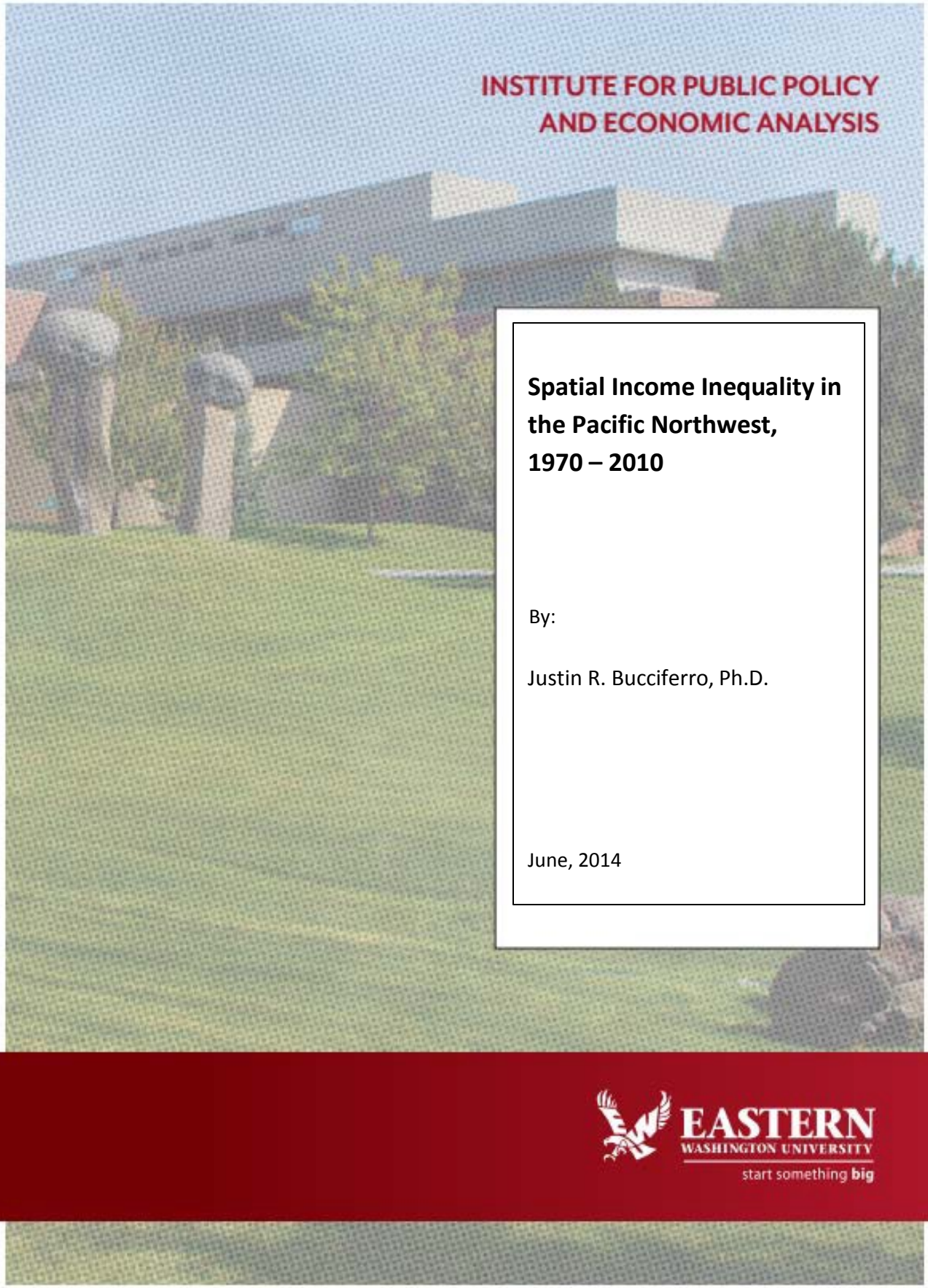


INSTITUTE FOR PUBLIC POLICY
AND ECONOMIC ANALYSIS

Spatial Income Inequality in the Pacific Northwest, 1970 – 2010

By:

Justin R. Bucciferro, Ph.D.

June, 2014

EASTERN
WASHINGTON UNIVERSITY
start something big

Spatial Income Inequality in the Pacific Northwest, 1970 – 2010

By

Justin R. Bucciferro, Ph.D.
Department of Economics
Eastern Washington University
jbucciferro@ewu.edu

June, 2014

FOR
THE INSTITUTE FOR PUBLIC POLICY AND ECONOMIC ANALYSIS
EASTERN WASHINGTON UNIVERSITY

With this latest monograph from the Institute for Public Policy & Economic Analysis, I welcome you to Eastern Washington University. I hope this research will inform your knowledge of the Inland Northwest. Efforts like this Institute monograph series are manifestations of this University's commitment to serve the region. I applaud the initiative of Eastern's Board of Trustees to launch this Institute.

Teaching remains our core mission at Eastern Washington University. Increasingly, teaching and research are interwoven. Our faculty members stay professionally current when publishing in peer-reviewed journals. These achievements, in turn, allow them to better convey the evolving knowledge base of our academic disciplines.

Our students receive an enhanced education if their classroom experience is informed by the content and enthusiasm of their professor's research. Increasingly, we ask students to conduct research projects of their own. Whether conducting their own projects or assisting professors, our students acquire a richer learning experience through research.

Research for academic journals is not the only area our faculty members target, however. Our University also asks its faculty to engage the communities and region from which we draw our students. This research provides a greater sense of place and a commitment by our faculty to it. It also translates academic methods and findings into a broader, and ultimately more relevant, arena: the lives of the residents of the Inland Northwest.

The overarching goal of the Institute for Public Policy & Economic Analysis is to serve the region by translating knowledge. It does this through a variety of activities, including this series, annual economic forecasts, contract research and the Community Indicators Initiative. I invite you to explore its web site (www.ewu.edu/policyinstitute) to learn more.

I have tremendous optimism that by collaborating with EWU's faculty, staff and partners, I will continue to ensure our institution will be anchored into the daily course of life throughout the Inland Northwest. During these difficult economic times, our collective future depends on an educated and informed citizenry. Helping our region reach higher levels of knowledge is something this University can and will do.

My office and that of the Institute director welcome all comments on how we might better serve.

Rodolfo Arévalo, PhD
President

Table of Contents

List of Figures

List of Maps

List of Tables

Executive Summary

Absolute economic equality is neither possible nor desirable. Some inequality can be innocuous, as the wealth of one may pose no harm to another and actually serve to his or her benefit. Beyond some point, however, such inequality becomes undesirable on both moral and economic grounds. Scholars have found that inequality is associated with lower economic growth, poor institutions, and corruption, all of which makes the economy vulnerable to crises. In this monograph, I consider the history and geography of inequality in the Pacific Northwest and nation over the past forty five years, and provide a preliminary analysis of its implications for economic growth.

I define inequality measures and consider their properties; examine income inequality across households and individuals in the U.S. and Pacific Northwest; investigate spatial inequality across counties within the nation and region; and consider the inequality-growth relationship through the correlation of inequality and income growth for U.S. and Pacific Northwest states. I also consider the correlation of inequality at the beginning of each decade and ensuing growth.

Inequality exists in different forms – wages, income, wealth – and among various groups – population, labor force, households. Inequality also has a spatial dimension, which has received increasing interest: all else equal, one would expect regional incomes to converge over time as transportation and communication costs decline. Yet the agglomeration of economic activity is clearly visible, as is class segregation at the local level.

The drivers of the rise in U.S. inequality include: technological change, which has favored skilled workers; structural change, as the economy has shifted away from manufacturing; de-unionization and deregulation, which have lowered protections for workers and their bargaining power; and a tax-and-transfer policy which has increasingly favored the wealthy. Social changes, such as the commonality of the one-parent family, are perhaps as much a symptom of inequality as its cause.

I consider four measures of income inequality: 1) the *coefficient of variation* is the standard deviation of income in a population divided by its mean. This is a measure which does not vary with the level of income (scale-independence) and is reduced by income transfers from rich to poor, and vice-versa (the transfer principle). 2) The *mean log deviation* and 3) the *standard deviation of logarithms* – the average and standard deviation, respectively, of log income from the log mean – are less sensitive to changes in the upper-tail of the income distribution and satisfy scale-independence and the welfare principle (transfers to the poor have a greater impact on reducing inequality); the former measure also satisfies the transfer principle. Finally, 4) the *Gini concentration ratio* captures the proportional deviation of a group's income distribution from the benchmark of perfect equality, and satisfies the transfer principle and scale-independence. It ranges from zero (perfect equality) to one (perfect inequality), although country-level Gini values typically fall between 0.30 and 0.50.

For the U.S., I conclude that household income inequality has been on an upward trend since 1968 according to the Gini concentration ratio, and at least 1974 based on the income ratio of the top-to-bottom quintiles. Over this period, the top quintile's share of national income has surpassed 50% while that of all four other quintiles declined, with the poorest fifth of households receiving just about 3% of total income.

For the 143 counties in the Pacific Northwest – here defined as Idaho, Oregon, Montana (west of 111°W longitude), and Washington – historical data on county inequality are sporadic, so I present a cross-section of average income, income inequality, and population at the county level as of 2000. Across all counties, Madison, ID had the lowest average income ($16,021) and King, WA the highest ($51,222); Clark, ID had the lowest Gini coefficient (0.35) and San Juan, WA the highest (0.52); Camas, ID had the smallest population at 968, and King, WA the largest at 1,739,009.

Distance continues to matter for today's economy. I describe the pattern of spatial inequality by visually identifying differences in inflation-adjusted (real) personal income growth at the county level and Gini coefficients at the state level for both the Pacific Northwest and Continental U.S. over time. For the Pacific Northwest, I present and interpret the values of the four inequality indicators at the state- and region-level.

In the continental U.S., real per-capita income growth between 1969 and 2011 was greatest in the South, and in scattered pockets along the East Coast, Southwest, and Northern Plains. The fact that these areas had relatively low starting incomes indicates convergence across states. At the same time, income inequality across counties *within* each state has increased, and has been persistently high in the Southwest, New York, and Florida. California ranks among the most unequal states today, but this was not always true. Many states on the Great Lakes or Mississippi – and in New England – have notably low levels of spatial income inequality; in the Pacific Northwest it is relatively moderate.

Between 1969 and 2011, per-capita income in Washington was mostly above the national average, as was Oregon's prior to 1980; incomes in Montana and Idaho have lagged the nation. For all states in the region, average incomes roughly doubled in inflation-adjusted terms over this period, although the pace of income growth in Washington outstripped the others.

In the Pacific Northwest, county-level inequality changed in often opposing directions across states, although there was a clear pattern for the region. When viewed via the simple average (not weighted by population) of counties within each state, most of the Pacific Northwest states saw a decline in inter-county inequality during the 1970s/2000s and an increase in the 1980s, but were evenly split for the 1990s. Ignoring state boundaries, the region saw a rise in income inequality across counties during the 1970s, a fall in the 1980s, an increase for the 1990s, and a decrease over the last decade. Of the years considered, spatial inequality was greatest in 2000.

Per capita income growth was most concentrated to the eastern and western portions of the region from the 1970s through 1990s, although it was also robust along the Idaho-Washington border during the 1990s. In the 2000s, there was a noticeable shift, as the fastest-growing counties were those to the east of the Puget Sound. Overall, per capita personal income growth between 1969 and 2011 was largely limited to the coastal counties of Washington and Oregon, and to those stretching from the Rocky Mountains of Montana down through the Snake River Plain of Idaho; several border counties also fared well.

While many different perspectives exist on the acceptable level of income inequality, the issue also bears on an object dear to nearly everyone: economic growth. Does increasing income inequality portend lower economic growth? Across the 48 continental states from 1970 to 2010, my analysis shows that the correlation between the inter-county Gini concentration ratio and average real per capita income growth in the first year of each decade is 0.12 – a positive, but relatively weak association. In other words, an increase in the Gini measure (greater inequality) accompanies positive income growth, but without a strong effect.

The literature suggests that the inequality-growth relationship changes over time, however, so I consider the correlation between the inter-county Gini concentration ratio at the beginning of each decade and average income growth over the subsequent ten years for the Lower 48. The correlation changes notably by decade: from +0.43 in the 1970s, to -0.33 in the 1980s, -0.01 in the 1990s, and -0.11 in the 2000s. In other words, higher initial inequality levels were attendant to lower economic growth from the 1980s through 2000s. For U.S. states, measured at the county level, the overall inequality-growth relationship has weakened and become negative over time.

For the Pacific Northwest states, the correlation of inter-county income inequality, as measured by the Gini ratio, and real per capita income growth at the beginning of each decade was 0.32. Consistent with what was found for the nation overall, greater inequality across counties in the region was associated with higher rates of economic growth. This relationship also varies over time, with an inequality-growth correlation of -0.67 in the 1970s, -0.41 in the 1980s, +0.05 in the 1990s, and -0.36 in the 2000s.

In conclusion, while inequality may be a natural by-product of development it has increased to such a degree that it challenges our long-run prosperity. In recent experience, high inequality predated the largest economic contraction in at least a generation. Forebodingly, the negative relationship between inequality and subsequent growth might even be strengthening. Individuals and households throughout the nation are increasingly unequal, as are counties, states, and regions – trends which will not reverse themselves. The rising returns to high-skilled jobs make education and training of paramount importance; nonetheless, other public policies also have a critical role.

I. **Introduction**

During the last forty-plus years in the United States, income inequality has been on the rise. The share of total income earned by the richest quintile has grown to over 50%, for instance, while that of all other quintiles declined (Current Population Survey). According to the Congressional Budget Office's (2011) tax analysis, the inflation-adjusted, or real, after-tax household income of the richest 1% of the population increased 275% from 1979 to 2007, whereas that of the bottom quintile rose just 18%. The concentration of wealth and income is at its highest point ever: the 400 individuals on Forbes' list of the richest Americans together have a net worth of 2 trillion dollars (Fowler, 2013). To put this in perspective, the combined GDP of sub-Saharan Africa, home to 900 million people, is just 1.3 trillion (World Bank, 2013).

Incomes of the wealthy were certainly hit by the economic crisis, Krugman (2013) explains, "But the rich have come roaring back, to such an extent that 95 percent of the gains from economic recovery since 2009 have gone to the famous 1 percent." As of 2012, the richest decile of the population received over half of the national income and the top 1% alone received over a fifth; the income of "the 99%" grew by about a point that year – not much compared to the 20% income growth of the top 1% and the 32% growth of the top 0.1% (Lowrey, 2013).

The U.S. stands out when compared to other developed countries. According to the Gini coefficient – an inequality index which ranges from zero to one, complete equality to inequality, described later in this section – the U.S. was the most unequal of the G7 nations as of 2008 with a Gini coefficient of about 0.38 compared to 0.34 in the next-most unequal country, the United Kingdom (OECD, 2011); among 28 OECD nations, the U.S. was the third-most unequal, surpassed only by Mexico (0.48) and Turkey (0.42). American Community Survey data indicate that, over 2006 to 2010, the most unequal U.S. counties tended to be in the South and the most equal in the Midwest. The Pacific Northwest was more heterogeneous, with counties at both extremes of the national range (U.S. Census Bureau, 2012).

