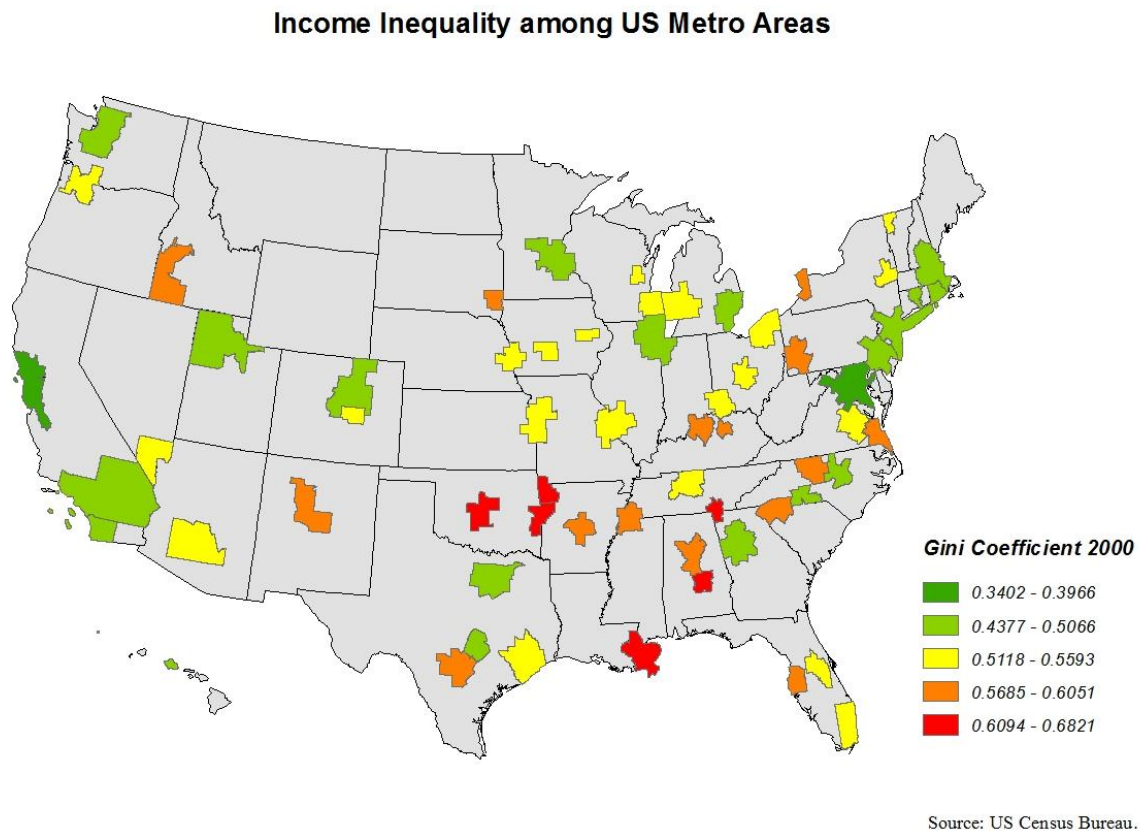


Figure 3.8. Income Inequality among sampled MSAs in 2000

Figure 3.8 depicts the Gini coefficient distribution across the MSAs for 2000. In 2000, most East and West Coast MSAs became much more unequal than they were in 1990. The central area MSAs changed less compared to 1990, partially because of their higher level of unionization, lower level of racial minorities, and a strong tradition of education. Conversely, the South region gained much more inequality; six MSAs entered into the highest inequality group when there were only two in 1990.

Table 3.5 lists the MSAs with the highest Gini coefficients in 2000. Most MSAs are the same as in 1990 but Sioux Falls and San Antonio-New Braunfels are replaced by the Pittsburgh and Buffalo-Niagara MSAs, which located at the Great Lake and Mid-East area with industrial history. There is another striking evidence is the Oklahoma City ranked at No.3 where it was No.10 in 1990. We may have some insights on it later when look into our explanatory variables.

Table 3.5. Top 10 MSAs Gini Coefficients, 2000

<i>MSA Name</i>	<i>Rank</i>	<i>Gini</i>
<i>Mean.</i>		<i>0.5343</i>
Fort Smith, AR-OK	1	0.6821
Fayetteville-Springdale-Rogers, AR-MO	2	0.6315
Oklahoma City, OK	3	0.6170
New Orleans-Metairie-Kenner, LA	4	0.6156
Chattanooga, TN-GA	5	0.6148
Montgomery, AL	6	0.6094
Pittsburgh, PA	7	0.6051
Buffalo-Niagara Falls, NY	8	0.6000
Tampa-St. Petersburg-Clearwater, FL	9	0.5996
Little Rock-North Little Rock-Conway, AR	10	0.5984

Source: US Census.

As with the higher inequality MSAs, there is little change in the bottom 10 group (Table 3.6) beyond some changes in ranks and the replacement of San Diego-Carlsbad-San Marcos by Denver-Aurora-Boulder. Compared to 1990, the geographical pattern remained about the same.

Table 3.6. Bottom 10 MSAs Gini Coefficients, 2000		
<i>MSA Name</i>	<i>Rank</i>	<i>Gini</i>
<i>Mean.</i>		<i>0.5343</i>
Hartford-West Hartford-East Hartford, CT	55	0.4689
Chicago-Naperville-Michigan City, IL-IN-WI	56	0.4642
Denver-Aurora-Boulder, CO	57	0.4632
Atlanta-Sandy Springs-Marietta, GA	58	0.4576
Honolulu, HI	59	0.4550
Minneapolis-St. Paul-St. Cloud, MN-WI	60	0.4535
New York-Northern New Jersey-Long Island, NY-NJ-PA	61	0.4486
Boston-Worcester-Manchester, MS-NH-CT-ME	62	0.4377
Washington-Baltimore-Northern Virginia, DC-MD-VA-WV	63	0.3966
San Jose-San Francisco-Oakland, CA	64	0.3402

Source: US Census.

Table 3.7 summarizes MSA socioeconomic statistics in 2000. With respect to the MSAs averages, the population increased 14.5% from 2,272,509 in 1990 to 2,601,358 in 2000; the union coverage rate dropped from 16.07% to 13.1% during the 10 years; the black population and female population remain consistent on average, but the PRO/RE ratio and BD/DBG ratio had dramatically increases. The PRO/RE ratio increased 70%, from 48.79% to 34.6% and the BD/DBG ratio raised nearly 57% from 70.53% to 110.47% which indicate that there is a rapid growth in skilled employment and high level educated population in the study MSAs.

With regards to the individual MSA, for the top 10 in 2000, all of them were still below the average median household income line, but the gap was narrowing. Most MSAs had lower union coverage rates, except for Buffalo-Niagara, likely due to its manufacturing characteristics. Insufficient professional occupation and high levels of dropout students are common features for the most unequal MSAs. Fort Smith and Fayetteville-Springdale-Rogers take the first two positions for 1990 and 2000. These two MSAs are adjacent to each other and they had the lowest PRO/RE and BD/DBG ratios in the whole set of MSAs. High levels of union coverage mark the

MSAs with the least inequality, especially San Jose-San Francisco-Oakland, Washington-Baltimore-Northern Virginia, and Boston-Worcester-Manchester.

