

Regional Economic Growth and Income Distribution in California

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Abstract

This paper uses the Solow and Kuznets models to help explain the pattern and differences in economic growth and income distribution in four major regions within California. Using county-level data from 1969 to 1999, I estimated that statewide real per-capita personal income has diverged (become more unequal). However, after controlling for regional effects, statewide income divergence becomes statistically insignificant. On a continuum, the data suggest that on average, the Central, Northern, Southern and Coastal regions have the least to most well endowed composition of resources. The corresponding spatial division of labor across California's regions results in income inequality. Regional development policies should be diversified and coordinated to insure long-term success and not be overly reliant on one best approach. Policies are more likely to fail if they deviate from the local context. Regional economic development depends more on a partnership of local policy-makers, industry, labor unions and community leaders who can work together towards common goals.

Introduction

The growth of the U.S. economy is a complex process that evolves over time. One way to reduce this complexity and increase understanding of the growth process is to focus the analysis on a subset of the national economy. To that end, the purpose of this research is to investigate the economic growth and income distribution within regions of the State of California. The importance of examining both regional economic growth and the distribution of income at the state level is based on two general observations. One, the rate of economic growth within regions of California can differ from the overall rate of growth for the state. Secondly, the sources of economic growth within regions of California can lead to variations in the resulting distribution of income within those regions over time.

This paper contributes to the literature on economic growth and income distribution by applying existing theory and empirical analysis to regions of California. Hopefully, the results of this research will encourage further empirical analysis of various aspects of the growth process within regional economies.

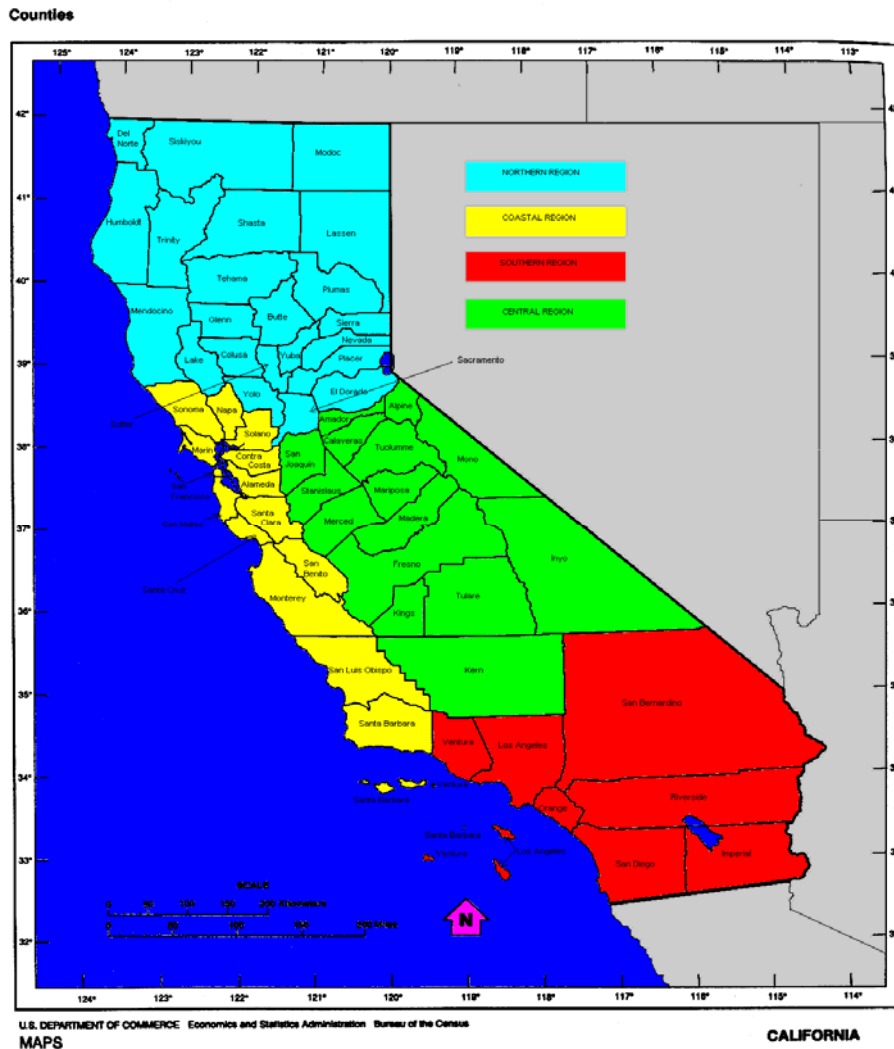
Section I defines the four regions of California chosen for analysis. Section II describes the general nature of production. The importance of initial resource endowments, technology and production will be discussed in the context of economic growth. Section III narrows the analysis by focusing on regional economic growth with special emphasis on California. Regional economics is defined and the scope of production is widened to include agglomeration economies that refer to the concentration of economic activities. Section IV addresses potential sources of change in the pattern of the distribution of income across California's regions. Section V highlights the relationship between regional economic growth and income inequality while Section VI discusses some implications for regional economic policy. Section VII summarizes this research and offers concluding remarks.

I. Geographic Definition of Regional Economies in California

There is no universal methodology for defining the boundaries of a regional economy, as they will vary depending on the criteria used in a particular study. For the purposes of this paper, I define four regional economies within California based on the geographical proximity of

contiguous counties¹. The Northern, Coastal, Central and Southern regions are highlighted in Map 1².

California's Regions (Map 1)



¹ Other studies use different criteria. For example, Kawahara & Kelly et al. (2000) define nine California regions based upon geographical proximity. Their definition as well as mine has limitations as industrial clusters may overlap, coincide or transcend regional boundaries. Feasel & Rodini (2002) define two regional California economies based upon countywide unemployment rates. The California Department of Employment Development defines six regions based upon similarities in agricultural production. Ten bioregions are identified by the California Resources Agency based upon the homogeneity of their biological and geophysical features.

² The Northern region includes Butte, Colusa, Del Norte, El Dorado, Glenn, Humboldt, Lake, Lassen, Mendocino, Modoc, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Siskiyou, Sutter, Tehama, Trinity, Yolo and Yuba counties. The Coastal Region includes Alameda, Contra Costa, Marin, Monterey, Napa, San Benito, San Francisco, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano and Sonoma counties. The Central region includes Alpine, Amador, Calaveras, Fresno, Inyo, Kern, Kings, Madera, Mariposa, Merced, Mono, San Joaquin, Stanislaus, Tulare, and Tuolumne counties. The Southern region includes Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego and Ventura counties.

These four regions are aggregated to a greater extent compared to the nine regional economies defined by the *California Economic Strategy Panel*³. I chose a higher level of aggregation for statistical purposes and to focus on a limited set of key economic variables⁴.

The dominant industries in the Northern region include agriculture, forestry, recreation, diversified manufacturing, services and retail trade. Government is the largest employer in the greater Sacramento area. The Coastal region is primarily composed of agriculture, technology, health care (including biotechnology), transportation, financial and retail trade industries. Also important to this region is research and development and educational services. Industries such as agriculture and forestry are particularly important to the Central region. However, diversified manufacturing, distribution and warehousing are taking on greater importance in the central part of California. Southern California has the largest regional economy in the state. Construction, motion pictures, fashion, engineering, services, aerospace, health care, distribution, manufacturing, trade and education compose the bulk of economic activity in the Southern Region.

Before discussing regional economic growth in California, Section II will provide a general discussion of production and economic growth.

II. Production and Economic Growth

The production process in any economy involves transforming resources (inputs) into goods and services (output). An economy can grow if it acquires a greater quantity and/or quality of resources or uses its existing resources more efficiently. For example, it may be possible to produce more output with the same inputs or the same level of output with fewer inputs. Both outcomes require greater efficiency of input usage.

Economists use production function models to illustrate the technical relationship between a firm's inputs and corresponding output⁵. One of the most common models used is the Cobb-Douglas (CD) production function named after Mathematician Charles Cobb and former U.S. Senator Paul Douglas. An important advantage of this model is its ability to address both the short and long run relationship between a firm's inputs and output. For simplicity, the CD model assumes a firm has only two inputs, and produces one output where:

$$Q = AK^aL^b$$

Q = the maximum amount of output produced, K = the quantity of capital, L = the quantity of labor and A = total factor productivity. The exponents "a" and "b" indicate the relative share of input usage. For each factor of production, the value of their relative share must be less than 1. Mathematically, this guarantees diminishing returns to labor holding capital constant. Intuitively, diminishing returns to labor will occur as more and more labor is added to a fixed plant size. The resulting increases in output will diminish as the workforce has on average, less capital to work with. In the short-run, firms' are limited in how much additional output they can produce given the fact that it can take a much longer period of time to change the amount of capital usage and size of their production facility. Even though the production function exhibits diminishing returns to labor in the short-run, it may show constant returns to scale over

³ See Kawahara & Kelly et al. (2000)

⁴ For my empirical estimation, I gain more observations by analyzing fewer regions. This increases my degrees of freedom in the regression analysis making it less likely that the error term will affect the parameters of interest. The result is more reliable estimates. See Studenmund (1992) for a detailed discussion of the importance of gaining degrees of freedom.