Whether inequality is natural and unavoidable or a social ill that must be treated is a contentious issue, but research suggests that it can present a barrier to economic growth (Berg and Ostry, 2011). The nation's imbalanced distribution of income has received much attention, but equally-important trends in income disparities within and across regions – spatial inequality – have been overlooked. I examine the experience of the Pacific Northwest over the past four decades; in particular, county-level income growth and inter-county measures of inequality for the area spanning Washington, Oregon, Idaho, and Western Montana. This region has many commonalities, but also exhibits heterogeneous local paths of development.

I illustrate shifting spatial inequality by mapping the cumulative change in per-capita income by county at ten-year intervals (1970, 1980, 1990, 2000, and 2010) using data from the Bureau of Economic Analysis. I tabulate four measures of inter-county inequality: the Gini concentration ratio, coefficient of variation, mean log deviation, and standard deviation of logarithms, all described below and in greater detail in

Appendix I, at both the region- and state-level. I also examine national inequality trends using household income data from the Census Bureau.

Economic development has traditionally been synonymous with urbanization. Economies of scale and the migration of skilled labor, for instance, have prompted rapid urban growth at the expense of rural areas. I find that nationwide, counties with a low initial level of income tend to grow faster than more affluent counties, lending support to the convergence hypothesis which stipulates that incomes tend to approach a common level over time. Within the Pacific Northwest, however, agglomeration of economic activity is also evident: the coastal and mountain zones have experienced sustained economic growth while much of the intermediate area has stagnated or experienced only moderate growth.

Income and inequality have both increased over time, but the nature of their relationship is unclear. By correlating changes in inequality with county-level personal income growth, I ascertain whether an inverse inequality-growth relationship may hold for our area. Consistent with other scholarship, I find that the relationship between inequality and economic growth is nonlinear; that is, inequality can be associated with strong economic growth but also make the economy more vulnerable to economic crises.

The goal of this monograph is to enhance our understanding of local and regional shifts in relative well-being, at a time when inequality is a heated issue of debate. Although people have different positions on 'the inevitability of inequality', it is impossible to have a meaningful conversation without knowing what has actually transpired.

1.1 Inequality of What and for Whom?

In discussing inequality, it is particularly important to specify "inequality of what and among whom." Inequality exists in wages, earnings, income, and wealth, and among individuals, workers, and households (OECD, 2011). There is also inequality of consumption, perhaps a better long-term indicator because of year-to-year income fluctuations (Johnson and Shipp, 1995). I briefly consider the differences between alternative units of analysis, notwithstanding that each concept has many possible definitions.

To begin, disparities in hourly wages differ from annual wages because there are both part-time and full-time workers. "Earnings" comprise wages plus other work remuneration, whereas "income" comprises all returns, including wages, rent, interest, and profit; among those with the highest incomes, for instance, labor income has come to exceed capital income in recent decades (Saez and Piketty, 2006). Consumption is more stable than wages, earnings, or income, and suggests moderate changes in well-being (Johnson and Shipp, 1995). Wealth inequality, in contrast, is acute: the richest 10% of households own roughly 90% of stock (Lowrey, 2013). I focus on income because it is a broad concept that directly reflects changes in relative well-being somewhere between what would be indicated by either consumption or wealth.

The total population differs from the working-age population, which excludes youth under 16, active military, and the institutionalized; the labor force further excludes full-time students, retirees, and others not seeking work. Although the working-age population has grown, the proportion of men in the labor force declined from 83% to 70% between 1960 and 2010, while that of women increased from 37% in
1960 to 60% by 2000 (Bade and Parkin, 2013). Individual earnings, in turn, differ from household or family earnings because the latter vary in size and number of workers. To be as inclusive as possible, I focus on the entire population.

1.2 Spatial Inequality

Individuals' geographic location is by no means random: areas with greater access to trade, for instance, tend to be more wealthy and populous. Inequality of income across individuals therefore only addresses one dimension of inequality – essentially treating people as if they all lived on a speck of dust – and can be misleading. The geography of inequality, i.e. spatial inequality, refers to the relative well-being of people or groups in different locations, such as districts, cities, counties, states, regions, or countries. The recent rise in income inequality in the U.S. is largely undisputed; however, the evolution of spatial inequality is debatable as results depend on the unit of analysis and indicator considered.

The literature on spatial inequality is in ways an extension of the economic growth literature of the 1990s which evaluated the extent of cross-country income convergence. The theory that countries' incomes approach some common level as they develop does not have empirical support; rather, each country is believed to reach its own static level given its particularities ("conditional convergence"). The notion of convergence applies equally-well to sub-national units, and the early consensus was that the average incomes of U.S. states were, in fact, becoming more-equal (e.g. Barro and Sali-i-Martin, 1991).

The economic geography literature which followed saw things differently. It recognized that the migration of skilled labor to fast-growing areas of the U.S. accelerated regional disparities. By considering both the potential for economies of scale and mobility of labor and capital, these models predicted the agglomeration of economic activity (Combes, Mayer, and Thisse, 2008). In other words, high demand for labor in urban centers and the corresponding rewards to skilled workers prompts their migration, leaving behind peripheral areas with place-bound workers and thus broadening the economic divide.

In contrast to international studies, the evidence on spatial development across U.S. states supports income convergence, but with qualifications: According to Glaeser (2013), the rate of regional income convergence has slowed, and spatial disparities will continue to exist. Escurra & Pascual (2009) find state-level convergence of income inequality over 1969-99, but not convergence in income per se. Lynch (2003) merges IRS and Census data and affirms: "states with relatively low average family income in 1988 tended to have more rapid growth in average family income over the 1988-99 period than did states with relatively high average family incomes in 1988," (p. 572-3).

Yet within large cities, disparities accentuated: during the 1970s and 1980s, "residential dissimilarity" between rich and poor families in the largest metropolitan zones rose by 6 and 8

percent, respectively, while "class segregation" rose by 13 and 10 percent (Massey and Fischer, 2003). According to Fan and Casetti (1994), regional shifts in income inequality were driven by changes in the relative importance of sectors, like manufacturing and services, and globalization.

1.3 Why Should We Care?

Inequality is to some extent inevitable because people have different skills and face different circumstances. Moreover, equality of one sort, say income, necessarily implies inequality of another, like well-being: for example, a person of wealth is better-off with a given income than one who is poor, as is a healthy person opposed to one who is ill (Sen, 1992). At some level, however, the degree of income inequality exceeds what would be considered as fair or just (Wolff, 2009). Recent evidence suggests that income inequality may prompt instability and conflict, and present a barrier to our long-run economic prosperity.

Berg and Ostry (2011) of the International Monetary Fund find that more-unequal countries tend to experience shorter periods of economic growth; this is commensurate with the model presented by Alesina and Rodrik (1994). In his analysis of census data, Rajaram (2009) observes that counties with lower levels of poverty and inequality in 1980 tended to grow faster in the subsequent decade, while fast-growing counties in the decade preceding 2000 had lower average levels of poverty and inequality in that year. Rajan (2010) and Drennan (2011) hold that inequality made the recent recession more severe as households borrowed to maintain their level of consumption in the face of falling incomes.

The comparative development of countries is related to their historical levels of inequality: in highly unequal societies in the Americas, elites maintained their advantage by limiting suffrage and not investing in public education, thereby causing lower subsequent per-capita incomes (Sokoloff and Engerman, 2000). Easterly (2007) and Nunn (2008) confirm that in areas with geographies favorable for slavery or where there were large slaveholdings, people tend to be relatively worse-off.

The inadequate provision of public goods, like education or roads, is a major channel through which inequality stifles economic growth. The wealthy use their political power to resist higher taxes – which could be used to increase our economic potential through public education, infrastructure, and basic research – while lobbying for policies which restrict competition (Stiglitz, 2013). These actions are referred to as rent-seeking, and produce a vicious cycle in which inequality limits social mobility and fosters anti-trade sentiment (OECD, 2011).

Once thought of as unavoidable in the course of economic growth, income inequality is now viewed differently: the OECD suggests countries consider policies to mitigate increasing inequality (Lowrey, 2012). Firebaugh (2003) affirms, "Today there is more to go around than ever before and, with regard to poverty, the issue is not whether we are producing enough, but how evenly the total product is being distributed," (p. 12-13).

1.4 Causes of Inequality

Many factors are behind the increase in income inequality over the last forty years. I group potential driving forces into the following categories: 1) technological and structural change, 2) public policy (taxes and transfers), 3) deregulation and trade liberalization, 4) de-unionization and secondary employment, and 5) human capital and social trends. There is an extensive scientific literature on each of these topics, a full discussion of which is beyond the scope of the monograph.

Technological progress has led to increasing demand for high-skilled workers. The widespread diffusion of information technology has raised the productivity of skilled workers, while at the same time displacing unskilled labor (OECD, 2011). According to Wolff (2009), investment in office, computer, and accounting equipment per worker had the greatest impact on income inequality, explaining 44-52% of its rise between 1968 and 2000. Furthermore, shifts in the relative importance of different industries, e.g. manufacturing versus services, noticeably influenced the geography of wages.

Piketty and Saez (2004) contend that the increasing polarization of income cannot be accounted for by skill-biased technological progress alone. Hacker and Pierson (2010) argue that public policy, rather, is the main source of income disparities over the past four decades. Aside from corporate subsidies and personal deductions, top marginal income tax rates were cut in half between the Carter and G.W. Bush presidencies, from 70% to 35% (Stiglitz, 2013). In addition, taxes on inheritances and capital gains were lowered, further benefiting the wealthy.

As public policy shifted in favor of the rich, the real value of the minimum wage declined: between 1968 and 1998, it fell from $7.49 to $5.15 in 1998 dollars (Pollin and Luce, 1998). Today, the federal minimum wage of $7.25 – about $5.40 in 1998 dollars – has essentially the same purchasing power as it did fifteen years ago (U.S. Department of Labor). At this level, it is difficult for minimum-wage workers to afford basic necessities (Weisberg, 2004).

Across nations, regulatory reforms, such as reduced competitive barriers, labor market flexibility, and minimum wages, had offsetting results, the OECD (2011) explains. On balance, however, they prompted wider earnings inequality. After the mid-1990s, the report infers, tax and benefit policy worked less to counteract rising income inequality due to higher, but less progressive benefits; progressive taxation, at lower levels; and a flat, capped, social security tax.

The rising gap between high- and low-skilled workers is also related to globalization. The aforementioned study found that trade and financial openness did not significantly affect wage inequality or employment among OECD countries, although foreign investment and technological change did. For Latin America, one of the most-unequal regions in the world, Bucciferro (2010) concludes that so-called neoliberal reforms augmented the degree of both inequality and poverty, with the exception of trade openness.

Wolff (2009) identifies declining unionization as the second-most important cause of inequality in recent decades, explaining 36-44% of its rise over the 1968 to 2000 period. Union workers earn, on average, more than non-union workers, he explains, and the post-1950s decline in union membership is partly responsible for increased earnings inequities among male workers. He also cites the growth in 'secondary employment' – jobs with low wages and benefits, poor working conditions, and no security or opportunity for advancement – as a factor behind greater income inequality.

The demand for skilled workers has grown due to technological progress, but the size of the educated workforce has also expanded to help meet this demand: In 1940, only 4.6% of adults had completed four years of college, compared to 30.9% in 2012 (U.S. Census Bureau, Current Population Survey). The reward to education has been increasing in real terms but, at the same time, the real earnings of lower-skilled workers have declined (Schiller, 2008).

Access to education can remedy inequality, yet access is by no means equal. Family background affects the level of human capital both through at-home investments and educational attainment; education may actually reinforce class differences at the same time that it serves to reduce them (Wolff, 2009). Gender and race discrimination are other dimensions through which the persistence of inequality may be understood.

There has been great progress towards gender pay equality, yet the stagnation of male wages hints at a broader negative trend. According to Drennan (2011), "the 2009 male median wage is only 1.6 percent higher than it was 35 years ago. The female median real wage, although lower than the males', has grown 33 percent from 1974 to 2009," (p. 8). Nonetheless, women still earn less, on-average, than men and their greater representation in the labor force implies a reduced overall level of wages. Racial minorities' wage gap remains wide, ensuring the persistence of inequality, particularly between African-Americans and whites.

Finally, changes in family composition have created greater inter-household inequality. The OECD (2011) finds that, across member countries, there are more single-headed households with and without children; simultaneously, couples where both husband and wife have high-paying jobs are more common. In the U.S., 59% of black children and 90% of white children lived with two parents in 1970, compared to just 35% and 74% in 2005 (Wolff, 2009). In single-parent households, there is one less source of income and a greater incidence of poverty. As the economy expands, race, gender, and class barriers accentuate standard- of-living disparities.

1.5 Measures of Inequality

There are several ways to gauge income inequality, each with distinct attributes. At the basic level, the dispersion of income across groups of households or individuals can be captured by the difference between, or the ratio of, the richest and poorest groups' average incomes. A fallback of such concentration measures, however, is that they provide no information about the spread of income across intermediate groups. There are several further considerations to make when selecting among alternative inequality indicators.

Desirable properties include scale independence, the transfer principle, and the welfare principle. Scale independence requires that the measure be independent of the level of doubled, the metered amount income: for instance, if everyone's income of inequality should remain unchanged. The (Pigou-Dalton) transfer principle specifies that the indicator rise if income is transferred from a poor to rich person and, conversely, fall. The welfare principle entails that a given transfer have a greater impact at lower income levels.

I employ four inequality measures – the *coefficient of variation*, *mean log deviation*, *standard deviation of logarithms*, and *Gini concentration ratio* – and, in Appendix 1, consider the extent to which they satisfy these properties. Each indicator takes a value of zero when all individuals have equal incomes (perfect equality), and a value of one or are unbounded when income concentrates with a single person (perfect inequality).

The coefficient of variation is the standard deviation of income normalized by the sample mean. The mean log deviation and standard deviation of logarithms are, respectively, the average and standard deviation of log income from the log mean. The Gini concentration ratio captures the deviation of the cumulative distribution of income from perfect equality. These are general and intuitive measures which satisfy most, if not all, of the properties listed above.

1.6 Outline of the Report

The study area includes all counties in Idaho (44), Oregon (36), and Washington (39), plus those in Western Montana (24), defined here as west of 111°W. In total, 143 counties corresponding to the area presented in Figure 1. This region, referred to as the Northwest or Pacific Northwest, spans a roughly 400-mile radius around Spokane, Washington.

Figure 1. Area of Study

Source: Google Maps (Accessed 4/2013).