Table 3.7. MSA Soci-Economic Statistics ranked by Gini Index, 2000

<i>CSA Name</i>	<i>Rank</i>	<i>Total Population</i>	<i>Median Income</i>	<i>UnionCov%</i>	<i>Black%</i>	<i>Female%</i>	<i>PRO/RE</i>	<i>BD/DBG</i>
Fort Smith, AR-OK	1	273,170	32,399	12.3	3.95	50.8	40.1	32.02
Fayetteville-Springdale-Rogers, AR-MO	2	347,045	37,322	3.1	1.27	50.2	36.3	64.67
Oklahoma City, OK	3	1,095,421	36,797	7.7	10.44	51.0	71.0	96.62
New Orleans-Metairie-Kenner, LA	4	1,316,510	35,317	11.3	37.27	52.2	85.1	65.33
Chattanooga, TN-GA	5	476,531	37,411	10.0	14.18	51.9	63.8	55.53
Montgomery, AL	6	346,528	37,619	6.5	38.76	51.7	70.0	71.23
Pittsburgh, PA	7	2,431,087	37,467	19.7	8.02	52.2	73.0	98.65
Buffalo-Niagara Falls, NY	8	1,170,111	38,488	32.3	11.51	52.1	65.0	80.61
Tampa-St. Petersburg-Clearwater, FL	9	2,395,997	37,406	6.7	9.91	51.8	83.6	77.38
Little Rock-North Little Rock-Conway, AR	10	610,518	39,145	9.6	21.79	51.5	60.8	92.55
<i>Mean.</i>		<i>2,601,358</i>	<i>44,671</i>	<i>13.08</i>	<i>12.92</i>	<i>50.97</i>	<i>83.38</i>	<i>110.47</i>
Hartford-West Hartford-East Hartford, CT	55	1,543,919	52,188	17.5	9.16	51.3	76.1	102.91
Chicago-Naperville-Michigan City, IL-IN-WI	56	9,312,255	51,046	19.3	18.64	51.1	106.4	95.60
Denver-Aurora-Boulder, CO	57	2,629,980	51,088	9.7	5.32	49.9	115.9	176.58
Atlanta-Sandy Springs-Marietta, GA	58	4,247,981	51,948	6.7	28.67	50.6	104.0	128.19
Honolulu, HI	59	876,156	51,914	25.1	2.24	49.7	80.7	124.67
Minneapolis-St. Paul-St. Cloud, MN-WI	60	3,136,198	54,304	18.7	5.24	50.6	91.2	235.55
New York-Northern New Jersey-Long Island, NY-NJ-PA	61	18,323,002	50,795	24.4	22.75	52.0	116.2	83.92
Boston-Worcester-Manchester, MS-NH-CT-ME	62	5,632,239	52,792	14.3	4.62	51.5	110.7	148.97
Washington-Baltimore-Northern Virginia, DC-MD-VA-WV	63	7,507,876	57,291	14.0	25.73	51.5	155.3	140.60
San Jose-San Francisco-Oakland, CA	64	7,092,596	62,024	17.6	5.17	50.2	138.2	143.27

Source: Compiled by Author.

As in 1990, the general association among the highest and lowest inequality MSAs and the explanatory variables remains consistent with expectations (Figure 3.9). Income inequality increases with higher rates of union coverage and higher PRO/RE and BD/DBG values.

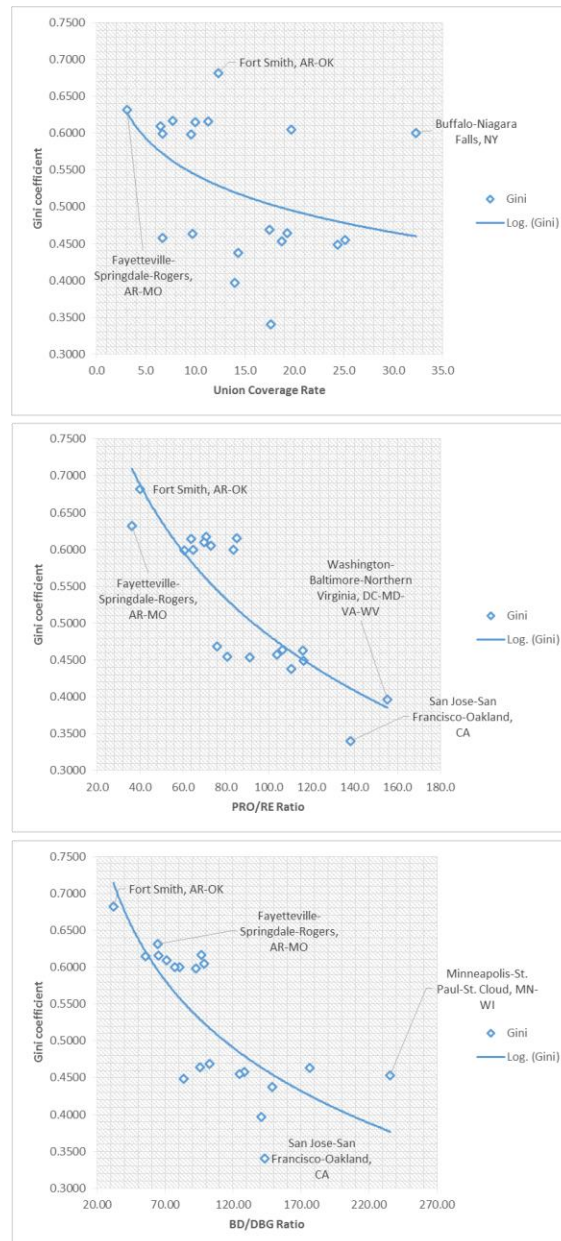


Figure 3.9. Gini Coefficient with Union Coverage Rate, PRO/RE and BD/DBG Ratio, 2000

3.2.3 Patterns of Inequality in 2010

Figure 3.10 depicts the geographical distribution of the Gini coefficients for 2010. Note that some Midwestern MSAs experienced relatively increasing inequality as compared to 2000.