⁵ Note that this section is largely adapted from McGahagan (2002).

longer periods of time. In other words, if you double all of a firm's labor and capital inputs (including production facilities), you will double output. When all factors of production can be increased over time, economists refer to this as a change in the size or scale of operations. The CD production function can be specified to show a range of scale economies. For example, the CD model will exhibit increasing returns to scale if the exponents $a + b > 1$. Constant returns to scale will occur if $a + b = 1$ and decreasing returns to scale result when $a + b < 1$.

Given the flexibility of the CD production function, Robert Solow (1956) used this model as a beginning in his study of economic growth. From the model, Solow realized that any increase in output (Q) could come from three primary sources, an increase in L, K or A. Since Solow was interested in studying economic growth from an economy wide perspective, he focused on labor productivity or output per worker (Q/L). Assuming a constant labor force share in the production function, Solow specified the CD model in the following per capita form:

$$Q/L = (AK^aL^b)/L = AK^aL^{b-1} = AK^a/L^{1-b}$$

Since he assumed constant returns to scale where $a + b = 1$, it follows that $a = 1-b$. Therefore, we can rewrite the above expression as follows:

$$Q/L = AK^a/L^a = A (K/L)^a$$

By defining $q = Q/L$ and $k = K/L$, small letters equal per capita variables with the result being the Solow growth model:

$$q = Ak^a$$

Small q represents the standard of living for an economy while k is referred to as the capital/labor ratio and represents the amount of capital available per unit of labor input. The thrust of Solow's model center's around explaining economic growth through the process of capital accumulation. Over time, as the capital stock grows in proportion to employment, the capital/labor ratio will rise. This process is often referred to as "capital widening" and is the primary source of economic growth in the Solow model. An economy will reach a steady-state level of capital when capital is neither growing nor shrinking and when the economy generates enough savings just sufficient to replace the depreciated capital stock each time period. The implication is that without replacing worn out or obsolete capital via investment expenditure, the capital/labor ratio would naturally decline over time leading to a lower standard of living.

Because savings is required in order to make resources available for investment, an economy needs to save some fraction of output per worker (q). The savings function would therefore be the following:

$$s = \alpha q$$

where (α) represents some fraction of (q) with $0 < \alpha < 1$. For simplicity, if we assume capital totally depreciates in each time period, the equilibrium condition is:

$$s = k$$

Given equilibrium savings and the savings function, we can determine the steady-state equilibrium capital/labor ratio (k) and output per worker (q). Let $A = 100$ and $a = 0.5$ in the Solow growth model where:

$$q = 100k^{0.5}$$

Let $\alpha = 0.25$ in the savings function where:

$$s = 0.25q$$

Substitute for (s) from the savings function into the equilibrium condition for capital to obtain:

$$0.25q = k$$

Substitute output per worker (q) from the Solow growth model into the equilibrium condition for capital to obtain:

$$0.25(100k^{0.5}) = k$$

Divide both sides by ($k^{0.5}$) and solve for the equilibrium capital/labor ratio where:

$$k = 625$$

Substitute the value of (k) into the Solow growth model to obtain the steady-state equilibrium output per worker (q):

$$q = 100 (625)^{0.5}$$

$$q = 2500$$

As Ruby (2002) has carefully pointed out, a steady-state level of capital does not imply that there is no growth in factor inputs or output. When k is constant, that implies the % change in K = % change in L. Furthermore, given that (q) is also constant in the steady-state, the % change in Q = % change in L. Thus steady-state equilibrium implies that:

$$\% \text{ change in } (Q) = \% \text{ change in } (K) = \% \text{ change in } (L).$$

As the labor force grows because of population growth and greater labor force participation rates, additional investment will be needed to keep the capital/labor ratio (k) at its steady state level. Moreover, the rate of investment must exceed the rate of depreciation by an amount equal to the growth rate of the labor force (Ruby 2002).

Given the above discussion, the primary prediction of the Solow model is that economic growth or greater output per worker (q) is the result of capital accumulation. Growth would tend to be very strong in economies that first begin to accumulate capital. Later, as economies mature, capital accumulation will slow along with the rate of economic growth. Looking across different economies, output per capita will tend to converge over time as those economies with faster growth rates eventually catch-up with economies with slower growth rates. Convergence suggests that the levels of per capita income would eventually be similar across economies. The question becomes: After convergence, does economic growth just stop? Not necessarily, since the Solow model allows for greater output per capita (q) to result from an increase in total factor productivity (A) as well as the capital/labor ratio. For example, if we observe an economy with a growth rate that exceeds the rate of labor force growth, the Solow model would predict the economy is below its steady state capital/labor ratio. What could be the source of the additional growth? The answer is from greater total factor productivity (TFP). Rearranging the Solow growth model we obtain:

$$TFP = A = q/k^a$$

Total factor productivity relates to how efficiently labor and capital are combined in the production process. At any point in time, the level of technology will determine the efficiency of a firm's production process. Therefore, technology is simply the sum of knowledge of the means and methods of producing goods and services (Bannock et al. 1998). Much of the growth in labor productivity is attributed to technological change that results in higher quality capital goods. In the Solow growth model, technological change is assumed to be "embodied" in new capital goods. According to Sargent and Rodriguez (2001), growth models of capital-embodied technical

change are sometimes referred to as “vintage” models because capital goods of more recent vintages are more productive than older capital goods. Since capital enters the Solow model as a predetermined or exogenous variable, it is assumed that technological progress is incorporated into capital goods purchased over time. In this case, TFP can be thought of as a variable that captures technological improvements that are embodied in new capital goods.

If technical change is “disembodied”, it increases the productivity of all machinery regardless of age (Pereira 2002). For example, access to high-speed Internet service improves the productivity of all computers and their operators. Even if input usage remains constant, output per worker will still rise over time with technological improvements. Other sources of disembodied technical change could include improved methods of organization and greater efficiencies associated with improvements in an economy’s infrastructure. For example, installation of air-conditioning systems or better lighting could improve the productivity of many workers (Idson and Oi, 1999). Under this scenario, disembodied technical change affects the quality of labor and capital more generally. In this case, TFP is defined as a variable that captures technological change that is not directly embodied into design of new machinery and equipment.

Because Solow’s growth model treats technological change as originating outside the production process, “new growth theory” has attempted to explain the actual sources of improvements in technology that lead to increased TFP. Endogenous growth models seek to explain technological change that originates from within the economy as measured by changes in TFP⁶. For example, the following model can be used to illustrate the evolution of TFP:

$$TFP = F (HC, RD, GP)$$

Where HC = expenditure on human capital, RD = research & development expenditures and GP = government policies.

Certainly, the amount of resources devoted to formal and informal education and training will have a positive impact on productivity growth. Expenditures on basic and applied research that lead to inventions and innovations with commercial applications will increase an economy’s capacity to produce. Government sponsored incentives such as deregulation of industries leading to more competition and subsidies targeted for research and development will increase TFP.

It should be noted that technical change could alter the capital/labor ratio once an economy has reached steady state equilibrium of output per worker (q) in the Solow model. For example, over time, technical change could lead to greater capital relative to labor utilization, a process known as capital deepening. Some new technologies tend to complement the skills of a smaller number of educated workers while replacing a larger number of less skilled workers. In this case, increase in TFP results from capital deepening where production becomes more capital intensive.

While the Cobb-Douglas production function and by extension the Solow growth model provide a basic understanding of aggregate economic growth, they are not a complete description of the growth process. Indeed, one of the reasons that endogenous growth models were developed was to further our understanding of sources of technological change and growth. Regional economics to a large extent has tried to identify other aspects of economic growth that go beyond traditional growth models. The next section will discuss the importance of regional economies in California and factors that lead to their growth and development.

III. Regional Economic Growth in California

According to Dubey (1964), economic resources tend to be unevenly distributed over a particular region. Since some of these resources such as land are immobile while others like labor lack perfect mobility, geographic considerations and personal preferences can have an important impact on regional economic growth. To paraphrase Dubey (1964), regional economics is the study of the differences and interrelationships of areas (counties) within a universe (region) of unevenly distributed, immobile or imperfectly mobile resources. There is

⁶ See for example, Romer (1986).

emphasis on the application and planning of infrastructure to mitigate the social problems caused by these circumstances.