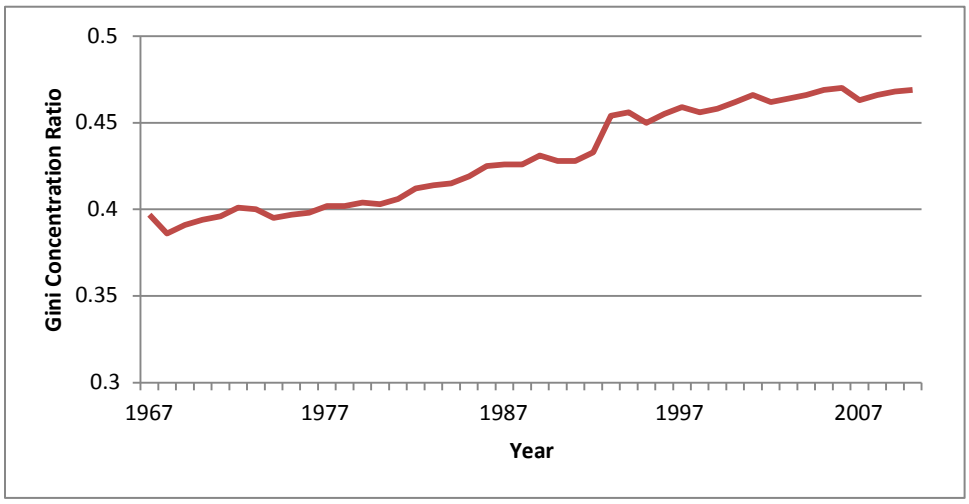
I compile indices of inequality at the county, state, regional, and national level and consider how they have evolved over the period between ca. 1970 and ca. 2010. I refer to household income data compiled from the Current Population Survey and personal income figures from the Bureau of Economic Analysis;

2. Income Inequality 1970 to 2010

2.1 United States

The following figures were made using time-series data for households from the U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplements. The data range from 1967 to 2010 and income figures have been adjusted to 2010 dollars using the research version of the Urban CPI. Note that these figures are for households, and are correspondingly higher than those for individuals. Figure 2 displays the time-path of the Gini concentration ratio, as calculated by the Census Bureau (recall that the Gini coefficient ranges from zero to one, perfect equality to perfect inequality).

Figure 2. Household Income Inequality in the U.S., 1967-2010

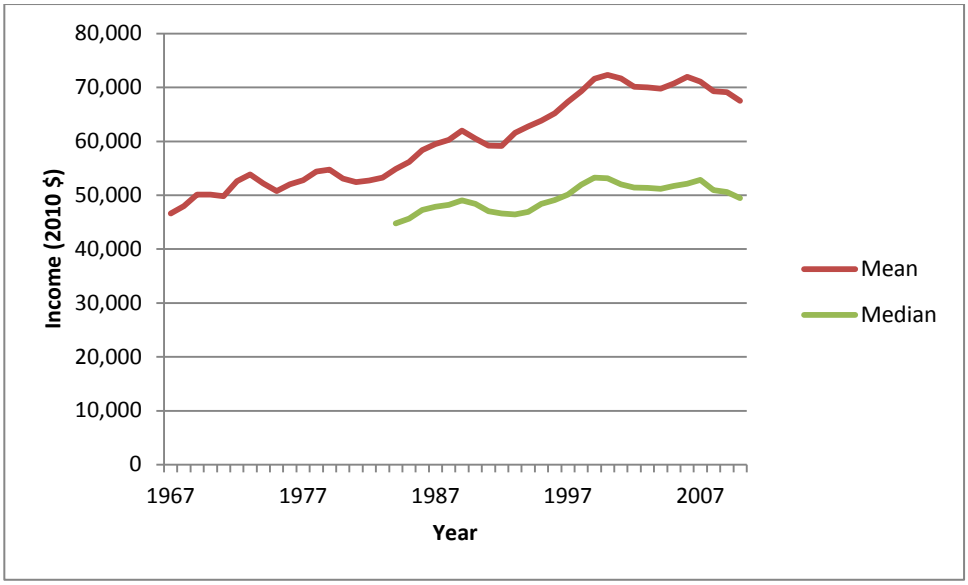


Source: U.S. Census Bureau, Current Population Survey

There was a notable increase in household income inequality in the U.S., as shown by the Gini concentration ratio, during this period. The Gini ranges from a low of 0.386 in 1968 to a high of 0.470 in 2006, slightly above its current level. Although the nation has become more unequal, it is also the case that mean and median household incomes have increased.

The difference between the mean and median income is itself a measure of inequality because of the income distribution's rightward-skew; i.e. some households with very high incomes raise the average above that of the typical household. In their case, the median gives a better sense of the "middle value" of the distribution. Mean and median real household income series are presented in Figure 3.

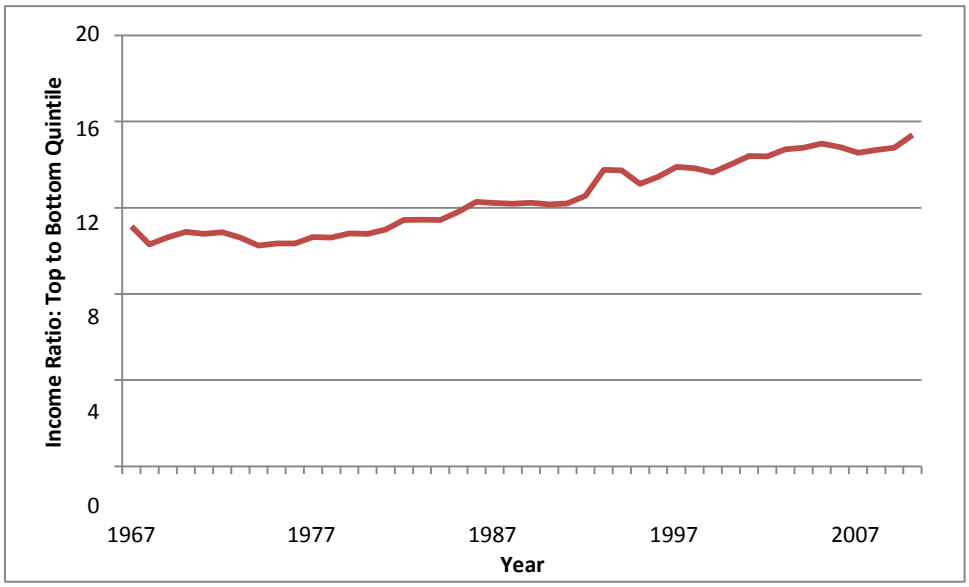
Figure 3. Growth Paths of Mean and Median Household Income in the U.S., 1967-2010



Source: U.S. Census Bureau, Current Population Survey (2010 Dollars)

In 2010, the average household income in the sample exceeded the median by $18,085 whereas in 1984, this difference was just $10,091 – the mean/median gap expanded by about $8,000. Considering that mean household income (in 2010 U.S. dollars) rose $12,637 over this period (from $54,893 to $67,530), it is apparent that the bulk of income gains in recent decades has accrued to households with incomes far above the median.

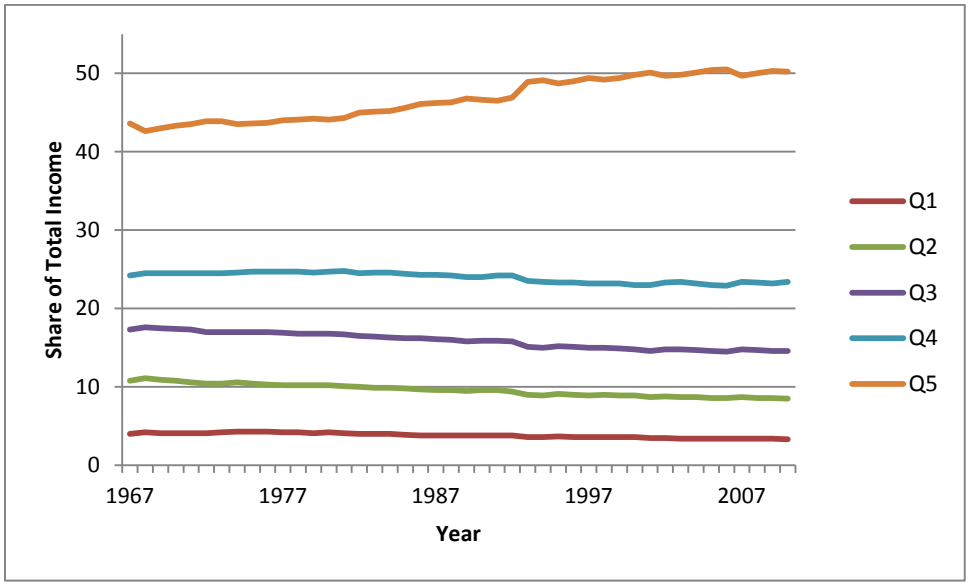
Figure 4. Ratio of Top to Bottom Household Income Quintile in the U.S., 1967-2010



Source: U.S. Census Bureau, Current Population Survey

An alternative measure of inequality is the ratio of the average income of the richest 20% of households to the average income of the poorest 20% of households (i.e. the income of the 5th quintile divided by that of the 1st). This series is shown in Figure 4. The average real income of the top 20% of households in the sample for 2010 is about $170,000, compared to $11,000 for the bottom 20% – a ratio of 15.5 to 1. At its low in 1974, this ratio was just 10.25 to 1 ($114,000 for the top compared to the same $11,000 for the bottom quintile).

Figure 5. Household Income Shares by Quintile in the U.S., 1967-2010



Source: U.S. Census Bureau, Current Population Survey

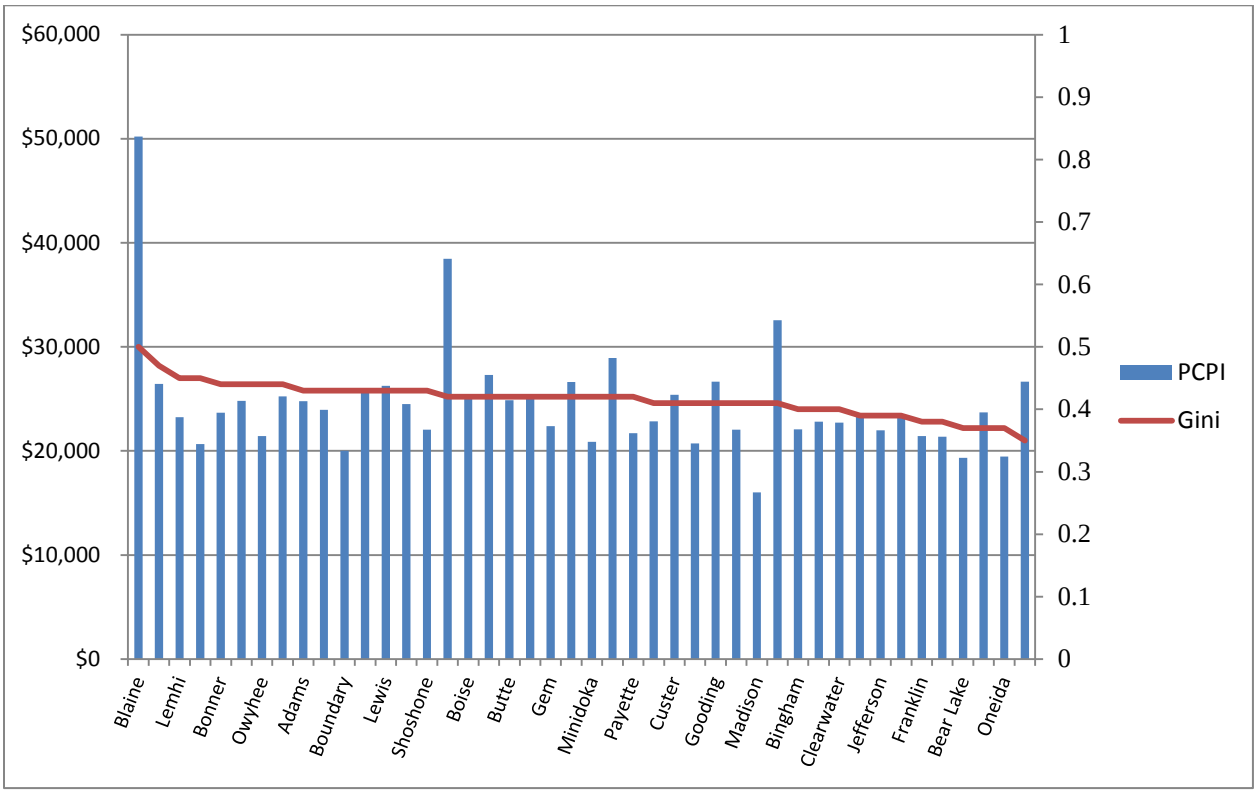
Increasing inequality in the U.S. over the past four-to-five decades is largely driven by income growth among the richest 20% (and particularly the richest 5%) of households. As shown in Figure 5, the share of aggregate income earned by households in the top quintile has grown since 1968, while the income shares of all other quintiles have declined.

To illustrate, the average incomes of the first four quintiles in 2010 were $11,000, $29,000, $49,000, and $79,000; income growth of the highest-earning households has not only outpaced that of the working-, but also those of the middle- and upper-middle classes.

2.2 The Pacific Northwest

In Figures 6 through 9, I illustrate the relationship between Pacific Northwest counties' average personal income and Gini concentration ratio as of 2000. These statistics, and the population of each county, are also described in Appendix 2. I represent inequality for a single year because Gini time-series are not available at the county- or state-level; of the years for which county-level Gini's are accessible, I chose the millennium because it is relatively recent and coincides with the peak in intra-regional inequality. Each graph is ordered left-to-right by counties whose Gini values range from the highest (most unequal) to lowest (most equal).

Figure 6. Gini Concentration Ratio and per Capita Personal Income in Idaho Counties in 2000

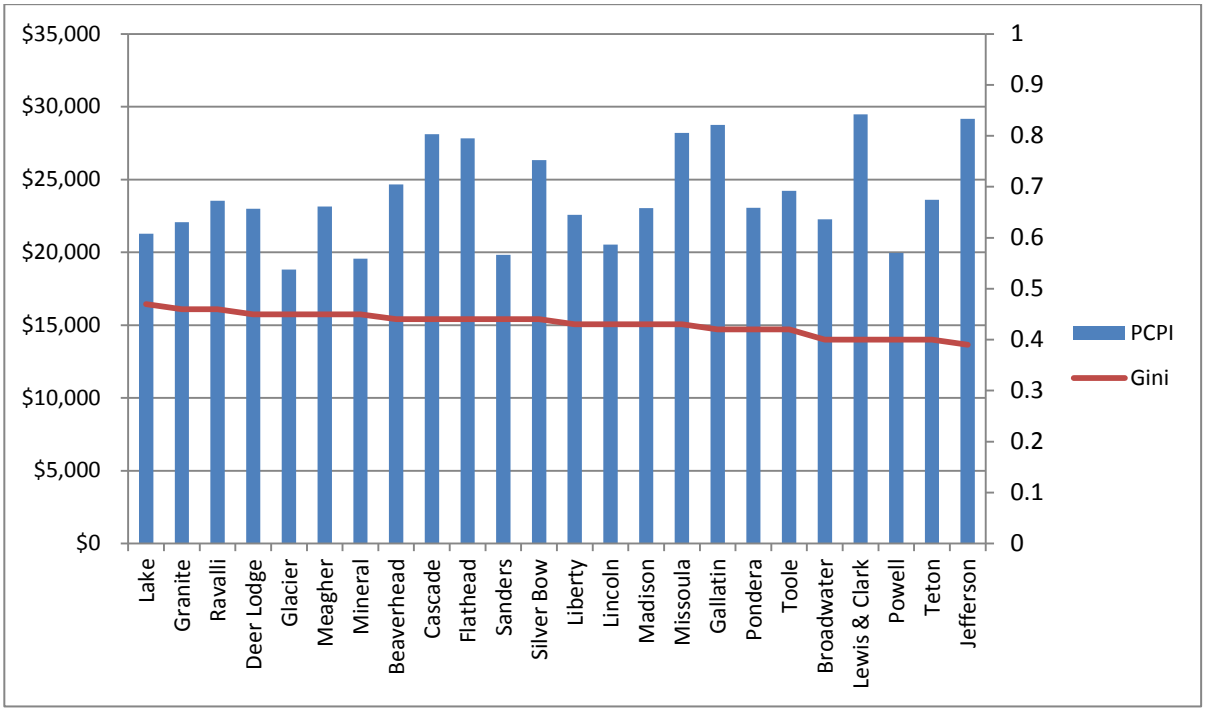


Sources: Gini Concentration Ratio - Census Bureau, American Community Survey; per Capita Personal Income - Bureau of Economic Analysis, translated into 2005 Dollars (using NIPA Implicit GDP Price Deflator).