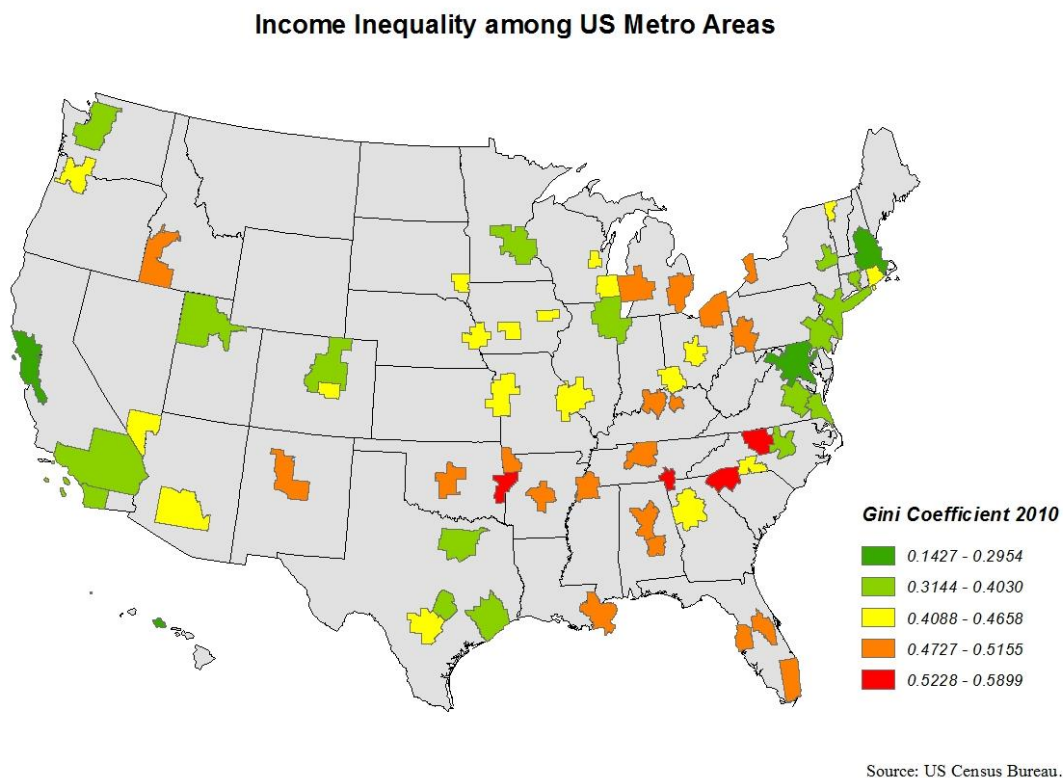


Figure 3.10. Income Inequality among sampled MSAs in 2010.

Fort Smith still ranked as the most unequal urban area in its 3rd decade, Greensboro-Winston-Salem-High Point from North Carolina and Greenville-Anderson-Seneca from South Carolina stepped into the top 3 unequal MSAs (Table 3.8). Five MSAs are replaced in the top 10 list for 2010 as compared to 2000, with the notable addition of the Grand Rapids-Muskegon-Holland MSA in Michigan.

Table 3.8. Top 10 MSAs Gini Coefficients, 2010

<i>MSA Name</i>	<i>Rank</i>	<i>Gini</i>
<i>Mean.</i>		<i>0.4331</i>
Fort Smith, AR-OK	1	0.5899
Greensboro--Winston-Salem--High Point, NC	2	0.5398
Greenville-Anderson-Seneca, SC	3	0.5244
Chattanooga, TN-GA	4	0.5228
Tampa-St. Petersburg-Clearwater, FL	5	0.5155
Fayetteville-Springdale-Rogers, AR-MO	6	0.5126
Grand Rapids-Muskegon-Holland, MI	7	0.5102
Lexington-Fayette, KY	8	0.5017
Louisville/Jefferson County, KY-IN	9	0.5016
Little Rock-North Little Rock-Conway, AR	10	0.5009

Source: US Census.

Table 3.9 lists the more equal MSAs in 2010 based on the Gini coefficient. Unlike the top 10 list, the bottom 10 MSAs almost all kept the positions they had in 2000. The only new face is Seattle-Tacoma-Olympia, which took the place of the Chicago-Naperville-Michigan City.

Table 3.9. Bottom 10 MSAs Gini Coefficients, 2010

<i>MSA Name</i>	<i>Rank</i>	<i>Gini</i>
<i>Mean.</i>		<i>0.4331</i>
Denver-Aurora-Boulder, CO	55	0.3627
San Diego-Carlsbad-San Marcos, CA	56	0.3558
Minneapolis-St. Paul-St. Cloud, MN-WI	57	0.3530
Seattle-Tacoma-Olympia, WA	58	0.3446
Hartford-West Hartford-East Hartford, CT	59	0.3308
New York-Northern New Jersey-Long Island, NY-NJ-PA	60	0.3144
Honolulu, HI	61	0.2954
Boston-Worcester-Manchester, MS-NH-CT-ME	62	0.2932
San Jose-San Francisco-Oakland, CA	63	0.2051
Washington-Baltimore-Northern Virginia, DC-MD-VA-WV	64	0.1427

Source: US Census.

Most explanatory variables were on an upward trend from 2000, except for the union coverage rate (Table 3.10). Population in the selected MSAs increased 7% on average, from 2.6 million to almost 2.8 million; union contract coverage dropped by 12% to 11.51% in 2010; the PRO/RE ratio increased about 15%, from 83.38% to 96.26%, while there was a dramatic increase in the BD/DBG ratio from 110.47% to 170.04%.

One striking thing is that within the top 10 list, nearly all the MSAs' union coverage rates are far below the average level. As in 1990 and 2000, income inequality among the extreme MSAs is negatively associated with union contract coverage, and the values of PRO/RE and BD/DNG (Figure 3.11).

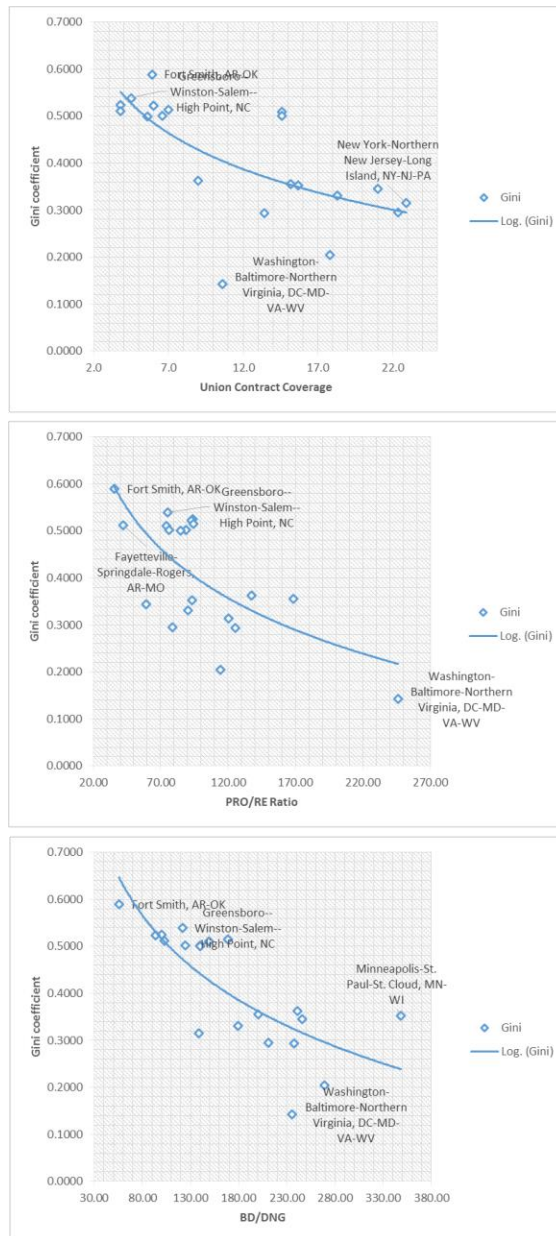


Figure 3.11. Gini Coefficient with Union Coverage Rate, PRO/RE and BD/DBG Ratio, 2010