Table 1 shows 10-year average growth rates of real per capita personal income (RPPI) for California and the four regional economies defined in Section 1. By definition, the sum of state income must equal the sum of state output. This definition would also hold for each region within the state. Given limitations of the data, I focus on personal income – that is, income received by individuals and families⁷. Real per capita personal income, e.g., personal income/population is a measure of the standard of living and is roughly similar to what the Solow growth model attempts to explain.

IIIa. Statewide Income and Population Growth

Table 1 shows that average RPPI has steadily increased statewide over the 31- year period. However, while the 10 – year growth rate increased substantially (21 percent) from 1969 to 1979, it slowed considerably to 4 percent from 1979 to 1989. Interestingly, statewide growth accelerated to 9 percent from 1989 to 1999.

Table 2 indicates the population of California and its regions with corresponding 10 –year population growth rates. Clearly, the state has experienced remarkable population growth over the last 31 years. From 1979 to 1989, California’s population grew more than 25 percent, significantly more than the prior decade. During the 1989-1999 period, population growth slowed to just 13 percent. During this period, the fact that California’s growth rate was higher than the previous decade suggests that the state reached its long-run steady state equilibrium of output per worker during the 1979-1989 period. From 1989 to 1999, capital deepening via technological change may have offset the growth dampening effects of a population growth rate of 13.4 percent.

IIIb. Northern Region Income and Population Growth

Similar to the state, Table 1 indicates that the Northern region has shown significant growth. From 1969 to 1979, growth increased by 18 percent but was followed by much slower growth (–0.2 percent) during the 1979-1989 period. Growth increased to 8 percent from 1989 to 1999.

From Table 2, a major portion of California’s population growth from 1969 to 1989 occurred in the Northern region. A likely source of this growth is the continuing suburbanization of the Sacramento area. Given the sluggish growth of –0.2 percent and the large population increase of 29.2 percent during the 1979-1989 period, the capital/labor ratio in the Northern region must have declined contributing to the substantially slower growth. The capital/labor ratio likely improved from 1989 to 1999 as population growth slowed to 17.7 percent while the growth rate of RPPI increased to 8 percent.

⁷ Personal Income includes: Total labor earnings, total proprietors’ earnings, rental income, dividends, personal interest income and transfer payments. All personal income is valued in 1999 dollars using the California Consumer Price Index (CCPI). The CCPI is not completely representative of price changes in California because it is computed from a weighted average of data for the Los Angeles consolidated metropolitan statistical area (CMSA) and the San Francisco CMSA. However, the CCPI is a better measure compared to the CPI for urban consumers in the western region. This measure is defined by the Bureau of Labor Statistics and is representative of price changes for 13 western states.

State Income = Personal Income (less taxes) + Business Retained Earnings + Government Net Receipts. See Wolff (1997) for an introduction to the National Income and Product Accounts.

IIIc. Coastal Region Income and Population Growth

From Table 1, a stronger pattern of growth can be observed in the Coastal region relative to comparable time periods for the state. Like the state, there was significant growth (24 percent) from 1969 to 1979.

As Table 2 indicates, even though the Coastal region had slower population growth (13.6 percent) during the 1969-1979 period compared to the state, it experienced a larger gain in income growth of 24 percent. If the predictions of the Solow model are correct, the capital/labor ratio must have accelerated at a relatively faster rate in the Coastal region compared to the state. This interpretation seems reasonable given that this region contains a broad cross section of sectors with a relatively high “value added” contribution to state personal income⁸. From 1979 to 1989, growth slowed to 13 percent in the Coastal region but remained higher than statewide growth of only 4 percent.

During the 1989-1999 period, growth in the Coastal region increased to 20 percent while the growth rate of the population declined to 10.6 percent. This suggests that capital deepening may have been an important contribution to growth in this region.

In addition to capital deepening, one of the most important characteristics that distinguish a regional economy from a statewide economy is the presence of agglomeration economies. These economies are characterized by a concentration of specialized firms in an industrial region. Sometimes called “growth poles”, these regions form a core of economic activity and interact with surrounding areas. There are many benefits for firms in the same industry that concentrate in a relatively small area. For example, research and development, transportation, information, training and communications costs are lower as a result of the functional linkages created between firms within an industrial region. External economies are created when backward linkages channel resources into firms while forward linkages channel a firm’s output to other firms for further processing or to the final customer.

The Silicon Valley includes firms in the coastal region whose growth can perhaps be partially explained by the growth pole theory. These firms produce high-technology capital goods, primarily for other industries. Many firms have backward linkages with local labor markets and regional universities. Industry engineers and scientists interact with colleagues and local faculty to generate new ideas that have potential commercial applications. Research and development is accelerated by these interactions because the cost of transmitting knowledge is lower in agglomeration economies. The institutional environment coupled with the concentration of highly skilled workers supports activities related to creativity and innovation.

Within the high – technology sector, applied research is directed towards searching for new products or improvements of existing products and processes. Since the Silicon Valley is a growth pole where technology is created, it can be diffused much faster via a mobile labor force and adopted more easily because of the ease in exchanging information. The success of firms in adopting newly produced technology is critically dependent on their investment in human capital acquired via on-the-job-training. This success can be measured by the improvements in production efficiency.

IIIId. Central Region Income and Population Growth

Table 1 shows the Central region experienced significant growth (21 percent) during the 1969-1979 period. However, growth slowed considerably from 1979 to 1999. In order for per capita growth rates in personal income to stabilize in the Central region, the capital/labor ratio must have widened considerably in order to support the significant increase in population that occurred in the Central region from 1979 to 1999.

⁸ Labor force growth is a function of population growth. While I do not report 10 – year labor force growth rates, they are highly correlated with population growth rates. A more disaggregate analysis might focus on detailed labor supply data such as labor force participation rates.

While Solow's model coupled with "new growth theory" helps in understanding the process of economic growth, they fail to address important spatial relationships that develop in economic regions that can enhance the growth process.

Over time and space, economic regions tend to specialize in certain types of production based on their comparative advantage. For example, the Central region might be very efficient in the production of computer chips compared to the other three regions. However, it can still profitably produce agricultural products because it is even more efficient compared to alternative types of production. In this sense, the Central region has a comparative advantage in agricultural production and should focus on producing what it can relatively more efficiently. Specifically, the large mass of fertile and immobile land that is sparsely populated coupled with permanently installed irrigation systems allows the Central region to achieve economies of scale (declining average costs). These factors give the Central region an important regional advantage in agricultural production compared to the Coastal region.

Economic development in the Central region is not entirely composed of a single sector such as agriculture. The agricultural sector will eventually support a more diversified economy. Technological change leading to more efficient production methods in the farm sector will reduce the demand for labor and make land available for the development of the manufacturing and service sectors. These sectors will in turn provide job opportunities for displaced agricultural workers. As mentioned earlier, diversified manufacturing, distribution and warehousing are becoming more dominant in the Central region.

IIIe. Southern Region Income and Population Growth

From Table 1, the Southern region and the state experienced similar growth from 1969 to 1989. Table 2 shows that the population growth over the 31 – year period in the Southern region mirrors that of the state. While the Southern region grew more slowly (0.9 percent) compared to the state's growth of 9 percent during the 1989-1999 period, the diversity and strength of this region's economy has been able to absorb an almost 13 percent increase in population. Like the Central region, this is likely due to capital widening.

Regional California economies have evolved by specializing based upon their initial resource endowments and comparative advantage in production. As industrial diversification followed, the spatial division of labor has been distributed along a continuum of jobs. Within each region, the labor force specializes in a variety of occupations that perform from very routine to highly innovative activities. According to Castro et al (1999) there is an inverse relationship between a region's resource endowments and dependency on routine activities. Less well-endowed regions will specialize in routine activities while regions with more abundant endowments will specialize in innovative activities. Between these two extremes is a continuum of specialization profiles. Regions with higher average RPPi are most likely to be associated with the greatest resource endowments and labor force that performs the most innovative activities. On a continuum, Table 1 suggests that on average, the Central, Northern, Southern and Coastal regions have the least to most well endowed composition of resources in California. The spatial division of labor that is associated with the continuum of resource endowments across California's regions results in income inequality which is the topic of the next section.