The range of values for each variable is revealing: In Idaho, county mean income stretched from $16,021 (Madison) to $50,226 (Blaine); Gini concentration ratios from 0.35 (Clark) to 0.50 (Blaine); and population from 968 (Camas) to 303,328 (Ada).

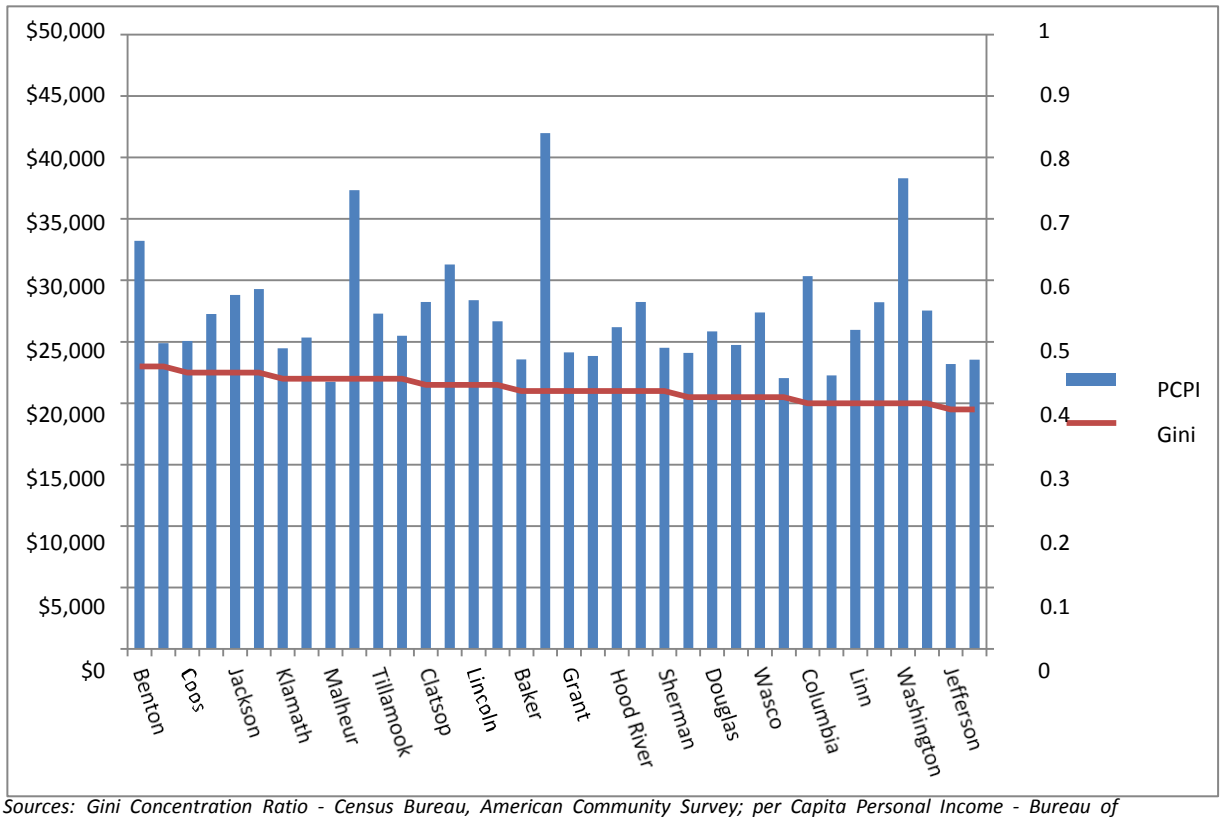
Among the 24 counties considered in Montana, per capita income ranged from $18,822 (Glacier) to $29,466 (Lewis and Clark); Gini coefficients from 0.39 (Jefferson) to 0.47 (Lake); and population from 1,916 (Meagher) to 96,178 (Missoula).

Figure 7. Gini Concentration Ratio and per Capita Personal Income in Western Montana Counties in 2000



Sources: Gini Concentration Ratio - Census Bureau, American Community Survey; per Capita Personal Income - Bureau of Economic Analysis, translated into 2005 Dollars (using NIPA Implicit GDP Price Deflator).

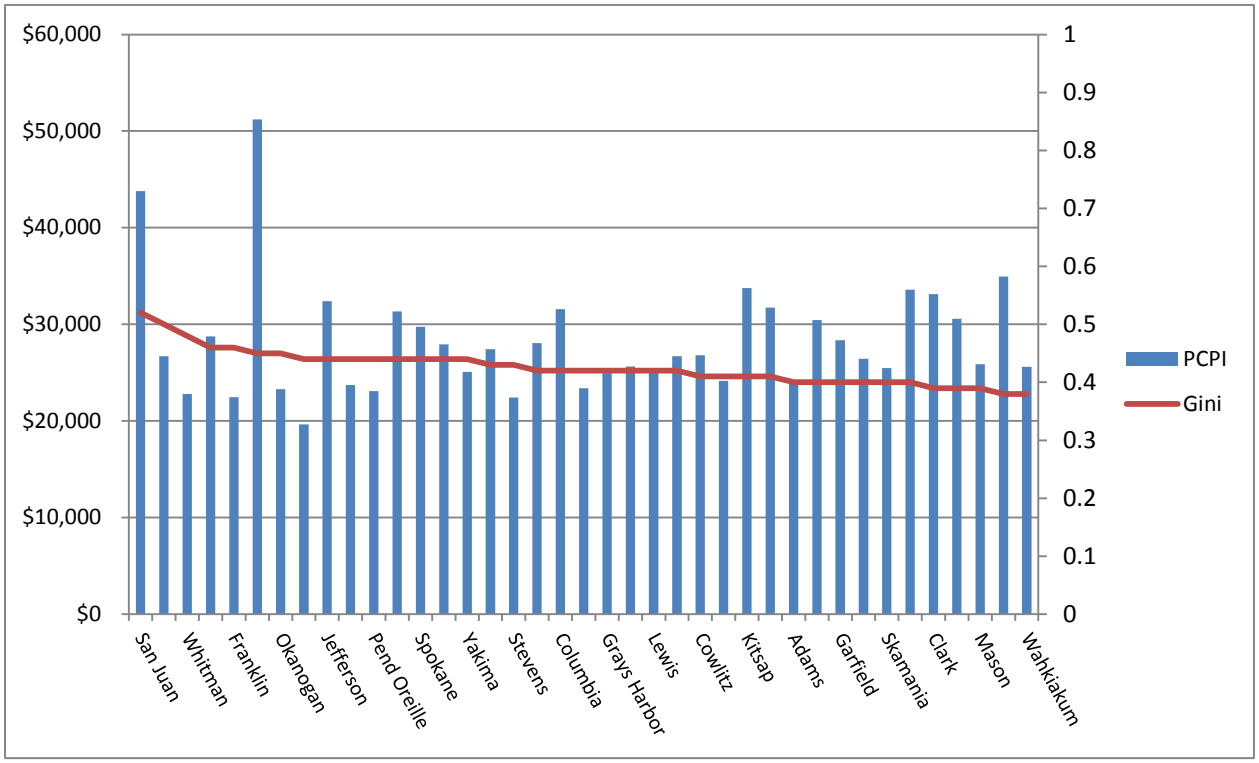
Figure 8. Gini Concentration Ratio and per Capita Personal Income in Oregon Counties in 2000



Sources: Gini Concentration Ratio - Census Bureau, American Community Survey; per Capita Personal Income - Bureau of Economic Analysis, translated into 2005 Dollars (using NIPA Implicit GDP Price Deflator). Not all counties could be identified on the graph; see Appendix 2 for the detail.

In Oregon, average income ranged from $21,745 (Malheur) to $41,981 (Clackamas); Gini ratios from 0.39 (Jefferson/Morrow) to 0.46 (Benton/Josephine); and population from 1,546 (Wheeler) to 661,654 (Multnomah). Finally, the range of per capita income in Washington was from $19,638 (Ferry) to $51,222 (King); Gini coefficients from 0.38 (Snohomish/Wahkiakum) to 0.52 (San Juan); and population from 2,383 (Garfield) to 1,739,009 (King).

Figure 9. Gini Concentration Ratio and per Capita Personal Income in Washington Counties in 2000



Sources: Gini Concentration Ratio - Census Bureau, American Community Survey; per Capita Personal Income - Bureau of Economic Analysis, translated into 2005 Dollars (using NIPA Implicit GDP Price Deflator).

Counties with the largest populations tended to have an elevated degree of income inequality as measured by the Gini coefficient. Furthermore, populous counties tended to have higher incomes (King County is a case-in-point, with a population and average income well in-excess of the state median). Altogether, there is a wide dispersion of income both within (gauged by Gini ratios) and across (judged by differences in average income) counties in this region. In the next section, I investigate whether county incomes have become more or less equal in the Pacific Northwest and the country as a whole.

3. Spatial Income Inequality

Despite the breakdown of trade barriers, communication and transportation innovations, and all the various other processes associatedwith globalization, distance continues to matter. As a consequence, absolute income convergence among regions or counties is infeasible. According to Combes, Mayer, and Thisse (2008), the reduction in trade costs has led to the convergence of good prices, but not necessarily of incomes: nominal wage gaps persist because of differences among types of firms and workers, plus the tendency for firms to locate close to suppliers of intermediate goods, leading to the agglomeration of economic activity.

To complicate matters, every political unit (e.g. state) is affected by what happens everywhere else. Formally, this is known as spatial autocorrelation which, when unaccounted for, biases traditional estimates of income convergence. Rey and Montouri (1999) and Rey (2001) highlight the importance of such spatial interdependence for analyses of regional income inequality, as well as Rajaram (2009) who concludes that spatial parameters are 'significant determinants of growth'.

The theory of agglomeration detailed by Combes et al. suggests that increased trade and factor mobility actually leads to the divergence of regional incomes, except under extremely low transport costs. Overall, this thesis does not appear to hold, save for large metropolitan areas relative to the rest of the country.

The incomes of places with a large number of skilled workers like Silicon Valley have taken-off, explains Glaeser (2013), what Moretti calls the "Great Divergence." Yet, inequality across all areas has not necessarily increased very much.

Inequality across space can be as important as inequality across individuals. Persson and Tabellini (1994) and Alesina and Rodrik (1994) provide models in which inequality impedes economic growth in democratic societies because voters favor a more-redistributive tax policy, thus undermining incentives. This mechanism has a straightforward spatial analog, although of a different orientation than what Massey and Fischer (2003) propose:

> Residents of high-income households in affluent communities (with high property values) will have an incentive to tax themselves at low rates to provide good public services, while poor people living in poor communities (with low property values) will have to tax themselves at high rates if they are to receive services that even approach the quality of those offered in more affluent communities… Thus, the simultaneous occurrence of rising socioeconomic inequality and growing class segregation portends a society that is divided not only geographically, but also socially and politically as well (p. 1-2).

The remainder of this section contains a series of maps and graphs illustrating spatial inequality in the region and nation. I highlight county-level disparities in economic growth and compare state Gini coefficients which reflect inter-county inequality. I also tabulate the values of four inequality measures (coefficient of variation, mean log deviation, standard deviation of logarithms, and Gini concentration ratio) by state and decade. State measures are the result of treating the county incomes equally; that is, no attempt is made to weight by population in arriving at the summary figures (which would indicate greater inequality than shown here).

3.1 United States

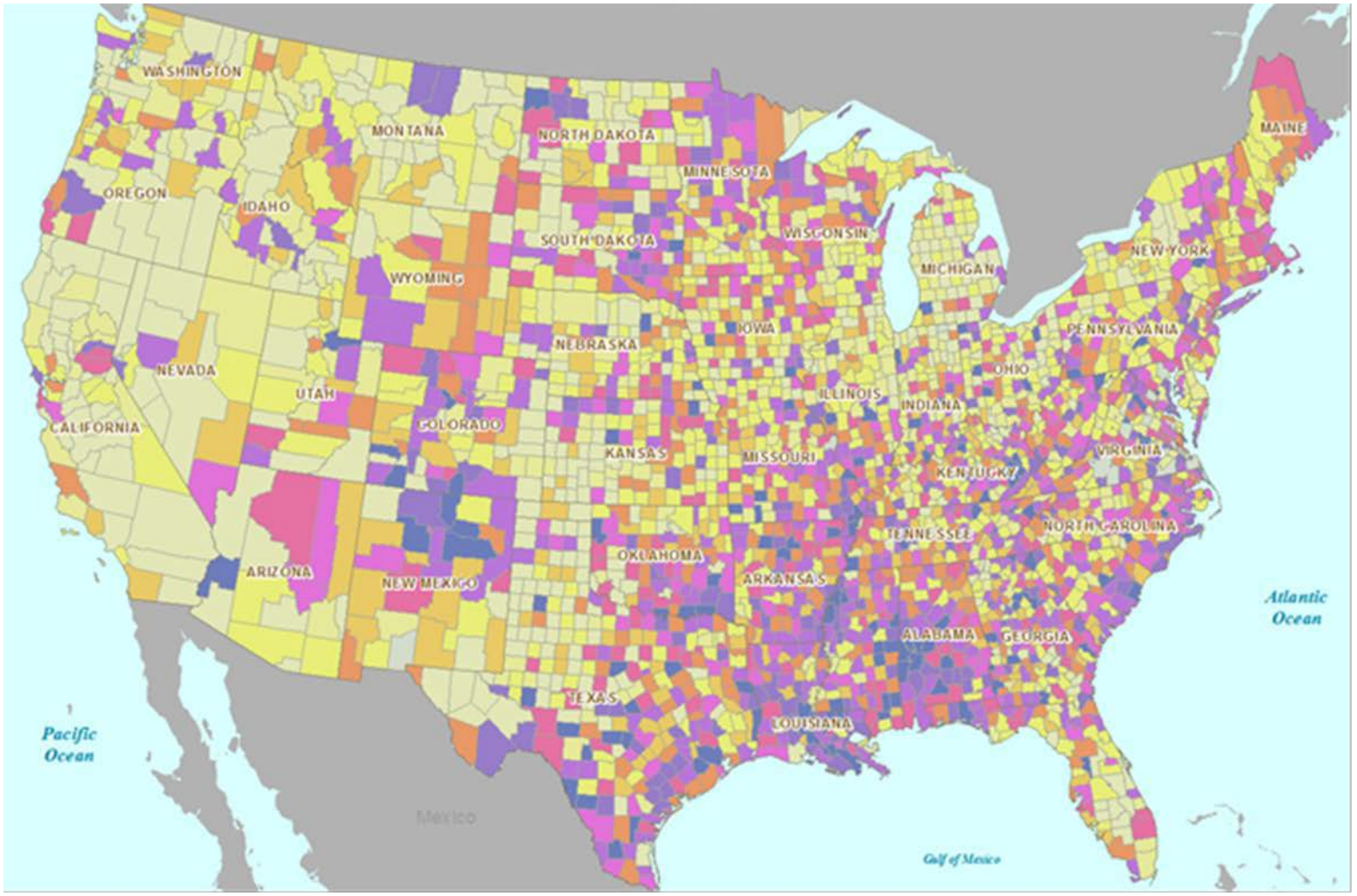
Map 1 illustrates the average annual growth rate of real per capita income for 3,070 counties in the continental U.S. between 1969 and 2011. The color-coding is a ten-class quantile categorization, with darker shades indicating faster rates of growth. Quantile class breaks are preferred over absolute breaks because they highlight relative inequality in the sample.