Table 3.10. MSA Soci-Economic Statistics ranked by Gini Index, 2010

<i>CSA Name</i>	<i>Rank</i>	<i>Total Population</i>	<i>Median Income</i>	<i>UnionCov%</i>	<i>Black%</i>	<i>Female%</i>	<i>PRO/RE</i>	<i>BD/DBG</i>
Fort Smith, AR-OK	1	299,749	37,992	5.9	3.60	50.80	35.71	55.74
Greensboro--Winston-Salem--High Point, NC	2	1,203,714	41,120	4.5	25.50	52.13	75.25	121.45
Greenville-Anderson-Seneca, SC	3	714,487	42,640	3.8	16.70	51.51	93.79	100.21
Chattanooga, TN-GA	4	530,205	42,288	6.0	13.90	51.74	93.03	93.83
Tampa-St. Petersburg-Clearwater, FL	5	1,675,343	43,547	7.0	11.80	50.78	94.47	168.89
Fayetteville-Springdale-Rogers, AR-MO	6	465,780	45,101	3.8	1.90	50.71	42.32	103.03
Grand Rapids-Muskegon-Holland, MI	7	1,210,663	47,040	14.6	8.10	50.46	74.11	149.42
Lexington-Fayette, KY	8	473,547	46,257	6.6	10.80	50.51	76.18	140.04
Louisville/Jefferson County, KY-IN	9	1,287,271	44,678	14.6	14.00	51.20	89.08	124.59
Little Rock-North Little Rock-Conway, AR	10	701,713	45,991	5.6	22.00	51.03	85.07	139.79
<i>Mean.</i>		<i>2,786,755</i>	<i>52,435</i>	<i>11.51</i>	<i>13.54</i>	<i>50.95</i>	<i>96.26</i>	<i>170.04</i>
Denver-Aurora-Boulder, CO	55	2,855,695	58,732	9.0	5.60	50.23	137.48	241.38
San Diego-Carlsbad-San Marcos, CA	56	6,188,575	59,923	15.2	5.10	50.43	168.70	200.14
Minneapolis-St. Paul-St. Cloud, MN-WI	57	3,475,479	62,352	15.7	7.40	50.61	93.31	348.31
Seattle-Tacoma-Olympia, WA	58	229,360	63,088	21.0	5.60	49.92	59.42	246.16
Hartford-West Hartford-East Hartford, CT	59	1,795,370	63,104	18.3	10.90	51.14	90.49	179.14
New York-Northern New Jersey-Long Island, NY-NJ-PA	60	18,919,983	61,927	22.9	17.80	51.85	120.39	138.88
Honolulu, HI	61	955,775	68,537	22.4	2.00	49.96	78.83	210.89
Boston-Worcester-Manchester, MS-NH-CT-ME	62	5,879,818	68,020	13.4	7.30	51.43	125.60	237.79
San Jose-San Francisco-Oakland, CA	63	4,071,057	73,027	17.8	7.00	50.22	114.61	268.81
Washington-Baltimore-Northern Virginia, DC-MD-VA-WV	64	5,610,082	84,523	10.6	25.80	51.29	246.12	235.58

Source: Compiled by Author.

3.3 Conclusion

This chapter contains geographical and temporal descriptions of the data used in the analysis.

Some of the summaries of the selected variables are re-iterated in Chapter 4, which is a “stand-alone” paper that contains the regression models of the MSA-level inequality.

Chapter IV

Regression Analysis

4.1 Models

4.1.1 Two Simple Models

Modeling the inter-metropolitan Gini coefficients can be effectively simplified as bivariate regressions using median household income or population as explanatory variables. So that:

$$\text{logitG}_{tm} = b \ln I_{tm} + e_{tm} \quad (1)$$

or

$$\text{logitG}_{tm} = b \ln P_{tm} + e_{tm} \quad (2)$$

Where logitG is the logit transform of the Gini coefficient, which has a range from 0 to 1, b is an estimated regression coefficient, $\ln I$ is the natural log of median household income, $\ln P$ is the natural log of population, e is error, and tm indicates a particular year and metropolitan area. The models are estimated by OLS and the Lagrangian method indicated no significant spatial pattern in the residuals. The response of inequality to income is, of course, the point of Kuznet's path breaking work, and has been empirically validated in regional analyses (e.g. Morrill 2000;

Glaeser, Resseger, and Tobio 2009). The city-size effect model has its foundation indirectly in Fallah, Partridge, and Olfert (2011), which linked inequality to market potential, and directly to Baum-Snow and Pavan (2013), who measured city-size effects for inequality directly. Summary statistics for the variables used in the simple bivariate regressions are given in Table 4.1, but only the population variable is comparable over time. The locations of the extremes in the Gini coefficients are not stable over the time. For example, in 1990 the extreme low Gini coefficients, indicating the lowest levels of inequality, were in Washington (lowest), San Jose, and Honolulu, while the three highest were in Fort Smith (highest), Fayetteville, and Chattanooga. In 2000, the extreme lows were in Boston, Washington, and Montgomery, and the three highest were in Austin, Colorado Springs, and Richmond. In 2010, the three lowest were in Boston, Grand Rapids, and Tampa, with the three highest in Kansas City, Oklahoma City, and Milwaukee, while Washington was ranked as the fifth highest in inequality after being among the lowest in 1990 and 2000.

Table 4.1**MSA Sample Gini Coefficients, Median Income, and Population Summary Statistics: 1990, 2000, and 2010**

	Gini Coefficient	Median Household Income	Population
		<u>1990</u>	
Minimum	0.58	\$22,400	153,500
Mean	0.701	\$31,466	2,272,508.50
Median	0.71	\$31,024	1,207,070
Maximum	0.804	\$46,884	16,818,080
		<u>2000</u>	
Minimum	0.34	\$32,399	187,093
Mean	0.534	\$44,671	2,601,358.50
Median	0.541	\$44,848	1,393,639
Maximum	0.682	\$62,024	18,323,002
		<u>2010</u>	
Minimum	0.143	\$37,992	211,035
Mean	0.433	\$52,434	2,786,755
Median	0.446	\$51,504	1,704,234
Maximum	0.59	\$84,523	18,919,983

Gini coefficients were computed using varying income intervals and are not comparable over time. Median household income is not adjusted for inflation.

A preliminary regression analysis indicated that income inequality did not conform to a Kuznets curve, at least with respect to a polynomial income term, across the metropolitan areas in any of the years analyzed. However, income inequality covaried negatively and significantly with median household income in each of the years examined (Table 4.2). The fit of the models in each of the years is also quite good, with the lowest R², for 2010, at 0.868. With respect to a Kuznets model, a basic interpretation is that income across the metropolitan areas are beyond the inflection point at which increasing inequality turns to decreasing, and that is why the negative coefficients define the inequality-to-income link across the sample of metropolitan areas.

Although the level of fit is much lower, the same negative covariance between income inequality and population is also indicated in those bivariate models for each of the years. This result is counter to that found by Baum-Snow and Ravan (2013) or implied in Falah, Partidge, and Olfert (2011). The contradictory results may arise from the differences in the empirical specifications

and inequality measures used in those analyses, which differ from each other and from the one used here, and the different data sets used. In any case, the goodness-of-fit of the binary model (R^2) is considerably lower for 2010 than it was for 1990 and for 2000.