Table 1: Ten – Year Real Per Capita Personal Income Growth Rates in California

Statewide – All Counties:	1969	1979	1989	1999
Average RPPI	\$11,300	\$13,703	\$14,199	\$15,489
10 Yr. Avg. Growth Rate of RPPI		21.0%	4.0%	9.0%
Northern Region:				
Average RPPI	\$10,870	\$12,839	\$12,610	\$13,677
10 Yr. Avg. Growth Rate of RPPI		18.0%	-2.0%	8.0%
Coastal Region:				
Average RPPI	\$12,739	\$15,818	\$17,890	\$21,509
10 Yr. Avg. Growth Rate of RPPI		24.0%	13.0%	20.0%
Central Region:				
Average RPPI	\$10,468	\$12,643	\$12,537	\$12,515
10 Yr. Avg. Growth Rate of RPPI		21.0%	-0.8%	-0.2%
Southern Region:				
Average RP	\$11,550	\$14,458	\$15,370	\$15,513
10 Yr. Avg. Growth Rate of RPPI		25.0%	6.0%	0.9%

Data Source: U.S. Department of Commerce, Bureau of Economic Analysis. Note that RPPI = real per capita personal income.

Table 2: Ten - Year Population Growth Rates in California

Statewide - All Counties	1969	1979	1989	1999
Population	19,711,000	23,255,069	29,218,165	33,145,121
10 Yr. Avg. Pop. Growth Rates		18.0%	25.6%	13.4%
Northern Region				
Population	1,434,785	1,867,573	2,412,437	2,839,744
10 Yr. Avg. Pop. Growth Rates		30.2%	29.2%	17.7%
Coastal Region				
Population	5,328,048	6,054,418	7,166,952	7,924,701
10 Yr. Avg. Pop. Growth Rates		13.6%	18.4%	10.6%
Central Region				
Population	1,674,892	2,113,371	2,809,429	3,377,958
10 Yr. Avg. Pop. Growth Rates		26.2%	32.9%	20.2%
Southern Region				
Population	11,273,275	13,219,707	16,829,347	19,002,718
10 Yr. Avg. Pop. Growth Rates		17.27%	27.30%	12.91%

Data Source: U.S. Department of Commerce, Bureau of Economic Analysis

IV. The Distribution of Income in California's Regions

According to the Solow model, output per capita will tend to converge over time as those regions with lower initial capital/labor ratios and faster growth rates eventually catch-up with regions that have higher initial capital/labor ratios and slower growth rates. For this process to occur, the Solow model assumes that each county within California has the same industrial structure. Therefore, convergence in this context suggests that counties with the same production function as well as savings, depreciation and population growth rates, would eventually approach the same steady-state level of per capita income.

To empirically determine the process of aggregate convergence/divergence across California's counties, I estimate an empirical version of Solow's model. Explained convergence, sometimes called the "absolute β (beta) convergence" hypothesis, predicts that counties that

differ only in terms of their initial capital/labor ratio will converge to a common steady-state level of real per capita income.

I regress the average growth rate of RPPI between time $t_{beg} = 1969$ and time $t_{end} = 1999$ on initial income at time $t_{beg} = 1969$ ⁹ where:

$$(\ln Y_{it(end)} - \ln Y_{it(beg)}) / T = \alpha + \beta \ln Y_{it(beg)} + \mu_i \quad (1)$$

Here, i is the index for each county where $i = 1$ to 58. Time is indexed by t where $t(beg) = 1969$ and $t(end) = 1999$. The sample period is indexed by T where $T = 31$ years.

$\ln Y$ = natural log of real per capital income.

α = constant term and μ_i = random error term.

Absolute β -convergence implies $\beta < 0$. This suggests that, on average, lower initial income should be associated with higher growth of RPPI. The results from estimating equation (1) are provided in Table 3. Contrary to the hypothesis predicting absolute β -convergence, the positive and significant coefficient estimate for initial income implies a statewide divergence of RPPI over the sample period. At the statewide level, this result suggests that on average, poorer counties are not converging with richer counties leading to greater income inequality.

California's regional economies are structurally diversified and it is not reasonable to assume each region has the same steady-state level of output per capita. For example, Table 1 indicates that in 1999, the statewide average RPPI was \$15,489. The 1999 statewide average is very close the Southern region's average RPPI of \$15,513. In this case, the state's aggregate production function is representative of the production function in the Southern region. This suggests the state and southern region have approximated a convergence in average RPPI based on the implication of the Solow model. However, in 1999, the Northern and Central regions average RPPI fell below the statewide average while the Coastal region's average RPPI exceeded the statewide average. This is not surprising given the fact that production in the Northern and Central regions is relatively more land intensive while production in the Coastal region is more capital intensive.

As a practical matter, I will drop Solow's assumption that economies are homogeneous recognizing the heterogeneity of California's regional economies. It follows that these economies are more likely to converge to their own steady-state level of per capita income. Under these circumstances, all the Solow model predicts is "conditional β -convergence". To test for conditional β -convergence, I extend equation (1) above by using a set of dummy variables to control for unobservable effects that differ between individual regions. These unobservable effects could include (but are not limited to) differences in regional production functions and industrial structure, savings depreciation and population growth rates. By accounting for these unobserved regional differences, I can determine whether or not individual regional effects influence the statewide divergence of income.

The following semi-log regression model extends equation (1) where:

$$(\ln Y_{it(end)} - \ln Y_{it(beg)}) / T = \alpha + \beta \ln Y_{it(beg)} + \beta_1 \text{NREGD}_i + \beta_2 \text{COSREGD}_i + \beta_3 \text{CENREGD}_i + \mu_i \quad (2)$$

$\text{NREGD}_i = 1$ if county i is in the Northern region, $i = 1$ to 22 (1969 initial income), 0 otherwise.

$\text{COSREGD}_i = 1$ if county i is in the Coastal region, $i = 23$ to 36 (1969 initial income), 0 otherwise.

$\text{CENREGD}_i = 1$ if county i is in the Central region, $i = 37$ to 51 (1969 initial income), 0 otherwise.

⁹ Initial income is a proxy for initial capital/labor ratio. Lower (higher) initial county income is correlated with a lower (higher) capital/labor ratio and therefore lower (higher) productivity.

Table 3: Convergence Estimates of Statewide Real Per Capita Personal Income

	Absolute β -Convergence	Conditional β -Convergence
α	-0.152 (-3.01)*	-0.024 (-0.48)
β	0.017 (3.20)*	0.003 (0.66)
NRDUM		-0.002 (-0.74)
COSDUM		0.007 (2.95)*
CENDUM		-0.003 (-1.29)
Adjusted R ²	0.139	0.389
N	58	58

Note: Both equations are estimated using ordinary least squares with the t-values reported in parentheses. The asterisk (*) indicates statistical significance at the 5 percent level. N = number of observations. Adjusted R² = coefficient of determination. In general terms the adjusted R² measures the proportion of the total variation in the average growth rate of RPPI that is explained by variation in the independent variables. NRDUM, COSDUM and CENDUM are dummy variables for the Northern, Coastal and Central Regions of California where the Southern region is excluded and serves as the base region. The regression results from the other regions are interpreted relative to the base region.

The parameter estimates from equation 2 are located in Table 3. Interestingly, the speed of divergence (β) slowed considerably and is no longer statistically significant. The adjusted R² improved suggesting a better overall fit of the model. The coefficients for the dummy variables show the most productive area to be the Coastal region with the Central region being the least productive. The result for the latter region is economically but not statistically significant.

The implication of the results from estimating equation 2 is that the speed of divergence in statewide RPPI slows considerably after accounting for unobserved differences in regional economies that likely affect their individual steady-state income levels.

In the context of income distribution within a particular region, convergence takes on a different meaning. According to Bergstrom (1998), gross or σ (sigma) convergence relates to the variability of some variable (e.g. average RPPI) that decreases over time. For example, if the variability of average RPPI in the counties of the Northern region declined over time, then it is said that the region has converged. The result would be a more equal distribution of income. On

the other hand, divergence would occur in the Northern region if the variability of average RPPI increased over time. In this case, the region would generate greater income inequality. The Solow model addresses convergence of growth rates of average RPPI across and between regions while σ -convergence measures the degree of average RPPI inequality among counties within a state or region. Clearly, the distribution of average RPPI among counties within a state or regional economy versus its growth rate may evolve quite differently. Tables 4 and 5 provide various measures of σ -convergence for California and its four regional economies discussed in this paper. For convenience and comparative purposes, the ten – year statewide RPPI and average growth rate data are shown at the top of both tables. Three different measures of income inequality are provided in Tables 4 and 5¹⁰. These measures include the standard deviation of the natural log of average RPPI, the coefficient of variation and quintile point measure¹¹.

An increase in these measures of income inequality is associated with greater variability in the distribution of income that is consistent with increasing income inequality. Between 1969 and 1979, the statewide and regional distribution of income across counties remained relatively stable.