The county averages reveal substantial heterogeneity, but some patterns are clear: the South experienced rapid rates of economic growth, as well as parts of the Eastern Seaboard, the Southwest, Minnesota, and the Dakotas.

The map offers evidence of income convergence because Southern counties, which exhibited above-average growth, had relatively low initial incomes. Conversely, income growth rates on the West Coast lagged the rest of the country, perhaps because of its high starting income.

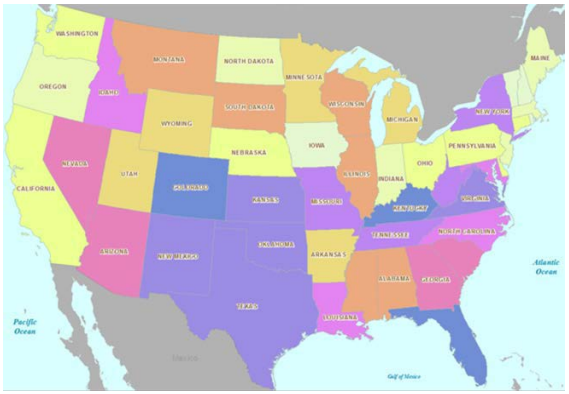
To evaluate how U.S. income inequality has changed over time, I construct the Gini coefficient for each state, treating each county and its average income as an "individual," and consider the results at ten-year periods. As stated above, the Gini coefficients are not weighted by population, thereby giving each county equal consideration. Map 2 separately presents the state Gini values at the beginning of each decade and the average over these five periods.

Map 1. Average Annual U.S. County Real Personal Income Growth, 1969-2011



<1.4% …… >2.6%

Map 2. State Gini Coefficients (Personal Income across Counties), 1970 – 2010

1970	1980	1990
		
0.035.....0.134	0.021.....0.169	0.033.....0.148
2000	**2010**	**Average**
		
0.057.....0.184	0.057.....0.152	0.041.....0.147

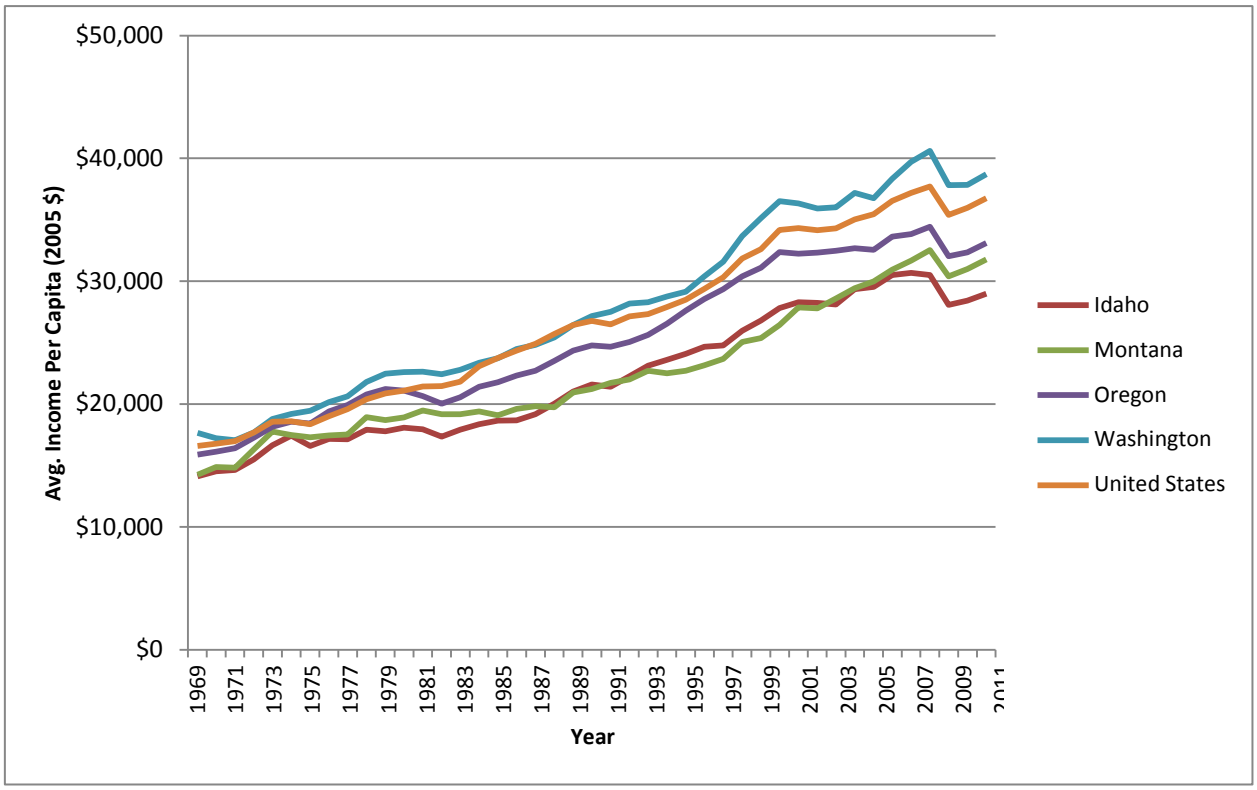
In 1970, a cluster of high inter-county inequality is evident in the Southwest, a condition which has persisted to some extent until the present. Over time, California became more unequal relative to the rest of the country, while New York maintained an elevated level of inequality between 1970 and 2010. The experience of other regions has been mixed but, by and large, the degree of intra-state inequality has not lessened. The Midwest has remained the most equal in terms of income disparities.

These maps must be interpreted with care. The scale for each panel varies, with the Gini coefficient peaking at 0.184 for the most-unequal state as of the year 2000. States are sorted by quantile, so the color pattern captures *relative* – not absolute – shifts in equality (until recently, states have generally become more unequal).

3.2 The Pacific Northwest

I present similar metrics for the Pacific Northwest – cumulative per capita income growth and state Gini coefficients – as well as region-wide measures of inter-county inequality. Figure 10 shows the trend of average real per capita personal income (in 2005 US Dollars) between 1969 and 2011 for the five Pacific Northwest states considered here, contrasted with the nation as a whole.

Figure 10. Real per Capita Income Paths for Pacific Northwest States, 1969-2011



Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Income Division (2012); per capita personal income figures converted into 2005 Dollars using National Income and Product Accounts, Implicit GDP Price Deflator (2012).

Washington state income per person has historically been at or above the national average, with the exception of two years in the late 1980s; Oregon's has lagged the nation since about 1980, whereas Montana and Idaho have experienced strictly lower average incomes over this period. The real incomes of all four states have roughly doubled over the past forty years, but the gap between them has widened more than proportionally. Table 1 presents the average county income, its standard deviation, and the values of the four inequality indices by state and decade. At the bottom of the table, these statistics are presented for all counties collectively (not the state average, but the dispersion of income across counties irrespective of state). Overall, county income inequality rose between 1970 and 1980, fell between 1980 and 1990, increased from 1990 to 2000, and declined by 2010.

Table 1. Pacific Northwest Inter-County Measures of Real per Capita Income Inequality

	Idaho *(n=44)*				
	1970	*1980*	*1990*	*2000*	*2010*
Mean	$14,485	$17,396	$20,490	$24,525	$27,492
Standard Deviation	$2,898	$2,778	$5,213	$5,371	$5,559
Coefficient of Variation	0.20	0.16	0.25	0.22	0.20
Mean Log Deviation	0.017	0.012	0.024	0.018	0.018
Standard Deviation of Logarithms	0.178	0.151	0.209	0.181	0.185
Gini Coefficient	0.099	0.086	0.114	0.095	0.100
	W. Montana *(n=24)*				
	1970	*1980*	*1990*	*2000*	*2010*
Mean	$14,432	$17,405	$20,342	$23,875	$28,666
Standard Deviation	$3,174	$2,302	$3,109	$3,271	$3,800
Coefficient of Variation	0.22	0.13	0.15	0.14	0.13
Mean Log Deviation	0.020	0.008	0.011	0.009	0.009
Standard Deviation of Logarithms	0.192	0.127	0.148	0.133	0.131
Gini Coefficient	0.108	0.072	0.084	0.076	0.074
	Oregon *(n=36)*				
	1970	*1980*	*1990*	*2000*	*2010*
Mean	$15,498	$20,568	$21,985	$27,239	$29,239
Standard Deviation	$2,331	$4,342	$2,538	$4,518	$4,672
Coefficient of Variation	0.15	0.21	0.12	0.17	0.16
Mean Log Deviation	0.009	0.016	0.006	0.012	0.011
Standard Deviation of Logarithms	0.132	0.169	0.107	0.149	0.146
Gini Coefficient	0.071	0.086	0.059	0.083	0.080
	Washington *(n=39)*				
	1970	*1980*	*1990*	*2000*	*2010*
Mean	$16,001	$20,446	$22,683	$28,261	$31,166
Standard Deviation	$2,507	$2,934	$3,547	$5,916	$5,329
Coefficient of Variation	0.16	0.14	0.16	0.21	0.17
Mean Log Deviation	0.011	0.010	0.011	0.018	0.013
Standard Deviation of Logarithms	0.145	0.143	0.146	0.184	0.157
Gini Coefficient	0.080	0.075	0.081	0.103	0.088
	Pacific NW States *(n=143)*				
	1970	*1980*	*1990*	*2000*	*2010*
Mean	$15,144	$19,028	$21,440	$26,118	$29,131
Standard Deviation	$2,766	$3,545	$3,966	$5,299	$5,166
Coefficient of Variation	0.18	0.19	0.18	0.20	0.18
Mean Log Deviation	0.0148	0.0151	0.0148	0.0173	0.0143
Standard Deviation of Logarithms	0.168	0.171	0.169	0.180	0.167
Gini Coefficient	0.094	0.095	0.092	0.100	0.093

Source: County per capita income figures are from the Bureau of Economic Analysis, and were adjusted into 2005 dollars. Note: 'Western Montana' includes only those counties located mostly to the west of 111°W longitude.

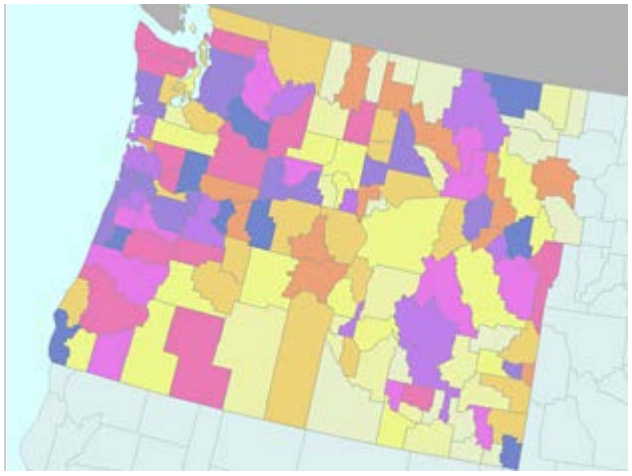
There are some common patterns across states: spatial inequality declined in Idaho, Western Montana, and Washington between 1970 and 1980, and then increased by 1990; in Oregon, the opposite occurred. By 2000, inequality dropped in both Idaho and W. Montana, but increased in Oregon and Washington. In the most-recent period, inter-county inequality declined in W. Montana, Oregon, and Washington; in Idaho, depending on the measure, it either declined (coefficient of variation), was flat (mean log deviation), or increased (standard deviation of logarithms/Gini coefficient) – a phenomenon which may reflect the thinning-out of the middle of the distribution.

Maps 3 and 4 illustrate the relative paths of real income growth across counties by decade and for the entire 1970 to 2010 period, respectively. I use a different scale than in earlier maps to highlight regional income changes; as before, the contrast between lighter and darker areas represents inequality across space.

Looking at Map 3, it appears that growth during the 1970s, 1980s, and 1990s clustered to the eastern and western extremes of the region. During the 1990s and 2000s, it accelerated along the Idaho-Washington border and, in the 2000s, shifted inward from the coast towards the Cascades.