Table 4.2

Bivariate Regressions of the Natural Log of the Gini Coefficient on the Natural Log of Median Household Income and on the natural Log of Population: Regression Coefficients and R² for 1990, 2000, and 2010

Ln Median Household Income	Constant (t-statistic)	Regression Coefficient (t-statistic)	R ²
1990	4.306 (19.572)	-0.451 (-21.476)	0.878
2000	8.864 (19.963)	-0.881 (-21.487)	0.881
2010	14.604 (19.090)	-1.424 (-20.342)	0.868
Ln of Population	Constant (standard error)	Regression Coefficient (standard error)	R ²
1990	0.316 (3.717)	-0.048 (-8.000)	0.504
2000	0.421 (2.614)	-0.074 (-6.727)	0.409
2010	0.422 (1.137)	-0.089 (-3.423)	0.161

Each of the listed regression coefficients is significantly greater than zero with 99.9% confidence.

4.1.2 Multivariable Models

The simple bivariate models, especially that using median household income as the explanatory variable, would be very effective if point estimation of Gini coefficients were of primary interest, but they are not very illuminating with respect to more specific covariates. Each can be represented as encompassing process, so that changes in income, for example, can be viewed as representative of structural change à la Kuznets or city-size can be representative of combinations of labor skills. The initial multivariable model we use to find more specific covariate information related to process takes the following form:

$$\text{logitGtm} = b_1 \ln \text{Utm} + b_2 \ln \text{Btm} + b_3 \ln \text{Ftm} + b_4 \ln \text{Stm} + b_5 \ln \text{Etm} + \text{etm} \quad (3)$$

where, as before, logitG is the natural log of the Gini coefficient, $b_1 - b_5$ are estimated regression coefficients, $\ln U$ is the natural log of the percent of employees covered by a union contract, $\ln B$ is the natural log of percent black population, $\ln F$ is the natural log of the percent

female population, $\ln S$ is the natural log of the ratio of professional to retail employment, $\ln E$ is the natural log of the ratio of bachelor's degree holders to those who did not graduate from high school, and as above, e is error and tm indicates a particular year and metropolitan area. Also as above, the models are estimated by OLS and the Lagrangian method indicated no significant spatial pattern in the residuals.

Our analysis focuses on union effects (U) in modelling the inter-metropolitan variation in Gini coefficients, and some relevant literature is reviewed above. Briefly, unions are expected to effectively standardize wages and other employment benefits at a relatively high level for their members because of collective bargaining strength in negotiating with management. Increased union coverage, therefore, should dampen income variation, but that dampening would dissipate as union coverage decreases, and income inequality should become more pronounced – the general observation cited above in the relevant literature. Given that, the regression coefficient for the variable U (b_1) is expected to be negative and significant. Our measure of union effects is the percentage of employees who are covered by union contracts, which includes actual union members and also those who are not actual members but who are affected by the provisions of union contracts. As indicated above, about 11 percent of workers in the US are currently union members, but a little over 12 percent are covered by union contracts. Those covered by the contracts, but who are not union members typically are not free riders, but are required to pay agency fees that approximate union membership dues. Such arrangements became common in the US after the Taft-Hartley Act outlawed so-called closed shops in 1947. Summary statistics on the union coverage variable are listed in Table 4.3 for our sample of metropolitan areas. While both the minimum and maximum values are higher in 2010 than in 1990, the national trend is reflected in the mean and median values that consistently decrease from 1990 to 2010. There is

fairly consistent pattern in the extremes during the years examined; the extreme low values were for Greenville (lowest), Fayetteville, and Raleigh in 1990 and for Raleigh (lowest), Colorado Springs, and Greenville in 2010. Extreme high values were in Albany (highest), Buffalo, and New York in 1990 and in the same three cities in 2010.

Table 4.3

MSA Sample Percent Employees Covered by Union Contracts (Union Coverage), Percent Black, Percent Female, Ratio of Professional to Retail Employment (PE-to-RE), Ratio of Bachelor's Degree Holders to those who did not Graduate from High School (BD-to-DNG) Summary Statistics: 1990, 2000, and 2010

	Union Coverage	Percent Black	Percent Female	PE-to-RE	BD-to-DNG
<u>1990</u>					
Minimum	2.9	0.29	49	0.28	0.38
Mean	16.1	12.4	51.3	0.49	1.15
Median	15.2	10.3	51.4	0.47	1.06
Maximum	33.3	40.6	52.6	1.47	2.37
<u>2000</u>					
Minimum	2.7	0.5	49.1	0.36	0.51
Mean	13.1	12.9	51	0.83	1.71
Median	12.2	10.2	51	0.8	1.57
Maximum	32.3	43.2	52.2	1.55	3.74
<u>2010</u>					
Minimum	3.4	0.9	49.5	0.36	0.82
Mean	11.5	13.5	50.9	0.96	2.79
Median	10.4	11.4	51.1	0.93	2.44
Maximum	35.3	45.7	52.3	2.46	5.87

Percent black (B) and percent female (F) are social variables that are obviously of individual interest, but used here largely as controls. Racial and gender discrimination are almost global in practice (Chakravorty 2006), and their impact can be expected to affect household income inequality in the US. Racial discrimination has been found to be a factor in effecting income inequality in a number of contexts in America (e.g. Lipsitz 2011; Temin 2015; Tighe and Ganning 2015; Margo 2016). Morrill (2000) found evidence of such a racial bias effect in his state-level analysis of income inequality. Discrimination against black people in the labor market

can result in suppressed wages regardless of skill, and lead to higher than expected wage inequality than what skill varieties would generate in a population without racial bias. Household incomes are further reduced for black people because racial discrimination has suppressed their ability to own income producing assets, which are largely owned by white people in the US. As indicated in Table 4.3, there is wide variation in the proportion black populations across the metropolitan areas, although none had black majorities in any of the years under consideration. In all three years, the means and medians are about 10%-13%, which is consistent with the percent black population of the US, which was 12.6% in 2010. The geographical pattern of race across the sample of metropolitan areas largely reflects the racial geography of the US. Higher proportions of black people are more common in the southern part of the country and lower proportions in smaller metropolitan areas in the northern part of the country and in the Mountain West. Extreme low values in 1990, for example, were in Appleton (lowest), Boise, and Burlington, and extreme high values were in New Orleans, Montgomery, and Memphis (highest). By 2010, the metropolitan areas with extreme low values were essentially the same, although Burlington moved up one place in the rankings having been replaced by Salt Lake City. The three metropolitan areas with the three more extreme high values remained the same as in 1990.

Gender differences in income are easily observed in the US (Joint Economic Committee 2016), where women earn about 80% the amount earned by men. In his state-level study, Morrill (2000) found that income inequality was greater where female headed households were in relatively high proportion. There is some evidence that the gender gap in earnings is decreasing in the US because of improved access to education and increasing levels of work experience, but the inequality is still significant (Blau 2012; Cha and Weeden 2014; Temin 2015). In addition, while

women do not have as significant asset deficits as do black people, they typically have much smaller asset holdings than do men, especially in female-headed households (Chang 2010).

Female population proportions in the set of metropolitan areas generally conform to the national figure, which was 50.8% in 2010 (Table 4.3). Given the compressed variation in the proportions, listing extreme locations is not meaningful, and no spatial pattern in the metropolitan values is apparent.