¹⁰ Economists often use different statistical procedures to measure an economic phenomenon (in this case, income inequality) to determine if the phenomenon is sensitive to a particular analytic method. If the economic results are not significantly affected by a variety of statistical measures, then the results are said to be “robust”. Robustness is associated with more consistent and reliable results.

¹¹ The standard deviation (S) of the natural log of average RPPI is calculated as follows:

$$S = \sqrt{\sum_{i=1}^n (Y_i - \bar{Y})^2 / n - 1}$$

Where Y = the natural log of average real per capita personal income per county, \bar{Y} = the natural log of average statewide or regional real per capita personal income. $i = 1$ to n counties where $n = 58$ counties statewide, $n = 22$ counties in the Northern region, $n = 14$ counties in the Coastal region, $n = 15$ counties in the Central Region and $n = 7$ counties in the Southern region.

The Coefficient of Variation is calculated as follows:

$CV = S(Y) / \bar{Y}$ where CV = Coefficient of Variation, S = Standard deviation of average real per capita personal income and \bar{Y} = Average statewide or regional real per capita personal income.

The Quintile Point Measure is calculated as follows:

Q1/Q5 where Q1 = the percentage of total real per capita personal income received by the richest counties in the top 20 percent (quintile) of the statewide or regional income distribution. Q5 = the percentage of total real per capita personal income received by the poorest counties in the bottom 20 percent (quintile) of the statewide or regional income distribution.

Table 4: Measures of Income Inequality for Northern and Coastal Regions in California

Statewide - All Counties:	1969	1979	1989	1999
Average RPPI	\$11,300	\$13,703	\$14,199	\$15,489
10 Yr. Avg. Growth Rate of RPPI		0.21	0.04	0.09
Stand. Dev. of log of Avg. RPPI	0.142	0.148	0.212	0.28
Coefficient of Variation	0.15	0.16	0.23	0.32
Quartile Point Measure (Q1/Q5)	1.47	1.5	1.94	2.19
Northern Region:				
Average RPPI	\$10,870	\$12,839	\$12,610	\$13,677
10 Yr. Avg. Growth Rate of RPPI		0.18	-0.02	0.08
Stand. Dev. of log of Avg. RPPI	0.122	0.112	0.15	0.179
Coefficient of Variation	0.13	0.11	0.15	0.185
Quartile Point Measure (Q1/Q5)	1.36	1.35	1.52	1.64
Coastal Region:				
Average RPPI	\$12,739	\$15,818	\$17,890	\$21,509
10 Yr. Avg. Growth Rate of RPPI		0.24	0.13	0.2
Stand. Dev. of log of Avg. RPPI	0.16	0.18	0.21	0.28
Coefficient of Variation	0.156	0.18	0.22	0.29
Quartile Point Measure (Q1/Q5)	1.54	1.64	1.77	2.13

Data Source: U.S. Department of Commerce, Bureau of Economic Analysis

Table 5: Measures of Income Inequality for Central and Southern Regions in California

Statewide - All Counties:	1969	1979	1989	1999
Average RPPI	\$11,300	\$13,703	\$14,199	\$15,489
10 Yr. Avg. Growth Rate of RPPI		0.21	0.04	0.09
Stand. Dev. of log of Avg. RPPI	0.142	0.148	0.212	0.28
Coefficient of Variation	0.15	0.16	0.23	0.32
Quartile Point Measure (Q1/Q5)	1.47	1.5	1.94	2.19
Central Region:				
Average RPPI	\$10,468	\$12,643	\$12,537	\$12,515
10 Yr. Avg. Growth Rate of RPPI		0.21	-0.008	-0.002
Stand. Dev. of log of Avg. RPPI	0.10	0.07	0.10	0.13
Coefficient of Variation	0.105	0.07	0.1	0.126
Quartile Point Measure	1.3	1.21	1.34	1.43
Southern Region:				
Average RPPI	\$11,550	\$14,458	\$15,370	\$15,513
10 Yr. Avg. Growth Rate of RPPI		0.25	0.06	0.009
Stand. Dev. of log of Avg. RPPI	0.11	0.09	0.15	0.23
Coefficient of Variation	0.11	0.093	0.15	0.22
Quartile Point Measure (Q1/Q5)	1.3	1.27	1.46	1.76

Data Source: U.S. Department of Commerce, Bureau of Economic Analysis

However, from 1979 to 1989, regional income divergence began to accelerate and has continued to rise through 1999. These results are consistent with Daly and Royer (2000) that measured income inequality in California using Current Population Survey (CPS) data.

The measures of income inequality in Tables 4 and 5 suggest an increasing trend in the σ -divergence of income. Therefore, since the average RPPI levels across California and its regions are becoming more variable (σ -divergence) it must be the case that poorer counties are not growing faster than richer ones (absolute β -divergence). It is impossible to overcome income inequality across the state unless one observes absolute β -convergence. Absolute β -convergence relates to the mobility of different counties within the given distribution of countywide income across the state, while σ -convergence is related to whether or not this distribution of countywide income is becoming more equal (Marin, 2001/02).

The measures in Tables 4 and 5 do not explain the possible sources of income inequality within regions of California. Much of the recent research attributes rising income inequality to the changing composition of the population and the rising value of education and training. According to Daly, et al, (2001), immigrants that arrived in California since 1980 have disproportionately increased the number of low and lower-middle-income families. This tends to reduce regional average RPPI in two ways. Recall regional average RPPI equals the ratio of regional real per capita personal income/population. As the population grows, regional average RPPI will decline if the productive contributions of immigrants to regional output are less than their increase in the population. The result will be a greater proportion of the population at the lower end of the average RPPI distribution leading to greater income inequality¹².

The rising value of education and training has been attributed to international trade, technological and organizational change. As American consumers have increased their demand for low-cost imports from less developed countries, the demand for low-skill workers in the U.S. has declined. With fewer job opportunities for low-skill workers coupled with a rapid increase in the supply of skilled workers, Acemoglu (2002) claims that changes in the composition of labor demand and supply has induced the development of skill-complementary technologies. Technological change has tended to produce innovations that complement the skills of more educated workers and replace the skills of less-educated workers. Whether technological change is biased in favor of skilled versus unskilled workers depends on the particular innovation. Snower (1998) differentiates between intensive and extensive technological change. Intensive technological change makes skilled workers more productive without affecting the demand for unskilled workers. For example, a skilled worker may be allocated a faster computer allowing him to generate more computations per hour. Extensive technological change enhances the productivity of skilled workers while simultaneously replacing unskilled workers. For example, Snower suggests that Robots, working in conjunction with skilled engineers and programmers displace a much larger number of unskilled workers. According to Tinbergen (1975), the race between technology and education is the driving force behind greater earnings inequality. This, coupled with increased immigration of low-income workers has lead to persistent increases in income inequality among California's regions.

Organizational change has also had an enormous impact on the structure and design of jobs. Not only has the demand for less-skilled workers declined, but the skill requirements of more specialized workers are increasing to include a greater span of competence. For example, Snower notes that as capital equipment has become more versatile, skilled workers require a broader set of skills. Furthermore, beyond having versatile technical skills, workers need initiative, communication and social skills to effectively work in groups and interact with suppliers and customers. These worker characteristics are associated with higher wages.

According to Reed's (1999) study, greater income inequality is more of a result of falling wages of men in the bottom of the education distribution than of rising wages of more educated

¹² The decline in the real value of the minimum wage and union membership has also contributed to lower earnings for those workers at the lower end of the RPPI distribution. According to Mitchell (2002), from 1983 to 2001, unionization rates for California workers in private sector manufacturing and non-manufacturing fell from 63 to 50 percent. However, over the same period, public sector unionization rates increased from 37 to 50 percent.

workers. Reed defined skill in terms of years of schooling and work experience for civilian male workers in California ages 18 to 54. She found the return (differential in earnings) to having a high school diploma versus 11 or 12 years of schooling without a diploma to be 9 percent in 1969, 20 percent in 1989 and 35 percent in 1997. The earnings differential for a worker with a bachelor's degree compared to a high school diploma was 50 percent in 1969, 60 percent in 1989 and almost 70 percent in 1997. For male workers with 25 compared to 5 years of work experience, the earnings differential was 68 percent in 1969, 72 percent in 1989 and 91 percent in 1997.

Reed's research suggests that from 1967 to 1997, about 44 percent of the rise in income inequality for male workers in California can be explained by increasing returns to skill and immigration of low-income families.

V. The Relationship between Economic Growth and Income Inequality

It is clear from Table 1 that the growth rates for most regions over the past 31 years deviate from the corresponding growth rates for the state as a whole.