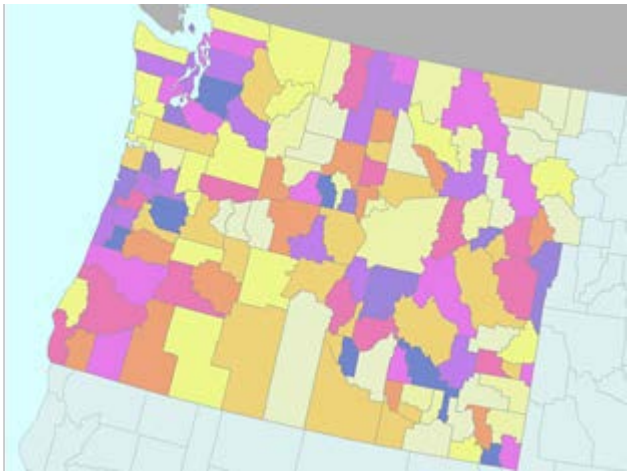
Map 3. Cumulative per Capita Income Growth (%) in Pacific Northwest Counties, 1970-2010

1970-1980



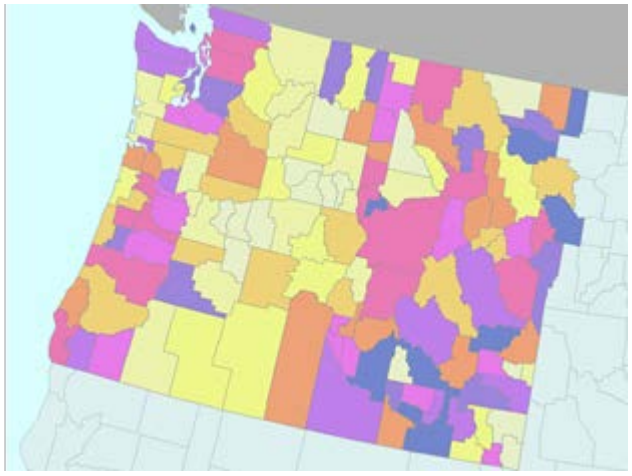
-20.....66

1990-2000



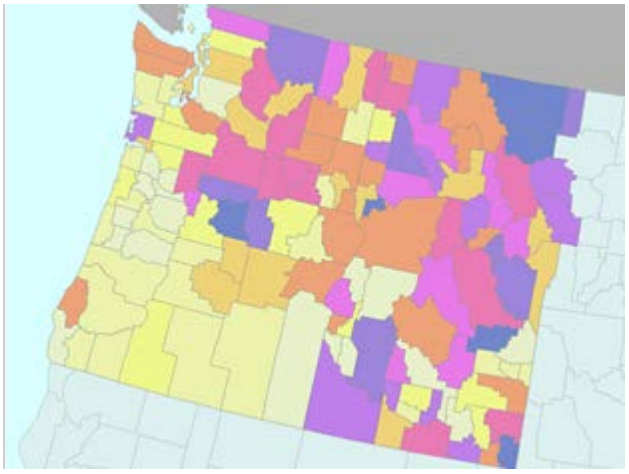
-41.....49

1980-1990



-39.....79

2000-2010

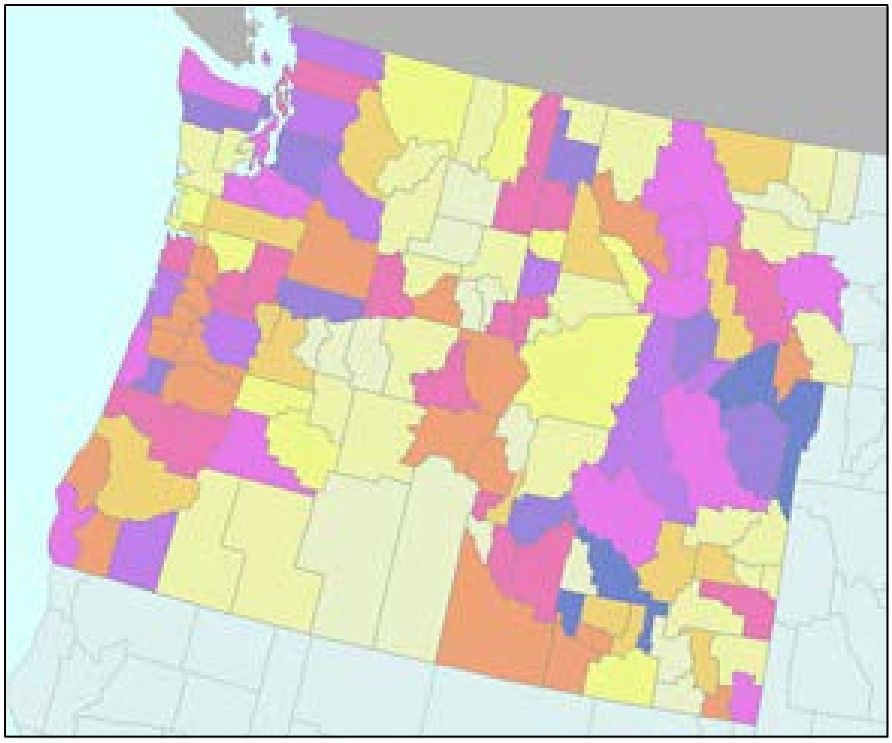


-10.....88

The most compelling overview is provided by Map 4, which shows the average annual growth rate of real, per capita income over these 42 years. Economic growth was notably higher on the Pacific coast and in the mountain zone, with strong growth in the latter area resembling a crescent.

Although the average difference appears minor, consider that a sustained 2% growth rate means that average county income doubles roughly every 36 years. For many inland counties, however, there was on-average no income growth over this period.

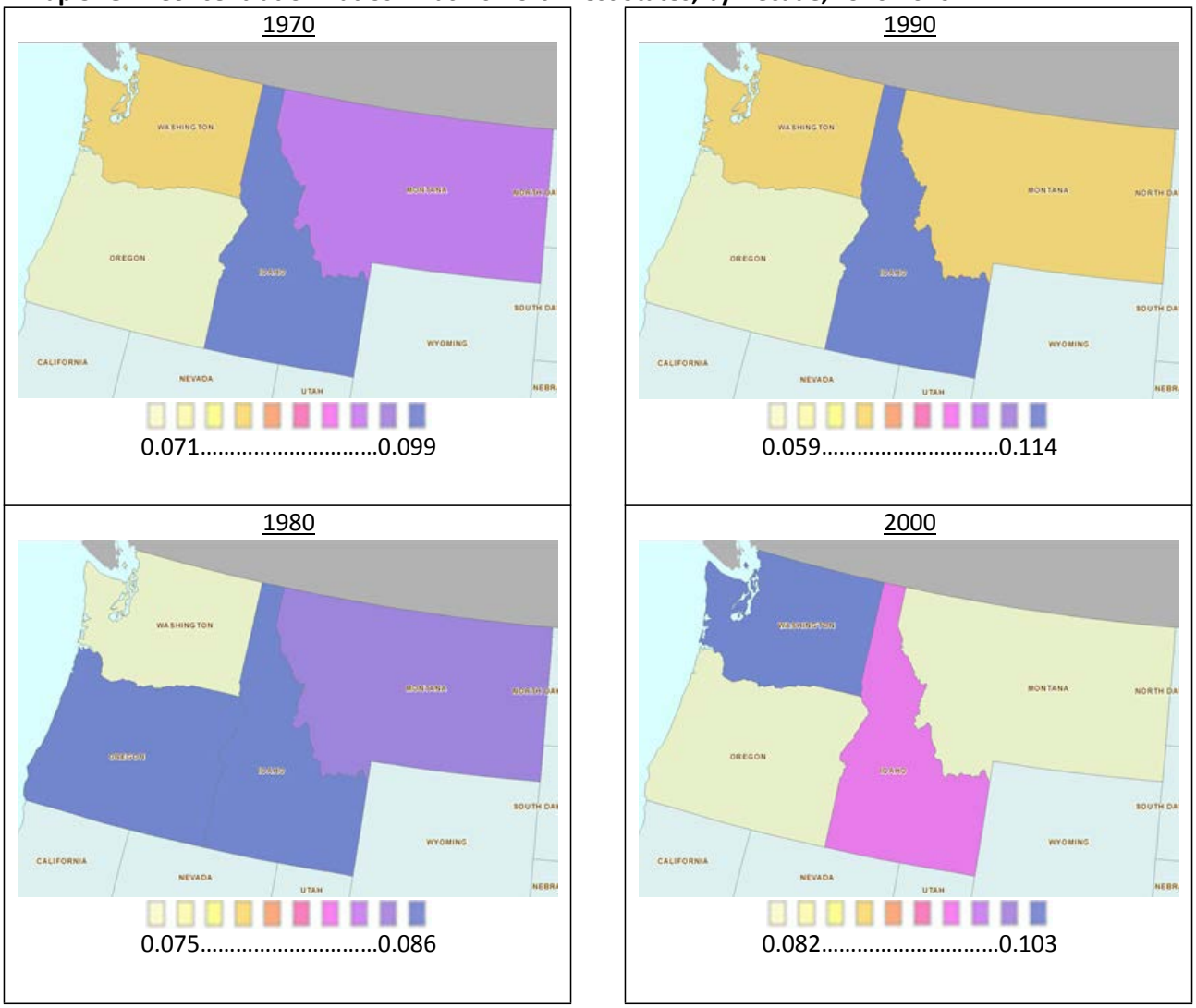
Map 4. Annual Income Growth (%) in Pacific Northwest Counties, 1969-2011

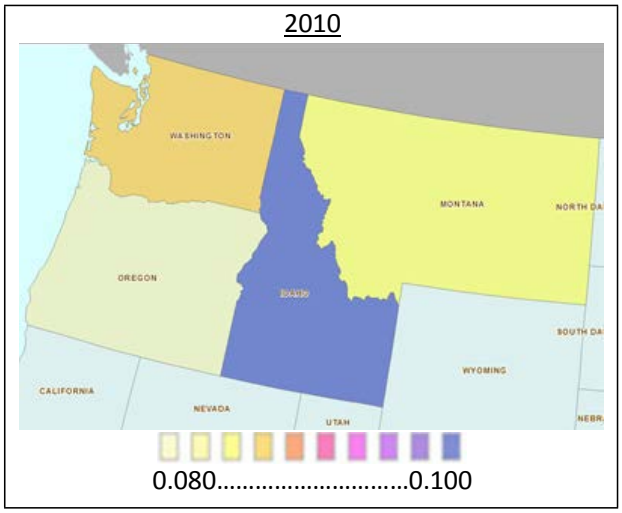


-0.6……2.5

Map 5 permits comparison of intra-state Gini coefficients at the beginning of each decade, using the same methodology as described for the nation (and shown in Map 2). When limited to state lines, the divergence of county incomes is less evident: the magnitude of inequality in Western Montana moderated, while in Washington it augmented over the 1980s and 1990s and then dropped post-Great Recession. Idaho was relatively unequal, although less-so in 2000; Oregon was relatively equal, with the exception of 1980. From this perspective, region-wide inequality as represented by the Gini coefficient does not seem altogether different now than in previous decades.

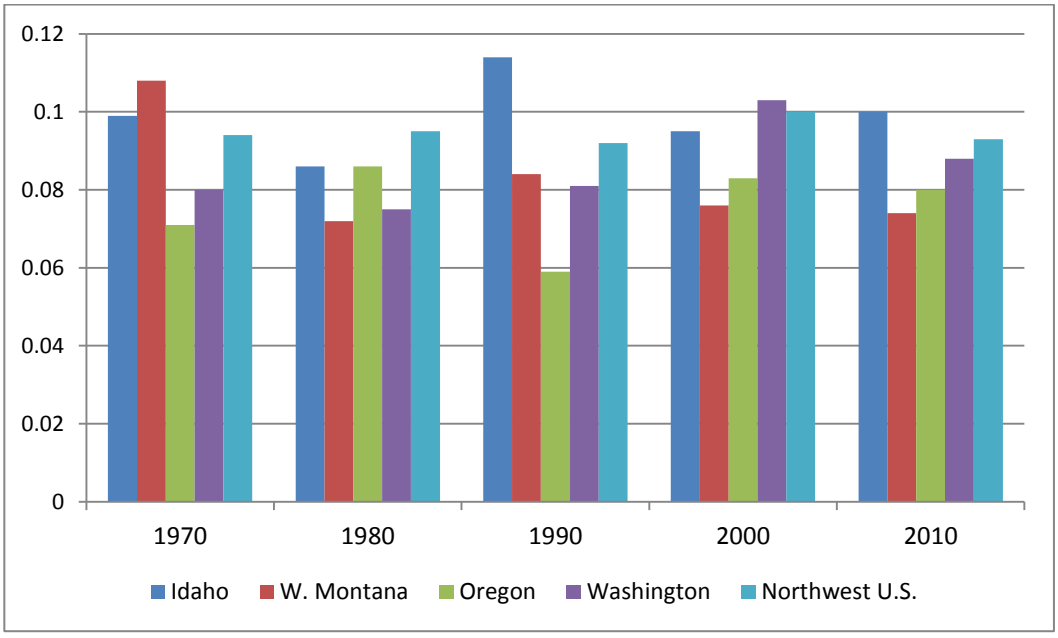
Map 5. Gini Concentration Ratios – Pacific Northwest States, by Decade, 1970-2010





In a different light, the temporal changes are substantial. The income of each county is an average of thousands (and potentially over a million) individuals: what are otherwise small income differences become rather meaningful. Suppose, for instance, that in 2000 the average income of residents in King County was $76,222 instead of $51,222. The inter-county Gini concentration ratio for Washington would then be 0.122 instead of 0.103 – an increase of almost 0.02. With that in mind, consider the alternative presentation of inter-county Gini coefficients shown in Figure 11. Although a $25,000 windfall for everyone would be incredible, the corresponding rise in the Gini coefficient (regardless of that county's population) is just two-thirds of the increase Idaho experienced during the 1980s and below that of Washington in the 1990s.

Figure 11. Inter-County Gini Coefficients, Pacific Northwest States 1970-2010



Source: Author's calculations using per Capita Personal Income figures from the Bureau of Economic Analysis, expressed in 2005 dollars based on the GDP price deflator.

4. The Inequality-Growth Relationship

Inequality may simply be an undesirable by-product of economic growth. According to Kuznet's (1955) inverted-U hypothesis, inequality increases during the early phases of economic growth, levels-off, and then declines as a country develops. This was a contentious claim when he made it, and no less-so today. The inequality-growth relationship appears to vary over time and across regions, but as of yet has not commenced the downward trend Kuznets portended.

Attempts to quantify the effects of growth on inequality have yielded inconsistent results sensitive to the econometric specification employed. Banerjee and Duflo (2003) attribute the variability of existing estimates to the non-linearity of this relationship. Accordingly, they use nonparametric methods – techniques which do not presume the structure of the relationship between variables – and find for a cross-section of countries that both increased inequality *and* equality are associated with reduced growth. Frank (2009) deals with nonlinearity by using multiple estimators and concludes that inequality in U.S. states between 1945 and 2004, as measured by the top decile income share, was positively related to economic growth.

The application of improved econometric techniques has not resolved the controversy. Frank's results are consistent with work by Li and Zou (1998) which aimed to refute the Alesina-Rodrik (1994) and Persson-Tabellini (1994) claim that inequality reduces growth. On the other hand, Banjeree and Duflo's research provides some support for what Fan and Casseti (1994) call the "obsolescence" of the inverted-U hypothesis.