Theoretically, both the race and gender variables can be expected to exhibit Kuznets effects. If bias and discrimination lead to income inequality, then proportional impacts should be observed. If, for example, there are no blacks in a metropolitan area then the inequality effect would be non-existent, and if a metropolitan area had only black population then inequality effects would be non-existent as well. Assuming a perfectly proportional inequality effect, as a metropolitan area's black proportion increased from zero inequality would increase up to the point where the black population reached 50 percent. Beyond that proportion, the black population becomes the majority, and as it increases the inequality effect would decline. The same relationship could be expected to hold for women, although given the known inequality in wages of approximately 80%, then the inflection proportion of females in a metropolitan area might be expected to be 55 percent, above which gender-based wage inequality would be seen as declining. As indicated in Table 4.3, both black and female populations in the set of metropolitan areas are below inflection proportions, so their estimated coefficients (b_2 and b_3 , respectively) are expected to be positive and significant. (Preliminary analysis indicated that neither variable is effective in polynomial form in accounting for variations in the metropolitan Gini coefficients.)

Two variables comprised of ratios are used to measure market effects in inter-metropolitan income inequality. The first is the ratio of professional employment to the retail employment,

and is a measure of relative skills. The second is the ratio of bachelor's degree holders to those who did not graduate from high school. Increasing variations in skills and education are frequently cited as factors underlying increasing income inequality over time (e.g. Lee, Shin, and Lee 2015; Murphy and Topel 2016), so it is likely their spatial variation contributes to spatial differences, such as those that are inter-metropolitan, in the US, as well (e.g. Glaeser, Resseger, and Tobio 2009; Fallah, Partridge, and Olfert 2011). Each of the measures is arbitrary in that a number of ratios of employment groups and of educational groups are possible. The ratios chosen are based on breadth, with wide differences in skill varieties assumed between professional and retail employment in the former measure and a major difference in educational levels in the latter. Simple percentages were used in the institutional variables because they measure dichotomous characteristics: covered by union or not, black or not, female or not. The skill and education measures are not taken from dichotomous circumstances; there are many sectors of employment and many levels of education and the ratios are useful in capturing relative differences across the metropolitan areas. As given in Table 4.3, the variation in both the skills and education ratios is fairly large in each of the years, and both measures are marked by consistent increase over time as employment structure and educational levels changed considerably in the metropolitan areas. In 1990 the typical (mean) metropolitan area in the set had two retail employees for every single employee in the professions but by 2010 there was nearly a one-to-one correspondence. In 1990 there was about a one-to-one correspondence between bachelor's degree holders and those who did not graduate from high school, but by 2010 the ratio was approaching a three-to-one majority of college graduates. In 1990 extreme low values of the skills ratio were located in Fort Smith (lowest) and Grand Rapids, while extreme high values were in New York (highest) and Washington. In 2010 the extreme low values were

in Fort Smith (lowest) and Fayetteville, and the high extreme values were in San Antonio (highest) and San Diego. In 1990 extreme low values of the education ratio were in Fort Smith (lowest) and Las Vegas and the extreme high values were in Minneapolis (highest) and Denver. In 2010 the extreme low values were in Fort Smith (lowest) and Chattanooga, and the high extreme values were in Minneapolis (highest) and Des Moines.

In the cases of these variables an inverted Kuznets effect could be expected, with both low and high ratios of each yielding the same high income inequality effect. However, the ratio inflection point is not as intuitively clear as in the cases of race and gender, and preliminary analysis did not find a good fit between their polynomial forms and the Gini coefficient for the metropolitan areas. Given that, the expectation within the data set is that as relative skill levels increase and as relative education levels increase the level of income inequality would decrease in a metropolitan area. Therefore the regression coefficients for these variables (b_4 and b_5 , respectively) are expected to be negative and significant. Income inequality should decrease with higher levels of education and higher levels of skill in a metropolitan area.

Given that the dependent and explanatory variables are measured contemporaneously. Here are obvious issues of inferring causality from the model. The simultaneity issue is present in a number of regional analyses of inequality (e.g. Bhatta 2001 and Glaeser, Resseger, and Tobio 2009). Our concern is especially with the union coverage variable, and lags are possible but timing is unclear. As an alternative, however, we replace the union contract coverage variable in the model with a dichotomous one that designates a metropolitan area as being located or not in a right-to work state. Right-to-work legislation is usually fairly innocuous on paper. The main components of Louisiana's, for example, are brief and to the point (National Right To Work Legal Defense Foundation, Inc. 2016):

Declaration of public policy

It is hereby declared to be the public policy of Louisiana that all persons shall have, and shall be protected in the exercise of the right, freely and without fear of penalty or reprisal, to form, join and assist labor organizations or to refrain from any such activities. (Enacted July 9, 1976; effective October 6, 1976.)

Labor organization

The term "labor organization" means any organization of any kind, or agency or employee representation committee, which exists for the purpose, in whole or in part, of dealing with employers concerning wages, rates of pay, hours of work or other conditions of employment. (Enacted July 9, 1976; effective October 6, 1976.)

Freedom of choice

No person shall be required, as a condition of employment, to become or remain a member of any labor organization, or to pay any dues, fees, assessments, or other charges of any kind to a labor organization. (Enacted July 9, 1976; effective October 6, 1976.)

The only real extension to Taft-Hartley in such laws is the prohibition of agency fee enactments for those declining union membership. That, of course, undermines union power significantly, which is the direct goal of right-to-work legislation, by encouraging free riding. Right-to-work laws have a variety of effects. Ellwood and Fine (1987) found that they inhibit union organizing and Moore (1998) found that they have an impact on union organizing (-), unionization (-), free riding (+), and union certification (-). Moore did not find any significant wage effect in either direction for either union or non-union workers in right-to-work states. Perhaps the most important impact of right-to-work legislation is its signaling effect with respect to labor vs

business power in state politics. In Holmes (1998), for example, states with right-to-work laws are considered pro-business (or anti-labor) and those without such laws are considered anti-business (or pro labor).

Peck (2016) describes the Snowbelt-Sunbelt geography of non-right-to-work states and right-to-work states, respectively, as a pattern that has recently been broken by the recent passage of right-to-work laws in Snowbelt states Indiana (in 2012), Michigan (in 2013), and Wisconsin (in 2015). The descent to right-to-work status in Michigan and Wisconsin, in particular, marked their transition from political scenes dominated by Democrats with strong ties to organized labor and other progressive groups to those dominated by Republicans with strong ties to reactionaries, especially in the so-called tea party movement. We used central city location to designate the right-to-work status of the metropolitan areas in our sample. Thirty one of the sixty four metropolitan areas were designated as right-to-work in 1990 and 2000, and thirty two in 2010, as Oklahoma (Oklahoma City) became a right-to-work state in 2001. The estimated coefficient for the right-to-work variable is expected to be positive and significant because such legislation suppresses union activity and membership and therefore contributes to income inequality.