Economists have extensively studied the fact that economic growth varies over time and is unevenly distributed. Simon Kuznets (1955) pioneered research attempting to determine the factors that lead to greater income inequality during the course of a country's economic growth. Kuznets hypothesized that personal income inequality would initially rise as a country was in the early stages of economic growth and development. Eventually, continued economic growth would lead to rising personal incomes for greater proportions of the population. Personal incomes would eventually converge across the population causing a decline in income inequality. The result could be graphically shown to have an inverted – U pattern relating increasing then decreasing personal income inequality to economic growth. Kuznets identified potential causes that could explain his inverted – U hypothesis:

1. For developing economies, upper-income groups account for the largest amount of savings. A relatively small group of individuals will accumulate a disproportionate amount of savings. The concentration of wealth allows for capital accumulation and the expansion of industry. The result is significantly greater personal interest income for wealth holders and an initial divergence of personal incomes causing greater inequality.
2. Economic growth will eventually shift away from agriculture to industrialization and urbanization. The income distribution of the total population becomes a combined distribution of rural and urban populations. The average per capita income of the rural population is usually lower compared to the urban population. However, the income distribution for the rural population tends to be more equal than the urban population. All else equal, an increasing share of the urban population as an economy grows means an increasing share for the more unequal of the two component distributions. The result would be increasing income inequality in the total income distribution.

Williamson (1965) adapted Kuznets' hypothesis to regions and argued there are four basic reasons supporting the inverted-U pattern of income inequality:

1. Unequal natural resource endowments across regions lay the foundation for unbalanced growth during the initial stages of economic development.
2. During development, the most skilled labor will migrate into urban and away from rural areas.
3. Capital will follow skilled labor (and vice-versa) into growing regions.
4. Government policies tend to benefit regions that are growing the fastest.

During later stages of development, Williams states that these four reasons will eventually contribute to greater income equality. Newly discovered natural resources and urban congestion can redirect resources to less developed areas often with incentives provided by government entities.

Once the inverted-U pattern is complete, does income inequality remain stable or begin to increase, setting the stage for the next cycle? Amos (1988) explored this possibility by examining income inequality among counties within U.S. states during advanced stages of economic development. He found that counties within California exhibited the inverted-U pattern from 1969 to 1973. After reaching a minimum point of income inequality in 1973, California began a new cycle of increasing inequality through 1983. Amos's results show a pattern of increase-decrease-increase indicating that intrastate income inequality did not remain stable in California. The data suggest that during advanced stages of economic development, a new inverted-U begins to form. Amos speculates that increases in suburbanization and movement towards a service-based economy may be partly responsible for increasing regional income inequality.

Charts 1 through 5 plot a measure of income inequality (the standard deviation of average RPPI) against average RPPI for California and the 4 regions under investigation. All charts indicate increasing income inequality since 1969 suggesting California and its regional economies have begun the initial phase of Kuznets' inverted-U hypothesis. The data in Chart 1 is consistent with Amos's study in that countywide inequality appears to have reached a minimum around 1973. Note the sharp rate of increase in statewide inequality in 1979.

The pattern of inequality for the state does not necessarily reflect trends in regional inequality. In the Northern region, Chart 2 indicates a relatively equal distribution of income during a period of strong economic growth from 1969 to 1979. Interestingly, income growth became slightly negative from 1979 to 1989 while inequality increased dramatically.

From Chart 3 it can be seen that income inequality in the Coastal region has continuously increased since 1969.

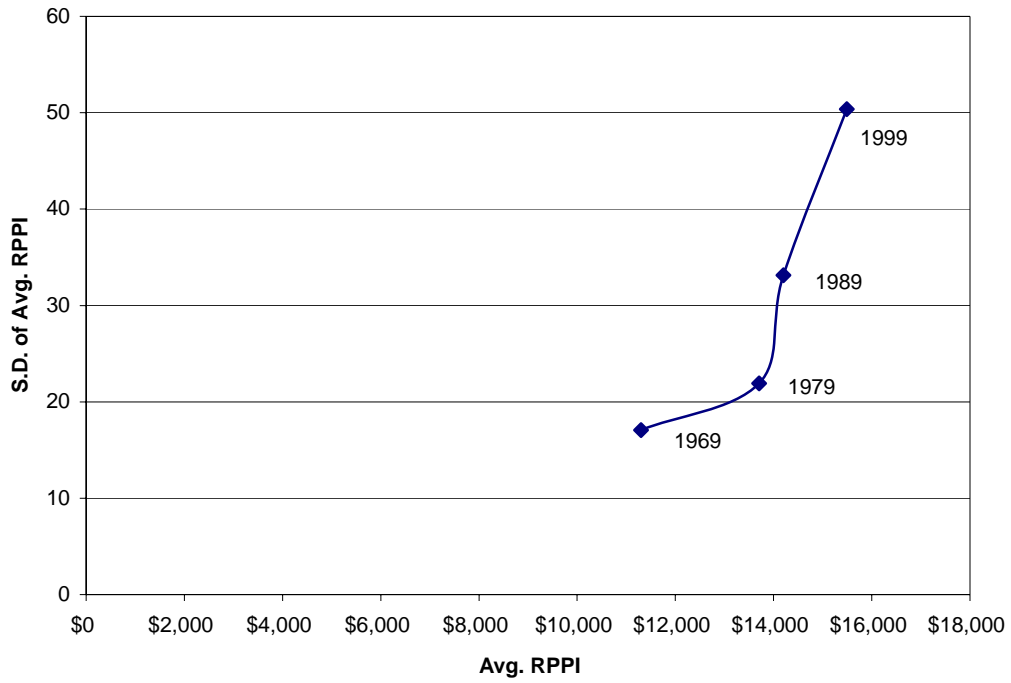
An unusual pattern of income inequality in the Central region is shown in Chart 4. Inequality sharply declined from 1969 to 1979. However, from 1979 to 1999 inequality accelerated while economic growth stagnated.

Similar to the Northern region, Chart 5 indicates the Southern region had strong economic growth from 1969 to 1979. However, like the Central region, inequality rapidly increased from 1979 to 1999 while economic growth faltered.

In sum, from 1969 to 1979, while counties statewide experienced strong economic growth, most of the growth emanated from the Coastal and Southern regions. This growth was offset by more mild growth in the Central and Northern regions. Statewide, income inequality increased only modestly from 1969 to 1979. The Coastal region had the most growth in income inequality while it actually declined in the Central region. Economic growth slowed considerably across California's counties from 1979 to 1989. The Coastal and Southern regions grew relatively faster compared to the negative growth experienced by the Northern and Central regions. From 1979 to 1989, statewide income inequality rose considerably. The Southern, Coastal and Northern regions experienced the greatest increase in inequality followed by the Central region.

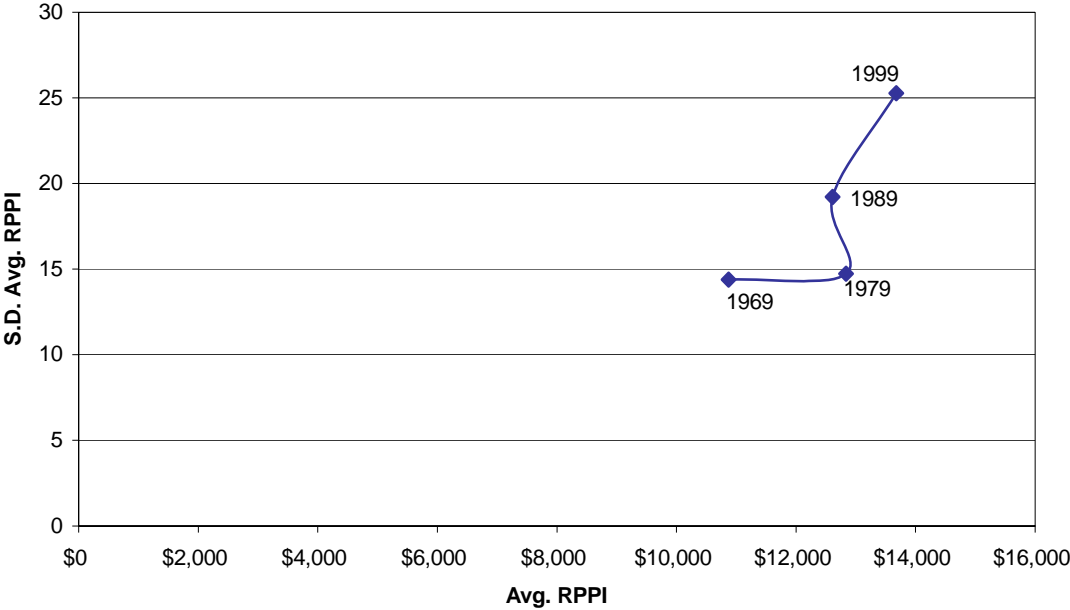
Economic growth began to recover across the state from 1989 to 1999. The bulk of this growth occurred in the Coastal and Northern regions. Incomes in the Central and Southern regions stagnated. Over the same period, income inequality continued to rise statewide. Most of this rise is attributed to the Coastal and Southern regions. Income inequality increased more moderately in the Northern and Central regions.