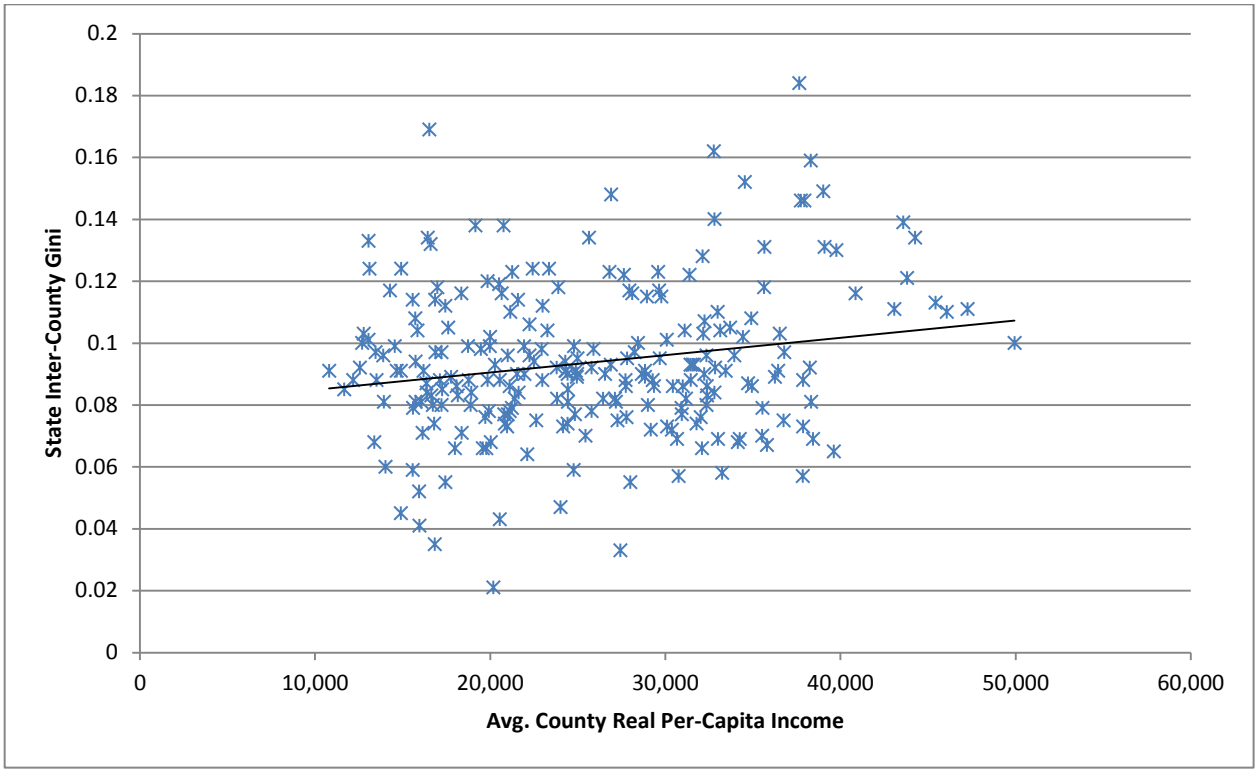
Recent scholarship betokens a consensus that inequality is harmful for long-run economic growth. Berg and Ostry (2011) consider the length of economic expansions with regards to the disparity of income within countries and conclude: "longer growth spells are robustly associated with more equality in the income distribution…Inequality still matters, moreover, even when other determinants of growth duration… are taken into account," (p.3). Correspondingly, the Federal Reserve has come to suggest that income inequality be included among its economic targets and the President has made it one of his central policy issues (Stieber, 2013).

I consider the association of spatial income inequality, measured by the state inter-county Gini concentration ratios, and the level and growth rate of annual real per capita income from 1970 to 2010. There is a complex relationship between inequality and the level of income, on the one hand, and its growth rate, on the other. Economists contend that the average level of income rises until it plateaus (and then grows as population and technology allow). The growth rate of income, correspondingly, may rise and then fall (or steadily fall) as economies develop.

In Figure 12, I present a scatterplot and linear regression of the inter-county Gini coefficients on the average level of county real per-capita income for the continental U.S. states in 1970, 1980, 1990, 2000, and 2010 (48 states x 5 years = 240 combined observations).

The Kuznets' hypothesis is that inequality rises and then declines with the level of income, tracing an upside-down "U". Inequality may resolve itself when incomes rise, the notion goes, yet no such curve is perceptible for U.S. states, at least as regards the geographic spread of income. If anything, income inequality is on a moderate but steady uphill climb.

Figure 12. Correlations between County Gini Concentration Ratios and per Capita Personal Income Levels for 48 States, 1970-2010



Source: Gini concentration ratios calculated by author using Bureau of Economic Analysis per capita personal income figures.

Now, consider income inequality's relationship to the *growth rate* of income. Table 2 presents the average inter-county state Gini coefficients and growth rates, and the correlation of the Gini concentration ratio and real per-capita income growth separately for the 48 continental U.S. states, comprising 3,070 counties, and the four Pacific Northwest states, encompassing 175 counties including all of Montana. (The correlation coefficient captures the extent to which two variables move together and is bound between -1 and +1.)

Table 2. Income Inequality-Growth Correlation, 1970-2010

Continental U.S. States				
Avg. State Gini Coefficient	0.094	Avg. Real Income	1970	$15,663
Avg. Annual Growth Rate	1.89	"	1980	$20,004
Correlation Gini/Growth Rate	0.120	"	1990	$25,184
(n=240)		"	2000	$32,477
		"	2010	$34,855
Pacific Northwest States				
Avg. State Gini Coefficient	0.086	Avg. Real Income	1970	$15,695
Avg. Annual Growth Rate	1.83	"	1980	$20,177
Correlation Gini/Growth Rate	0.318	"	1990	$23,692
(n=20)		"	2000	$30,792
		"	2010	$32,410

The correlation between the annual Gini concentration ratios and per capita real income growth is 0.12 for the Lower 48 states – positive but rather weak. For the Pacific Northwest the correlation is 0.32, indicating that higher inequality is also generally associated with accelerated economic growth.

Although the overall inequality-growth relationship is positive, its sign could change over time; indeed, this is commensurate with what Kuznets argued and why nonparametric estimation is warranted. In Table 3, I examine the correlation between states' initial level of inequality, as measured by the Gini coefficient, and their average annual income growth rate over the following decade.

Table 3. Income Inequality and Growth Correlation by Decade

Continental U.S. States						
Avg. Gini Coefficient	1970	0.088	Avg. Growth Rate	1970s	2.49	
"	1980	0.092	"	1980s	2.15	
"	1990	0.094	"	1990s	2.20	
"	2000	0.102	"	2000s	0.93	
"	2010	0.093				
Correlation 1970 Gini and Avg. Growth Rate		'70s	0.43			
"	1980	"	'80s	-0.33		
"	1990	"	'90s	-0.01		
"	2000	"	'00s	-0.11		*(n=48)*
Pacific Northwest States						
Avg. Gini Coefficient	1970	0.085	Avg. Growth Rate	1970s	2.48	
"	1980	0.083	"	1980s	1.40	
"	1990	0.083	"	1990s	2.38	
"	2000	0.091	"	2000s	0.78	
"	2010	0.089				
Correlation 1970 Gini and Avg. Growth Rate		'70s	-0.67			
"	1980	"	'80s	-0.41		
"	1990	"	'90s	0.05		
"	2000	"	'00s	-0.36		*(n=4)*

The relationship between spatial income inequality and later growth in the continental U.S. states is positive for the 1970s, but negative from the 1980s through 2000s. In the Pacific Northwest, this association is positive during the 1990s, but negative for other decades. The region's experience differs from that of the nation, yet both sets of findings substantiate a nonlinear inequality-growth relationship, potentially driven by periods of financial crisis.

The data presented in Tables 2 and 3 have alternative interpretations. On the one hand, they do not preclude the possibility that inequality rises with the level of income and then falls when incomes plateau, in-line with Kuznet's claim. In this case, however, one would expect to see the level of inequality and subsequent income growth eventually decline together (a positive correlation). This may have yet to occur, but during the last half- century it has not and, and as Keynes ominously reminded, 'in the long- run we are all dead'.

On the other hand, these results support the notion that inequality can have an independent, causal effect on the growth rate of income via channels such as rent-seeking. In three out of the four decades, higher initial inequality was associated with lower income growth over the next ten years. In accord with Rajaram (2009), a vicious cycle may exist in which income inequality – among individuals in one location or across cities, counties, states, and regions – becomes self-sustaining and deleterious.

5. Conclusion

I describe the status of income inequality among individuals/households and across space using U.S. Census and Bureau of Economic Analysis data from ca. 1970 to present, paying careful attention to exactly what is being measured and for whom. Inequality is important for many reasons other than fairness: it can be self-reinforcing and inhibit long-run economic growth and political stability. Technological change, public policy, deregulation, and employment insecurity are all contributing factors to the decades-long rise of U.S. income inequality.

There are several more-or-less intuitive inequality measures, each with unique properties. The Gini concentration ratio is the most-common, but the coefficient of variation and mean log deviation/standard deviation of logarithms are useful complements because they weigh changes in income differently depending on where they take place along the distribution. These measures point to a secular increase in income inequality in the U.S. from at least 1974 to present. In the Pacific Northwest (defined here as Washington, Oregon, Idaho, and Western Montana), higher-income and more-populous counties tend to have a greater extent of inequality.

Across U.S. states and counties, there was convergence of incomes during the sample period, as initially poorer areas experienced faster rates of growth. At the regional level however, there was divergence or greater inequality. Average cross-county inequality in the Northwest rose between 1970 and 1980, waned by 1990, reached a high in 2000, and then declined. In this region, the coastal and mountain zones realized the fastest growth.

The relationship between inequality and economic growth, long a contentious topic, has recently become better-understood. The inverted-U hypothesis, which holds that inequality rises during the early phases of development and then falls, has received less empirical support than theories of political economy or agglomeration, in which wealth begets wealth thus widening the economic breach between the haves and have-nots.

Specialists' thinking has experienced a reversal in the midst of public debate over the implications of our nation's heightened economic inequality. Income inequality can make the country vulnerable in many ways and has long-run implications for our standard of living. Whether it can be restrained without causing other damage is unclear, but there is broad support for strategies which promote equality-of- opportunity through education and job training. Lessening income inequality does not portend killing the proverbial golden goose, although it may ruffle some feathers.

Appendix 1 – Measures of Inequality

A.1.1 Coefficient of Variation

The distribution of income in a population is described by its mean and standard deviation; the first is a measure of "central tendency" and the later of "spread." The standard deviation itself expresses inequality, but does not permit a meaningful comparison across groups or over time because it increases proportionally with average income. Accordingly, the standard deviation (σ) is normalized by the sample mean (μ) to create the coefficient of variation (CV).

(1)
$$\mu = \frac{1}{n}\sum_{i=1}^{n} y_i \qquad \sigma = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(y_i - \mu)^2}$$

$$CV = \frac{\sigma}{\mu}$$

The mean (μ) is the sum of individual incomes (y_i) divided by the number of observations (n). The standard deviation (σ) is the square root of the average squared deviation from the mean (the differences are squared and then the square root is taken so positive and negative deviations do not cancel each other out). The CV is the ratio of the standard deviation (σ) to the mean (μ).

The CV is a relative measure of inequality which takes a value of 0 when all incomes are equal (σ = 0) and approaches infinity under perfect inequality. It exhibits the properties of scale independence and the transfer principle, but not the welfare principle because income transfers at all levels are treated equally. Its drawbacks are that it is unbounded, does not capture the distribution's skewness, and is sensitive to redistribution at high income levels (Wolff, 2009).

A.1.2 Mean Log Deviation/Standard Deviation of Logarithms

It is possible to construct inequality measures which are less sensitive to the upper-end of the income distribution by taking natural logarithms of individual and mean income. Income distributions are typically skewed rightward (most individuals have moderate incomes while a few have extraordinary ones) and taking logarithms balances them. I consider two indicators in this class: mean log deviation (MLD) and the standard deviation of logarithms (SDL), the average difference and standard deviation, respectively, of log income from the log mean.

$$MLD = \frac{1}{n}\sum_{i=1}^{n}(\ln(\mu) - \ln(y_i))$$

(2)

$$SDL = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(\ln(\mu) - \ln(y_i))^2}$$

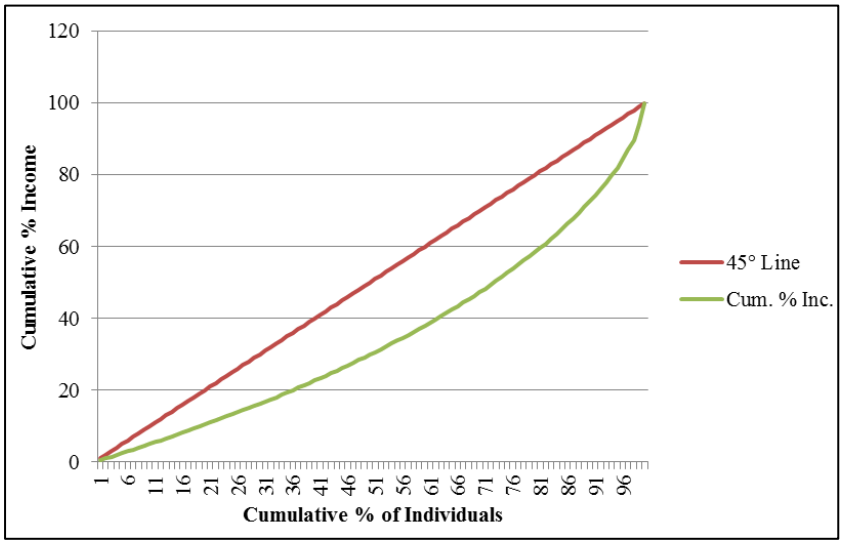
The income distribution's rightward skew makes it such that the log of the mean income exceeds the expected log income of an individual. The MLD captures, roughly, the percent by which the typical person's income falls below the mean (Collier and Dollar, 2002).

According to Firebaugh (2003), it can also be presented as the log ratio of the arithmetic to geometric mean (the arithmetic mean exceeds the geometric mean for all positive numbers). The SDL indicates the spread of log income around the log mean and, while it also emphasizes income transfers at the low end of the distribution, gives a more-equal weighting of individuals. Both measures take a value of zero when all individuals have the same income (the term in brackets equals zero) but are otherwise unbounded. They also satisfy scale independence and the welfare principle. Only the MLD satisfies the transfer principle, however: the SDL "violates the Pigou-Dalton condition because it is insensitive to transfers among the rich," (McKinley, 1996; p. 141).

The Gini concentration ratio is a measure of inequality based on the Lorenz Curve, which plots the cumulative share of income received on the cumulative share of individuals (or households), ranked from poor to rich. In a situation of perfect equality, all households have the same share of income and the Lorenz curve is the 45° line; inequality is therefore represented by the vertical distance between the 45° line and the Lorenz curve, as shown in Figure AI.

c.) Gini Concentration Ratio

Figure A.1. Lorenz Curve



Note: Example shown is based on a random draw of observations from the Pareto Distribution (2,100).

The Gini coefficient corresponds to the area between the two curves as a fraction of the area below the 45° line. I calculate this using a trapezoid method similar to that detailed in Wolff (2009). Let *A* correspond to the area between the 45° line and the Lorenz curve; let *H* be the area below the Lorenz curve. The areas *A* and *H* therefore sum to one-half the area of a square with length 100 ($0.5*100^2=5{,}000$). The area *H* is calculated by summing the areas of a series of trapezoids whose base is *100*(1/n)* and whose sides are the cumulative % of income corresponding to individuals *i* and *i-1*. The Gini coefficient (G) is then derived as follows:

(3) $$A = 5{,}000 - H,$$

$$H = \sum_{i=1}^{n} H_i = \sum_{i=1}^{n} \frac{100}{n} \{(z_{i-1} + z_i)/2\}$$

where $z_0 \equiv 0$, thus

$$G = \frac{A}{5,\,000}$$

The Gini concentration ratio ranges from zero (perfect equality) to one (perfect inequality). It is not based on deviations from the mean and is therefore more sensitive to shifts in the middle of the distribution. The Gini is an intuitive and widely-known measure which satisfies both scale independence and the transfer (but not welfare) principle.