4.2 Results

Results of the initial set of estimated models for 1990, 2000, and 2010 are given in Table 4.4. Goodness-of-fit of each of the models is relatively strong given the R² statistics. As expected the regression coefficient for the union coverage variable is negative and significant (as indicated by t-statistics) for each of the three years. The only other variable that is fully consistent with respect to coefficient sign and significance is the relative education (bachelor's degree/ did not

graduate from high school) variable. As expected it has a negative and significant effect on income inequality. The other market effect variable, the professional-to-retail employment ratio, is less consistent. Although its coefficient is negative for all three years, it is not significantly different than zero for 1990. The social variables of race and gender do not have the expected effects on income inequality. The estimated coefficient for the percent black variable is negative for all three years, although it is only significantly different than zero in 1990. The estimated coefficient for percent female is positive for each of the three years, as expected, but only significantly different than zero in 2000. It is unlikely that multicollinearity leads to the fuzzy results with respect to the social variables; the highest multicollinearity condition number for any of the models is only 19.36. It may be, however, that the relative skill variable, and especially the relative education variable, subsume the race and gender effects into broader class effects (Krieger, Williams, and Moss 1997). These results indicate that, at least in our sample of metropolitan areas, the institutional factor of union coverage is a temporally consistent, negative covariate of income inequality and that relative education and skill levels are important covariates of income inequality, as well.

Table 4.4

Regression Coefficients, R^2 , and t-Statistics of the Full Income Inequality Models using the Logit Transform of the Gini Coefficient as the Dependent Variable: 1990, 2000, and 2010.

Variable	1990		2000		2010	
	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic
Intercept	0.1066	0.2851	0.5062	0.9761	0.5306	0.4166
ln percent covered by union contracts	-0.0475	-3.9161	-0.0502	-3.1997	-0.0931	-2.3504
ln percent black	-0.0203	-2.8495	-0.0139	-1.1045	-0.0208	-0.7478
ln percent female	0.049	0.9478	0.1469	2.0361	0.1449	0.7797
ln PE-to-RE	-0.0512	-1.3527	-0.2381	-5.3559	-0.3118	-3.3158
ln BD-to-DNG	-0.0922	-4.7175	-0.1035	-3.4315	-0.1813	-2.4224
R^2	0.5232		0.7168		0.4815	

PE-to-RE is the ratio of professional to retail employment ratio; BD-to-DNG is the ratio of bachelor's degree holders to those who did not graduate from high school.

Results of the set of models substituting right-to-work status for union coverage are listed in Table 4.5. As expected, the coefficient for the right-to-work variable is consistently positive and significantly different than zero for each year (although the null hypothesis would be rejected with only 94% confidence in 2010). As in the earlier specification neither of the social variables is indicated as covarying with metropolitan inequality in any meaningful way. Both the relative skills variable and the relative education variable covary negatively, as expected, and significantly with metropolitan income inequality. The basic results of the two models are the same. Controlling for relative skill and relative education, the stronger the voice of organized labor in a place, the lower that place's income inequality is likely to be.

Table 4.5

Regression Coefficients, R^2 , and t-statistics of the Full Income Inequality Models with the Right-to-Work Variable using the Logit Transform of the Gini Coefficient as the Dependent Variable: 1990, 2000, and 2010.

Variable	1990		2000		2010	
	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic
Intercept	-0.2729	-0.8001	0.3201	0.629	0.2802	0.2185
Right-to-work (1,0)	0.0651	5.2193	0.0553	2.8975	0.089	1.9196
ln percent black	-0.0164	-2.4897	-0.0124	-0.9745	-0.0187	-0.6642
ln percent female	0.0223	0.4669	0.1432	1.9492	0.1466	0.7758
ln PE-to-RE	-0.0949	-2.6726	-0.2345	-5.1301	-0.2907	-3.0495
ln BD-to-DNG	-0.0707	-3.7468	-0.0841	-2.7355	-0.1806	-2.343
R^2	0.5898		0.709		0.4661	

PE-to-RE is the ratio of professional to retail employment ratio; BD-to-DNG is the ratio of bachelor's degree holders to those who did not graduate from high school.

Chapter V

Conclusion, Recommendation and Implication

5.1 Conclusion

This dissertation has explored the relationship between income inequality, unionization and other socioeconomic variables in the metropolitan areas of the United States. Analysis of income inequality at the metropolitan scale is important because beyond its direct association with social justice it is linked to crime, civil disturbance, economic growth, and even health (Lynch, et al. 1998; Bhatta 2001; Glaeser, Resseger, and Tobio 2009). Two important by-products of this research have been the construction of a dataset with the consistent MSA boundary for 1990, 2000 and 2010 and a model to compute the Gini coefficients at the metropolitan level by using US Census county level household income data.

I measured household income inequality across a set of metropolitan areas in the U.S. for three census years: 1990, 2000, and 2010, using Gini coefficients. Based on the map analysis and summarized statistics, I found that: 1) Over the three decades, the span of inequality expanded, but the magnitude had a slightly mitigation; 2) there was a geographical shift from the Mid-regions to the Great Lakes and the Southeastern areas; and 3) More equality is found in large metropolitan areas and coastal areas with more population, relatively high PRO/RE and BD/DNG ratios, and moderate union contract coverage rate. Conversely, MSAs with higher inequality are located in inland areas with fewer black people, lower union coverage, and relatively less professional occupations and more high school dropouts. Evidence shows that in 2010 lower union coverage and high proportion of black population were the significant features

of the most unequal MSAs. Increasing professional labor and college graduates may explain part of the decrease of income inequality in large and moderate MSAs.

I used regression models to measure the covariation and its significance between a series of independent explanatory variables and the Gini coefficient of income inequality. I demonstrated initially that household income inequality in the set of metropolitan areas covaries negatively and significantly in the study years with population of the metropolitan areas and also with the median income of those areas. Such bivariate models are statistically effective, but not very illuminating. I extended the analysis to multivariable models that were still spare in their explanatory structure but contained an institutional variable: union contract coverage, which for the purposes of my research is the variable of special interest; two social variables: percent black population and percent female population; and two market or economic variables: the ratio of professional to retail employees (relative skills) and the ratio of bachelor's degree holders to those who did not graduate from high school (relative education). Regression results indicated that union contract coverage was temporally consistent in its significant negative covariance with the income Gini coefficient. Relative skills and relative education also were generally consistent over time in their negative and significant covariance with the income Gini coefficient, but percent black population and percent female were generally found to have no statistically significant association with inequality in household income in the set of metropolitan areas. The substitution of right-to-work status of the metropolitan areas for union contract coverage in the regression models led to essentially identical results, with right-to-work status consistently positive and significant in its covariance with household income inequality.

Of course the analysis presented here has technical limitations. One is that there are many sources of household income, and potentially its inequality, that are not likely to be captured in

the models. The explanatory variables are largely relevant to wages, and not to transfer payments. Further, asset-based income is covered only indirectly through the race and gender variables. The bulk of household income is still wage based in the U.S. but non-wage income is increasingly important (Nesse 2014). Beyond the potential for omitted variable bias, simultaneity is another potential source of endogeneity in the models. Despite these potential problems, the covariance of the dependent variable with the independent variables was generally as expected. The major exception in the models was the general lack of association indicated between the Gini coefficients and percent black population and percent female population. One explanation for that result is that their effects were embedded in the relative education and the relative skills variables, similar to the findings of Broecke, Quintini, and Vandeweyer (2016) in their technical analysis of wage inequality at the national scale. Although couched as market variables in my models both relative education and relative skills are often used as measures of class (Krieger, Williams, and Moss 1997), and their domination of the social variables in my analysis fits the recent argument by Wilson (2011), at least with respect to race, that class may be surpassing color in determining life opportunities in the U.S.