Chart 1: Statewide Income Inequality



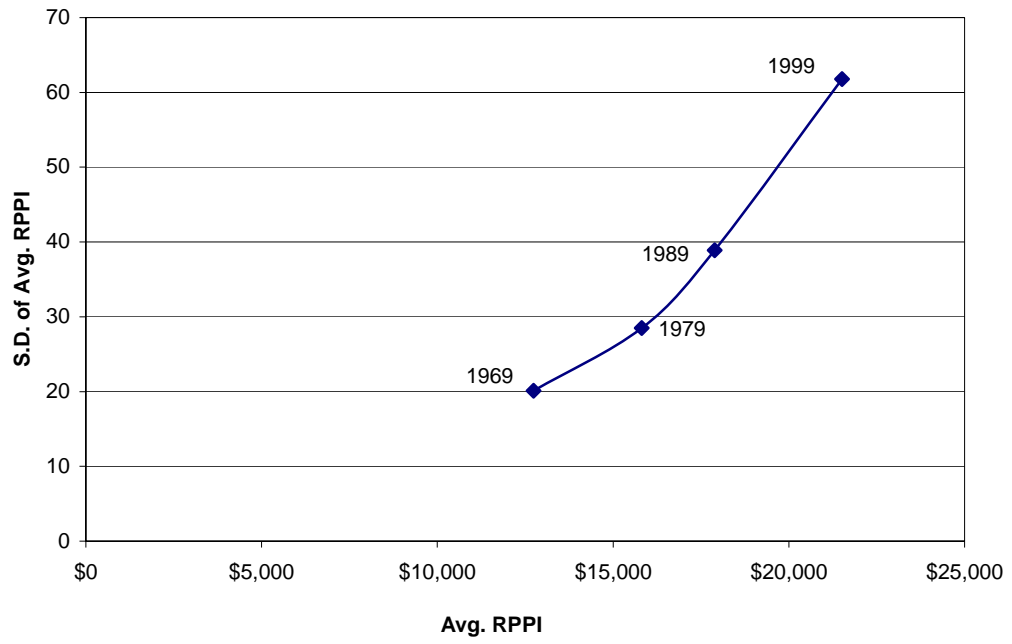
Data Source: U.S. Department of Commerce, Bureau of Economic Analysis

Chart 2: Northern Region Income Inequality



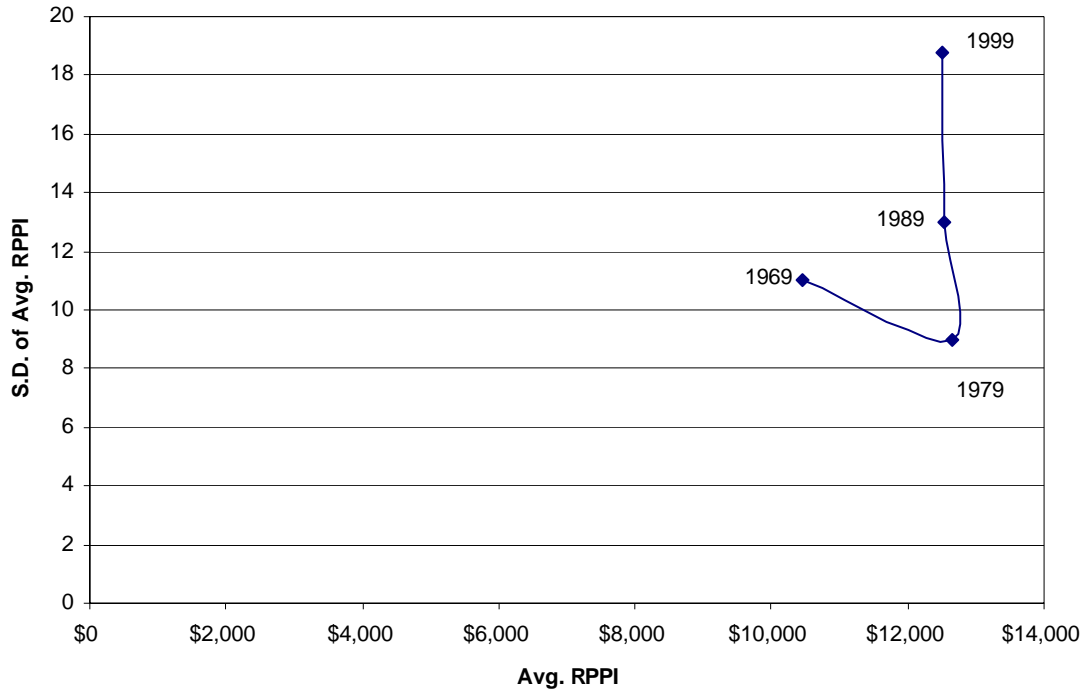
Data Source: U.S. Department of Commerce, Bureau of Economic Analysis

Chart 3: Coastal Region Income Inequality



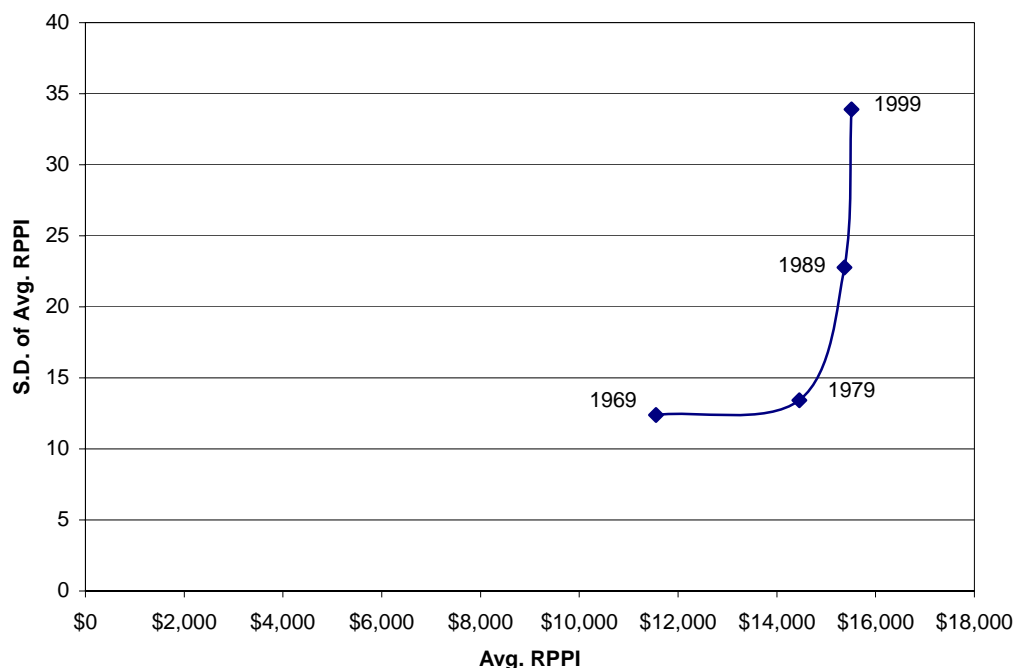
Data Source: U.S. Department of Commerce, Bureau of Economic Analysis

Chart 4: Central Region Income Inequality



Data Source: U.S. Department of Commerce, Bureau of Economic Analysis

Chart 5: Southern Region Income Inequality



Data Source: U.S. Department of Commerce, Bureau of Economic Analysis

VI. Implications for Regional Economic Policy

Regional economic growth has accelerated in California (except for the Central region) since 1989. However, regional inequality has consistently increased among counties within the four regions defined in this report since 1979. Neoclassical economists claim that as long as capital and labor are free to move to their highest valued use, market forces will lead to inter-regional income convergence. During this process, Kuznets' model implies that greater regional economic growth should eventually lead to decreasing income inequality within regions. Unfortunately, economic development is a complex process that cannot be sufficiently explained by any general theory (Hansen, 1996). Recent history in California regions suggests that growth processes are not necessarily an automatic phenomenon and may need to be addressed by policy makers.

Regional economic policies can focus on promoting increased development in lagging regions or reduce income disparities via inter-regional income transfers. In this context, policies that emphasize increasing the size of the regional pie (efficiency) need to be evaluated against how state expenditures are allocated between regions (equity).