Appendix 2 – Pacific Northwest County Income, Gini Coefficients, and Population in 2000

County	Per Capita Income	Gini Ratio	Population
Idaho	*(2005 $)*		
Ada	$38,475	0.42	303,328
Adams	$24,786	0.43	3,477
Bannock	$23,961	0.43	75,728
Bear Lake	$19,350	0.37	6,424
Benewah	$22,842	0.41	9,186
Bingham	$22,083	0.40	41,753
Blaine	$50,226	0.50	19,115
Boise	$25,120	0.42	6,702
Bonner	$23,660	0.44	36,950
Bonneville	$27,301	0.42	82,968
Boundary	$20,020	0.43	9,913
Butte	$24,877	0.42	2,894
Camas	$26,436	0.47	968
Canyon	$22,816	0.40	133,082
Caribou	$23,445	0.39	7,281
Cassia	$25,369	0.42	21,393
Clark	$26,659	0.35	1,024
Clearwater	$22,720	0.40	8,930
Custer	$25,395	0.41	4,336
Elmore	$23,694	0.37	28,610
Franklin	$21,443	0.38	11,350
Fremont	$20,729	0.41	11,769
Gem	$22,367	0.42	15,215
Gooding	$26,650	0.41	14,196
Idaho	$22,037	0.41	15,470
Jefferson	$21,972	0.39	19,193
Jerome	$25,669	0.43	18,493
Kootenai	$26,639	0.42	109,487
Latah	$24,797	0.44	34,878
Lemhi	$23,231	0.45	7,724
Lewis	$26,260	0.43	3,740
Lincoln	$23,267	0.39	4,051
Madison	$16,021	0.41	27,519
Minidoka	$20,866	0.42	20,103
Nez Perce	$28,941	0.42	37,398
Oneida	$19,471	0.37	4,135
Owyhee	$21,421	0.44	10,690
Payette	$21,709	0.42	20,624
Power	$24,501	0.43	7,484
Shoshone	$22,047	0.43	13,762

County	Per Capita Income	Gini Ratio	Population
Teton	$21,359	0.38	6,098
Twin Falls	$25,257	0.44	64,360
Valley	$32,562	0.41	7,659
Washington	$20,649	0.45	9,970

County	Per Capita Income	Gini Ratio	Population
W. Montana	*(2005 $)*		
Beaverhead	$24,651	0.44	9,204
Broadwater	$22,263	0.40	4,378
Cascade	$28,101	0.44	80,318
Deer Lodge	$22,997	0.45	9,409
Flathead	$27,821	0.44	74,774
Gallatin	$28,743	0.42	68,375
Glacier	$18,822	0.45	13,183
Granite	$22,072	0.46	2,849
Jefferson	$29,158	0.39	10,052
Lake	$21,277	0.47	26,588
Lewis & Clark	$29,466	0.40	55,886
Liberty	$22,569	0.43	2,168
Lincoln	$20,539	0.43	18,818
Madison	$23,035	0.43	6,870
Meagher	$23,154	0.45	1,916
Mineral	$19,554	0.45	3,877
Missoula	$28,210	0.43	96,178
Pondera	$23,055	0.42	6,384
Powell	$19,964	0.40	7,203
Ravalli	$23,541	0.46	36,301
Sanders	$19,833	0.44	10,287
Silver Bow	$26,340	0.44	34,571
Teton	$23,607	0.40	6,436
Toole	$24,233	0.42	5,261

Count	Per Capita Income	Gini Ratio	Population
Oregon	*(2005 $)*		
Baker	$23,570	0.42	16,714
Benton	$33,202	0.46	78,236
Clackamas	$41,981	0.42	339,223
Clatsop	$28,228	0.43	35,560
Columbia	$30,345	0.40	43,634
Coos	$25,074	0.45	62,662
Crook	$24,085	0.41	19,262

County	Per Capita Income	Gini Ratio	Population
Curry	$27,258	0.45	21,133
Deschutes	$31,279	0.43	116,566
Douglas	$25,828	0.41	100,485
Gilliam	$22,266	0.40	1,908
Grant	$24,141	0.42	7,906
Harney	$23,829	0.42	7,661
Hood River	$26,179	0.42	20,461
Jackson	$28,810	0.45	181,775
Jefferson	$23,192	0.39	19,113
Josephine	$24,897	0.46	75,851
Klamath	$24,472	0.44	63,885
Lake	$25,344	0.44	7,428
Lane	$29,292	0.45	323,492
Lincoln	$28,394	0.43	44,317
Linn	$25,955	0.40	103,020
Malheur	$21,745	0.44	31,540
Marion	$28,236	0.42	285,411
Morrow	$23,534	0.39	10,995
Multnomah	$37,336	0.44	661,654
Polk	$28,206	0.40	62,596
Sherman	$24,504	0.42	1,921
Tillamook	$27,298	0.44	24,253
Umatilla	$24,733	0.41	70,728
Union	$26,663	0.43	24,537
Wallowa	$25,478	0.44	7,220
Wasco	$27,375	0.41	23,837
Washington	$38,300	0.40	447,980
Wheeler	$22,034	0.41	1,546
Yamhill	$27,542	0.40	85,198

County	Per Capita Income	Gini Ratio	Population
Washington	*(2005 $)*		
Adams	$23,972	0.40	16,458
Asotin	$27,436	0.43	20,546
Benton	$30,443	0.40	143,131
Chelan	$28,736	0.46	66,648
Clallam	$28,041	0.42	64,269
Clark	$33,133	0.39	347,208
Columbia	$31,571	0.42	4,069
Cowlitz	$26,790	0.41	92,984
Douglas	$24,159	0.41	32,674
Ferry	$19,638	0.44	7,276

County	Per Capita Income	Gini Ratio	Population
Franklin	$22,446	0.46	49,565
Garfield	$28,357	0.40	2,383
Grant	$23,390	0.42	74,918
Grays Harbor	$24,939	0.42	67,075
Island	$30,587	0.39	71,886
Jefferson	$32,387	0.44	26,414
King	$51,222	0.45	1,739,009
Kitsap	$33,769	0.41	232,720
Kittitas	$26,695	0.50	33,537
Klickitat	$25,652	0.42	19,204
Lewis	$25,309	0.42	68,596
Lincoln	$26,428	0.40	10,143
Mason	$25,866	0.39	49,631
Okanogan	$23,274	0.45	39,566
Pacific	$23,726	0.44	20,939
Pend Oreille	$23,081	0.44	11,672
Pierce	$31,738	0.41	703,993
San Juan	$43,804	0.52	14,120
Skagit	$31,330	0.44	103,420
Skamania	$25,458	0.40	9,895
Snohomish	$34,957	0.38	609,185
Spokane	$29,730	0.44	418,803
Stevens	$22,424	0.43	40,210
Thurston	$33,574	0.40	208,287
Wahkiakum	$25,604	0.38	3,835
Walla Walla	$26,713	0.42	55,178
Whatcom	$27,922	0.44	167,696
Whitman	$22,792	0.48	40,754
Yakima	$25,090	0.44	222,615

Sources: Gini Concentration Ratio - Census Bureau, American Community Survey; Population and per Capita Personal Income - Bureau of Economic Analysis, translated into 2005 Dollars (using NIPA Implicit GDP Price Deflator).

Bibliography

Alesina, Alberto and Dani Rodrik. "Distributive Politics and Economic Growth." *Quarterly Journal of Economics*, 109.2 (1994): 465-490.

Bade, Robin and Michael Parkin. Foundations of Macroeconomics. 6th Ed. Upper Saddle River,J: Pearson, 2013.

Banerjee, Abhijit V. and Esther Duflo. "Inequality and Growth: What Can the Data Say?" *Journal of Economic Growth*, 8.3 (2003): 267-299.

Barro, Robert J. and Xavier Sala-i-Martin. "Convergence across States and Regions."*Brookings Papers on Economic Activity*, 1 (1991): 107-182.

Berg, Andrew G. and Jonathan D. Ostry. "Inequality and Unsustainable Growth:Two Sides of the Same Coin?" *IMF Staff Discussion Note*, SDN/11/08 (2011): 1-20.

Bucciferro, Justin R. "Economic Restructuring and Poverty/Income Inequality inLatin America." *Consilience: The Journal of Sustainable Development*, 4.1 (2010): 1-16.

Collier, Paul and David Dollar. Globalization, Growth and Poverty. Washington, D.C., World Bank 2002.

Combes, Pierre-Philippe; Mayer, Thierry; and, Jacques-François Thisse, Economic Geography. Princeton: Princeton UP, 2008.

Drennan, Mathew P. "The Economic Consequences of Rising Income Inequality."*UCLA Working Paper*, 2011.

Easterly, William. "Inequality Does Cause Underdevelopment: Insights from a New Instrument."*Journal of Development Economics*, 84.2 (2007): 755-776.

Ezcurra, Roberto and Pedro Pascual. "Convergence in Income Inequality in the United States: A Nonparametric Analysis." *Applied Economics Letters*,16 (2009): 1365-1368.

Fan, C. Cindy and Emilio Casetti. "The Spatial and TemporalDynamicsofUSRegional Income Inequality, 1950-1989." *Annals of Regional Science*, 28 (1994): 177-196.

Firebaugh, Glenn. The New Geography of Global Income Inequality. Cambridge: Harvard UP, 2003.

Fowler, Bree. "America's Richest Get Richer." The Spokesman-Review. 17 September 2013.

Frank, Mark W. "Inequality and Growth in the United States: Evidence from a New State-Level Panel of Income Inequality Measures." *Economic Inquiry*, 47.1 (2009): 55-68.

Glaeser, Edward. "A Review of Enrico Moretti's *The New Geography of Jobs*." *Journal of Economic Literature*, 51.3 (2013): 825-837.

Hacker, J. S. and P. Pierson. "Winner-Take-All Politics: Public Policy, Political Organization, and the Precipitous Rise of Top Incomes in the United States." *Politics and Society*, 38.2 (2010): 152-204.

Johnson, David and Stephanie Shipp. "Trends in Inequality using Consumer Expenditures: 1960 to 1993." *Proceedings of the Section on Survey Research Methods, American Statistical Association*, 1995.

Krugman, Paul. "Rich Man's Recovery." The New York Times. 12 September 2013.

Kuznets, Simon. "Economic Growth and Income Inequality." *American Economic Review*, 45 (1955): 1-28.

Li, Hongyi and Heng-fu Zou. "Income Inequality is Not Harmful for Growth: Theory and Evidence." *Review of Development Economics*, 2.3 (1998): 318-334.

Lowrey, Annie. "Income Inequality May Take Toll on Growth." The New York Times. 16 October 2012.

Lowrey, Annie. "The Rich Get Richer Through the Recovery." The New York Times. 10 September 2013.

Lynch, Robert G. "Estimates of Income and Income Inequality in the United States and in each of the Fifty States: 1988-1999." *Journal of Regional Science*, 43.3 (2003): 571-587.

Massey, Douglas S. and Mary J. Fischer. "The Geography of Inequality in the United States, 1950-2000." *Brookings-Wharton Papers on Urban Affairs*, (2003): 1-40.

McKinley, Terry. The Distribution of Wealth in Rural China. New York: M.E. Sharpe, 1996.

Nunn, Nathan. "Slavery, Inequality, and Economic Development in the Americas: An Examination of the Engerman-Sokoloff Hypothesis." Ed. E. Helpman. Institutions and Economic Performance. Cambridge: Harvard UP, 2008: 148-180.

Organization for Economic Cooperation and Development. "An Overview of Growing Income Inequalities in OECD Countries: Main Findings." Divided We Stand: Why Inequality Keeps Rising. Paris: OECD, 2011. 21-45.

Persson, Torsten and Guido Tabellini. "Is Inequality Harmful for Growth?" *American Economic Review*, 84 (1994): 600-621.

Piketty, Thomas and Emmanuel Saez. "Income Inequality in the United States, 1913-2002." *UC-Berkeley Working Paper*, 2004.
Piketty, Thomas and Emmanuel Saez. "Top Incomes: A Historical and International Comparison." *NBER Working Paper*, #11955, 2006.
Pollin, Robert and Stephanie Luce. The Living Wage. New York: The New Press, 1998.
Rajan, Raghuram G. Fault Lines: How Hidden Fractures Still Threaten the World Economy. Princeton: Princeton UP, 2010.
Rajaram, Ramaprasad. "Poverty, Income Inequality and Economic Growth in U.S. Counties: A Spatial Analysis." *University of Georgia Working Paper*, 2009.
Rey, Sergio J. "Spatial Empirics for Regional Economic Growth and Convergence." *Geographical Analysis*, 33.3 (2001): 195-214.
Rey, Sergio J. and Brett D. Montouri. "US Regional Income Convergence: A Spatial Econometric Perspective." *Regional Studies*, 33.2 (1999): 143-156.
Schiller, Bradley R. The Economics of Poverty and Discrimination. 10th Ed. Upper Saddle River, NJ: Pearson-Prentice Hall, 2008.
Sen, Amartya. Inequality Reexamined. Cambridge: Harvard UP, 1992.
Sokoloff, Kenneth L. and Stanley L. Engerman. "History Lessons: Institutions, Factor Endowments, and Paths of Development in the New World." *Journal of Economic Perspectives*, 14.3 (2000): 217-232.
Stieber, Zachary. "Obama Addresses Income Inequality." Epoch Times. 19-25 September 2013.
Stiglitz, Joseph E. The Price of Inequality. New York: Norton, 2013.
United States Census Bureau. "Household Income Inequality within U.S. Counties: 2006-2010." *American Community Survey Briefs*, 2012.
United States Congressional Budget Office. Trends in the Distribution of Household Income between 1979 and 2007. Washington: Government Printing Office, 2011.
Weisberg, Roger. Waging a Living. DVD. New York: Filmakers Library, 2004.
Wolff, Edward N. Poverty and Income Distribution. 2nd Ed. Oxford: Wiley-Blackwell, 2009.
World Bank. *World Development Indicators (*accessed 8/2013), <http://data.worldbank.org/data-catalog/world-development-indicators>.

EASTERN WASHINGTON UNIVERSITY

start something **big**

Our Mission

Eastern Washington University's mission is to prepare broadly educated, technologically proficient and highly productive citizens to obtain meaningful careers, to enjoy enriched lives and to make contributions to a culturally diverse society. The University's foundation is based on career preparation, underpinned by a strong liberal arts education.

Tradition, Connections, Opportunity

In 1882 the Benjamin P. Cheney Academy opened its doors to more than 200 students. More than a century later, the Academy has evolved into Eastern Washington University. The regional, comprehensive public University is a driving force for the culture, economy and vitality of the Inland Northwest region, with programs also offered in Spokane, Bellevue, Everett, Kent, Seattle, Shoreline, Tacoma, Vancouver and Yakima.

Eastern offers students the opportunity to study one-of-a-kind, in-demand disciplines such as biotechnology, cybersecurity, forensic science, children's studies, dental hygiene and urban planning. In addition, Eastern is the only regional university in the state to offer a doctorate in physical therapy.

Eastern enhances its strong commitment to teaching and learning by vigorously pursuing grants, extramural funding and student-faculty research collaborations. For the most recent fiscal year, the University secured a total of $10.5 million in grants and extramural funding.

A focus on personal attention, faculty excellence and community collaboration allows Eastern to accomplish its mission of preparing well-rounded students ready to hit the ground running in their chosen career fields. Eastern will give you the chance to start something big!

Accreditations

The University is accredited by the Northwest Association of Schools and Colleges and many discipline-specific associations, such as the American Assembly of Collegiate Schools of Business, the National Association of Schools of Music, the Computing Sciences Accreditation Board, the National Council of Accreditation of Teacher Education, the Planning Accreditation Board and many more.