Temin (2015) argues that class distinction, rather than race or gender, underlies emergence of a dual economy in the US along the lines of, but not the same as, the one proposed by Lewis (1954) for developing economies. Lewis described capitalist and subsistence sectors, with the former sector growing stronger initially due to “unlimited supplies of labor” drawn from the latter sectors. Temin writes of a high-wage finance, electronics, and technology sector and a low wage sector, with the former populated by the highly skilled and the latter by the less skilled. The dichotomy, or inequality, between the two is developed by the destruction of the middle class by various means, one of which is the decimation of labor unions by legislative, economic,

and cultural pressures, as well as the ineffectiveness of the labor organizations themselves (also see Freeman et al. 2015). The results presented in this dissertation support the related proposition that income inequality is greater where unionization, a measured of labor power, is relatively weak.

5.2 Policy Recommendation

The primary purpose of this research was to examine the associations between union contract coverage and other selected variables with income inequality at the metropolitan level. There is, however, also a strong need to consider policies to tackle inequality. Restoring the middle class, and increasing the income share of the poor is actually healthy for our society. While general associations are apparent from the models, different MSAs have different drivers of inequality and impacts, therefore, the nature of appropriate policies would necessarily vary across MSAs, and would also need to take into account MSAs-specific policy and institutional settings, and their implementation constraints.

The consequences of the fall of American labor unions are far beyond the current impacts on worker's welfare. Unions, as a crucial dimension of society and economy in the post-war era, played an important role in creating a thriving American middle class by ensuring a more equitable distribution of income. Where unions are strong, people have more opportunities for better welfare and more equality of income. Therefore, the revival of unionization and the related political environment are the immediate need for the development and stability of our society.

With the rapid growth of technological innovation, higher skill level means higher income. The local government should focus on improving education quality, eliminating financial barriers to

higher education and providing more opportunities for internship programs. These policies can better improve the income prospects of future generations as educated individuals are more capable than others of adapting to this changing world. In developed MSAs, with high shares of secondary graduates among the working-age population, policies should focus on the quality of upper secondary education. In developing MSAs, with currently low levels of education attainment, policies that promote more equal access to basic education could help narrow income disparity by facilitating the accumulation of human capital, and making more equal educational opportunities for the poor. Further, local government, based on local circumstance, should pay more attention to enhancing the opportunities for minority ethnic groups, especially for the black population, and the female population to successfully access the high education and professional occupation which would substantially reduce the racial and gender income gap.

According to Rigby and Wright's (2013) study, the Democratic Party prefers more liberal economic policies that the poor and the middle-income groups hold whereas the Republicans remain responsive to the upper income group on economic issues. Therefore, if the preferences of each income group were equally weighted, parties' stances on economic issues would shift to the left.

Previous works also show that redistribution through the tax and transfer system is a powerful tool in narrowing the income gap between rich and poor. The effects of redistribution on enhanced opportunities for lower-income households and stable social and political environments could potentially promote the growth of our economy. Appropriate fiscal policy could help raise the income share of the poor and middle class, and thus support growth.

MSAs, as spatial-economic units, typically do not have their own governments and institutions, creating a dilemma for policy-making and policy-execution. However, cities do have their own

governmental system and political institutions, which would serve as the generators of local policy.

5.3 Future Research Directions

Further research needs to elaborate on the findings in various directions. Spatial (statistical) analysis may have deeper insights to explain the spatial pattern of income inequality during the study period. More work should also be conducted to investigate the association between income inequality and the working black population as well as the working female population, which could provide more meaningful explanations than my current work. Finally, due to the boundary limitations on the policy perspective, single cities would be an alternative way of studying the local level of income inequality.

In my study I only provide an analysis with few socioeconomic factors, however, based on my results, I found that these explanatory variables could only account for partial changes of income inequality, especially for the relatively large, developed MSAs. Future research should explore more explanatory variables (e.g. IRS tax data, minimum wages, unemployment and mobility, etc.) and employ different methods (such as income group by percentiles) based on data from long time periods.

Appendix.

Median Weekly Earnings, 2004–2014

Quarter	Current dollars			Consumer Price Index for all Urban Consumers (2013 = 100)	Constant 2013 dollars		
	Total	Men	Women		Total	Men	Women
2004 Q1	629	705	562	79.96	787	882	703
2004 Q2	642	715	576	81.10	792	882	710
2004 Q3	635	712	574	81.39	780	875	705
2004 Q4	646	720	577	81.88	789	879	705
2005 Q1	647	723	580	82.39	785	878	704
2005 Q2	647	714	584	83.49	775	855	699
2005 Q3	651	723	588	84.51	770	856	696
2005 Q4	658	730	588	84.94	775	859	692
2006 Q1	662	737	594	85.40	775	863	696
2006 Q2	663	732	597	86.84	763	843	687
2006 Q3	678	755	603	87.33	776	865	691
2006 Q4	681	748	607	86.58	787	864	701
2007 Q1	687	752	610	87.47	785	860	697
2007 Q2	693	765	610	89.14	777	858	684
2007 Q3	698	774	621	89.39	781	866	695
2007 Q4	700	774	615	90.02	778	860	683
2008 Q1	713	783	633	91.05	783	860	695
2008 Q2	722	802	636	93.05	776	862	684
2008 Q3	724	802	637	94.13	769	852	677
2008 Q4	727	806	647	91.47	795	881	707
2009 Q1	732	815	645	91.01	804	896	709
2009 Q2	737	818	652	91.98	801	889	709
2009 Q3	742	820	664	92.60	801	886	717
2009 Q4	747	823	666	92.79	805	887	718
2010 Q1	748	836	662	93.16	803	897	711
2010 Q2	743	813	670	93.60	794	869	716
2010 Q3	745	822	670	93.69	795	877	715
2010 Q4	750	826	676	93.97	798	879	719
2011 Q1	750	821	679	95.15	788	863	714
2011 Q2	754	828	687	96.81	779	855	710
2011 Q3	758	837	682	97.21	780	861	702
2011 Q4	761	838	686	97.06	784	863	707
2012 Q1	765	841	693	97.83	782	860	708
2012 Q2	772	867	686	98.64	783	879	695
2012 Q3	764	838	693	98.86	773	848	701
2012 Q4	772	868	690	98.89	781	878	698
2013 Q1	770	860	700	99.48	774	865	704
2013 Q2	776	862	705	100.02	776	862	705
2013 Q3	778	859	706	100.39	775	856	703
2013 Q4	782	862	712	100.11	781	861	711
2014 Q1	791	867	716	100.88	784	859	710

Note:

Expressed in constant 2013 dollars, median weekly earnings of full-time wage and salary workers were \$784 in the first quarter of 2014, compared with \$787 in the first quarter of 2004. Among women, inflation-adjusted median earnings were \$710 in the first quarter of 2014, compared with \$703 a decade earlier. Inflation-adjusted median weekly earnings of men who worked full time were \$859 in the first quarter of 2014, compared with \$882 in the first quarter of 2004.

These data are from the Current Population Survey. The CPI-U from the Consumer Price Index program is used to convert all dollar values into 2013 dollars.

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