Economic policies should be designed based upon the Pareto principle¹³. In the context of regional economic growth and income inequality, this principle implies that a policy change is the most effective if it makes one region better off without making another region worse off.

The development of enterprise zones has been one policy adopted by state and local governments as a way to promote growth in lagging regions. An enterprise zone is a designated area, usually in a distressed location that provides tax incentives to industries that locate in the zone and provide jobs for local residents. This type of regional development policy is Pareto improving because existing tax dollars are not allocated from one region to another. Local governments in California develop proposals through a competitive application process and

¹³ The Pareto principle is attributed to Italian economist, Vilfredo Pareto (1848-1923).

submit their proposals to the Technology Trade and Commerce Agency. This Agency designates enterprise zones to local communities who have the most convincing economic development plan (O’Keefe and Dunstan, 2001). According to Polese (1999), economic development has the greatest chance of success if it is locally initiated. Polese states:

The success of a region will in the end depend on the capacity of the local actors (firms, individuals, policy-makers, etc.) to take matters in hand, to organize various parties around common goals, to adapt and to successfully adjust to outside pressures. Thus, the ultimate sources of development lie in the region itself, in its people, its institutions, its sense of community, and, perhaps most important of all, in the spirit of innovation and entrepreneurship of its population.

The success of enterprise zones in California’s regions has been mixed. These zones have been designated for particular areas within the four specific regions discussed in this paper.

One common goal across enterprise zones is to increase employment opportunities and monthly earnings for local residents. O’Keefe and Dunstan conducted their study comparing similar census areas, with and without enterprise zones. They calculated the percentage point difference in employment growth, monthly earnings and number of firms between each enterprise zone and corresponding matched census area. Table 6 provides a summary of their results. Between 1991 and 1999, positive (negative) growth indicates enterprise zones outperformed (under performed) their matches.

Table 6: Performance of Enterprise Zones Established Prior to 1990 Using Within – Region Matches

Region/Enterprise Zone	Employment	Monthly Earnings	Number of Firms
Northern Region:			
West Sacramento (1988)	445%	16%	48%
Yuba/Sutter (1986)	-27%	15%	-10%
Coastal Region:			
Pittsburg (1988)	30%	42%	25%
San Jose(1986)	27%	23%	11%
Central Region:			
Bakersfield (1986)	-27%	-7%	1%
Porterville (1986)	-46%	-21%	-45%
Madera (1989)	-51%	9%	-1%
Southern Region:			
Riverside (1986)	16%	2%	13%
San Diego (1986)	21%	8%	5%
Calexico (1986)	4%	39%	2%
Los Angeles(1986)	-8%	-4%	-11%

Data Source: Table 4, O’Keefe and Dunstan (2001)

West Sacramento had the most impressive percentage gains in employment and number of firms while Pittsburg had the most significant percentage increase in monthly earnings. Overall, earnings growth in the Coastal region's enterprise zones was the strongest. This is not surprising since economic growth tends to be more rapid in regions that already have a highly educated population, large stock of capital and an economic environment favorable to the accumulation of knowledge (Romer 1986, Gould and Ruffin 1993). More troubling is the generally poor performance of enterprise zones in the Central region. According to Bernstein, et al (2002) and Polese (1999), state policy makers have little control over much of the growth in regional income inequality¹⁴. For example, what is economically sound may not be politically feasible. An effective regional growth pole policy requires a concentrated and sustained investment in infrastructure at a limited number of locations (Polese, 1999). Political pressures in a democracy make it impossible to pursue this strategy because every regional economy will demand their fair share of public investment expenditures. Regionally targeted resources will end up being spread over many regions to satisfy the most voters. The end result is likely to have little impact on regional disparities in income.

Certainly, some regional income inequality is unavoidable. If the age distribution of a region were biased in favor of a relatively younger work force, higher income inequality would be expected. Also, immobile factors of production such as land, the personal preferences of individual workers and the composition of industry within a particular region will affect the distribution of income. For example, the Central region's dominate agricultural sector contributes relatively less to per capita state income compared to the high-technology sector in the Coastal region. This is because in part, rural areas tend to have lower incomes compared to urban areas while the skill requirements are typically less in agricultural compared to high-technology sectors. Recent immigrants to California tend to be either highly skilled and speak English or unskilled and non-English speaking. These workers will naturally gravitate to regions' where they have the greatest comparative advantage.

Lambooy and Boschma (2000), stress that regional development policies are more likely to fail if they significantly deviate from the local context. Regions differ greatly in their ability generate or apply new technologies and adapt to economic change. A high technology enterprise zone in a largely rural area such as the Central region is likely to fail compared to locating in the Coastal region where complementary resources are located. Agricultural, manufacturing, distribution and service industries are likely to be more successful in rural areas.

An integrated "top down" and "bottom up" regional development plan is likely to be the most successful. Since the development potential may differ between regions, a "top down," one-size-fits-all policy approach is likely to fail. Regional development policies should be diversified and coordinated to insure long-term success and not be over reliant one best approach. For example, public funds used for staffing schools with better teachers could increase out-migration if job opportunities are not created for better-educated workers. Local community leaders must be able to form partnerships with the private sector in order to design an economic plan consistent with the economic goals of the region. This may require hiring consultants to determine the development plan that is consistent with the needs and resources of the region. One of the most useful services a statewide government could provide would be information. A statewide or regional development information system could be used to diffuse knowledge pertaining to economic development opportunities. The diffusion of new and existing knowledge is essential for entrepreneurial activity since many innovations developed in an R & D intensive region have the greatest impact in industries located in other regions (Hansen, 1996). Greater collaboration between academic economists and economic development practitioners could also lead to improved policy making by increasing the understanding of the economic development process.

¹⁴ Federal level policies may have a greater economic impact than state economic development initiatives. For example, the decline in the Southern region's defense industry in the 1980's and early 1990's had a negative impact on that region's economic growth leading to an eventual change in the composition of output.

VII. Summary and Conclusions

Between 1969 and 1979, California exhibited impressive economic growth. This growth was relatively uniform across all four regional economies. The implication of the Solow model suggests the Northern and Central regions reached a steady-state equilibrium in the growth of real per capita personal income (RPPI) between 1979 and 1989 while growth slowed considerably in the Coastal and Southern regions.

Income inequality has consistently risen within all regional economies since 1979. Between 1989 and 1999, growth began to increase in the Northern and Coastal regions. During the same time period, growth slowed and remained stagnant in the Southern and Central regions respectively.

Regional economics goes beyond traditional economic growth models and attempts to explain patterns of economic growth focusing on the spatial relationships among regions. Since resources are unevenly distributed across regional economies, there will be a continuum of resource endowments within and between regions. Workers will tend to locate where their labor services generate a comparative advantage causing a spatial division of labor. This can result in initial income inequality within and between regions. If capital and labor are mobile, the differences in regional income should dissipate over time, as resources tend to move to their highest valued use.

Geographic and personal preferences of workers can reduce (or increase) worker mobility accentuating the dispersion of regional incomes. Furthermore, the age distribution of the population within a regional economy may contribute to greater income inequality. Over time, as younger workers age and accumulate more work experience, many will advance to higher income brackets within regions helping to moderate some of the income inequality.

Agglomeration economies are associated with similar firms in an industry producing goods and services in close proximity to one another. Economies of scale can be generated through lower transportation costs and more efficient knowledge exchange. These "growth poles" can be a catalyst for regional economic growth especially when complemented with expanding public infrastructure financed in part with tax revenues generated from the agglomeration economies.

Research suggests that the changing composition of California's population and the rising value of education have been the most significant factors associated with increasing income inequality. The race between technology and education coupled with a disproportionate share of low-income immigrants has altered the structure of regional labor markets causing a greater divergence of incomes.

Regional economic development is a complex process that unfolds over time. The fact that different regional economies have varying growth potential suggests a possible role for government policy. Ideally, government policy should attempt to make one region better off without making another region worse off. This is one important advantage of the creation of enterprise zones. Political realities reduce the effectiveness a purely "top down" approach to regional development. If policy makers desire to please a statewide constituency, their actions will likely have little impact on regional disparities in income.

The economic development of a region depends more on a partnership of local policy makers, industry and community leaders who can work together towards common goals. Therefore, an integrated "top down" and "bottom up" approach is likely to be more effective in the long run. A possible role for statewide government would be to serve as an information source helping to diffuse new and existing knowledge useful to regional development authorities. This information could be used to help regions improve their productivity, competitiveness and growth potential. California has already taken steps in this direction through the formation of the California Center for Regional Leadership. Regional development should include a mix of policies that are designed and coordinated to achieve established goals.

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