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Income Growth Across the U.S. States: An Empirical Analysis

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INCOME GROWTH ACROSS U.S. STATES:

AN EMPIRICAL ANALYSIS

An internship report submitted in partial fulfillment
of the requirements for the degree of
Master of Science

By

WEIXIONG HE
B.A., Nankai University, 1991

1998
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WRIGHT STATE UNIVERSITY

DEPARTMENT OF ECONOMICS

June 10, 1999

I HEREBY RECOMMEND THAT THE INTERSHIP REPORT PREPARED UNDER MY SUPERVISION BY WEIXIONG HE ENTITLED Income Growth across U.S. States – An Empirical Study BE ACCEPTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF Master of Science.

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Abstract

B.A., Nankai University, 1991, Weixiong He

Income Growth across U.S. States: An Empirical Analysis

The purpose of this study is to test the convergence hypothesis that prevails the neo-classical economic literature. In light of research on cross-country economic growth, the paper is adopting the same kind of methodology in studying income growth across U.S. states. The paper starts with a survey of literature in the study of growth of convergence. Then it tries to define the term of "convergence" in various economic implications, in particular the notion of "δ-Convergence" versus "β-Convergence", "conditional convergence" versus "absolute convergence", and such popular notion as "club convergence". The paper then goes into the quantitative analysis of U.S. per capita personal income change in a time series. The time-series data is firstly divided up by U.S. census regions and the pattern of regional income change overtime is carefully identified. δ-Convergence is tested by plotting personal income dispersion across U.S. states in time series from 1958 to 1996. β-Convergence is tested by doing a simple regression of personal income growth on personal income at its initial level. The issue of alleged divergence since 1980s is carefully addressed and the importance of State Price Index is evaluated for the sake of the accuracy of economic studies on convergence and growth. The paper ended with a multiple-regression analysis aiming at identifying some attributes and determinants of income growth at state level.

Introduction

A new growth theory has emerged out of the vast economic controversies in the long-term economic growth in the past decades. The large amount of economic literature has been specially devoted to the study of long-term convergence in income, output and productivity between countries as well as national regions. The mainly empirical debate has promoted the development of the endogenous growth theory as an alternative to the conventional neoclassical exogenous theories. Conventional neoclassical model has treated such factors as technological change and human capital as exogenous and implies that per capita output in a regional economy will converge to a same level regardless of its initial capital endowments. This seemingly automatic converging mechanism has been largely controversial and more and more economists have found that there exists different growth patterns among countries and regions. This paper seeks to test the convergence hypothesis by using different approaches with different empirical evidences. It will identify the growth pattern of U.S. states in the past thirty years and attempt to explain the reasons that caused such growth differential between states.

Survey of Literature

Starting with Romer (1986) and Lucas (1988), a body of theoretical research and empirical studies has challenged the implication of the neoclassical theory. The New Growth theorists have challenged the convergence hypothesis of the neoclassical theory

by pointing out the failure of per capita output to equalize across first and third world economies as well as the failure of growth rates in less developed countries to exceed those of advanced industrialized countries. Research by Lant (1996) shows that the convergence has never occurred between rich and poor countries, in fact, exactly the opposite has occurred in some cases. In terms of theory, Bernard and Durlauf argued that a fundamental factor in growth is the presence of non-convexities in production that can create a non-diminishing relationship between an economy's initial conditions and its output level over arbitrarily long horizons. Authors such as Azariadis and Drazen (1990) and Durlauf (1993) have specifically shown how production complementarities can interact with market incompleteness to generate multiple equilibria in long-term output paths, which implies that similarly specified economies need not converge.

The striking differences in the empirical implications of the neoclassical and new growth perspectives have led to a huge amount of literature to test the convergence hypothesis.

Two of the earliest and most influential studies of regional convergence was Borts and Stein's (1964) classic study of regional development in the United States and Williamson's (1965) analysis of the evolution of regional income differences in advanced industrial countries. The models of regional growth advanced by writers such as Perroux (1950, 1955), Myrdal (1957), and Kaldor (1970, 1981), however, predict that regional incomes will tend to diverge, because market forces, if left to their own devices, are spatially disequilibrating. Economies of scale and agglomeration lead to the cumulative concentration of capital, labor, and output in certain regions at the expense of others: uneven regional development is self-reinforcing rather than self-correcting.

The Marxist theories that have become popular among some geographers in the 1970s and 1980s, on the other hand, challenged both of the above two views. These theories, suggested by the writings of Harvey (1982), Massey (1984), and Smith (1984), view regional economic evolution as neither convergent nor divergent, but rather as essentially episodic. The accumulation crises that from time to time punctuates the course of capitalist development promote the search for new capital, technological, and social "fixes" and lead to new configurations of regional relative growth and decline. Thus, in theory, it would be possible to observe regional convergence in one historical phase of regional development but divergent in another phase.

Since the mid-1980s, Marxist approaches have given way to neo-Marshallian and transactions cost theories of regional economic agglomeration and growth. However, these studies depicted a particular sort of region rather than understanding and charting the trajectories of a nation's regional system as a whole. In other words, the emphasis remains firmly on the contingent conditions of growth in particular regions, rather than on the long-term evolution of the entire regional economic system.

While the study of the long-term evolution of regional systems is waning, interest in long-term economic growth has seen a revival among economist in the late 1980s. Languishing in the early 1960s, the study of long-term growth revived as economists renewed their interests in the empirics of growth, and especially in the evidence for long-term convergence in per capita incomes and output between nations and national regions. The new studies have been treating factors as technological change and human capital as endogenous and formulating their new endogenous growth theory by using regional growth patterns to evaluate and develop their theory.

Over the past decade, empirical work by economists on cross-national and cross-regional convergence has proliferated, and a list of examples are Chatterji (1992), Barro and Sala-i-Martin (1995), Canova and Marcet (1995), de la Feente (1995), Galor (1996) and Sala-i-Martin (1996). There have been also numerous attempts to measure the speed of convergence, for example, Baumol (1996), Romer (1986), Baumol and Wolff (1988), Doweich and Nguyen (1989), Barro (1991), Barro and Sala-i-Martin (1992, 1995), Mankiw, Romer, and Weil (1992), etc. The general conclusion from these studies is that there is some support of absolute convergence only when attention is restricted to the set of richer countries, such as OECD countries.

Economic Theory of Convergence

The neoclassical growth model was originated with Solow (1956) aiming at interpreting the relationships between economic inputs, mainly capital and labor, and long run growth. The model treated technological and capital endowment as exogenous and implied that per capita output in an economy will converge to the same level regardless of initial technological and capital endowment. The logic behind the universal convergence is the law of diminishing return to capital and the automatic flow and mobility of labor and capital. Under free market system, labor and capital will automatically flow to where its marginal return is the highest. In the long run, higher growth economies tend to slow down while lower growth ones tends to catch up. New growth theory, however, suggest that due to different endowments in technology, human and physical capital, the convergence may not occur.

There are two concepts or measures of convergence. The so-called β-convergence is said to exist if the regression coefficient, β, of the growth rate of regional relative per capita income over a given period on the level of regional relative per capita income at the beginning of the period is negative. A negative value of β implies that there is a tendency for per capita incomes to equalize across economies and the value of β measures the speed of convergence. A group of economies (countries or regions) is said to be characterized by so-called δ-convergence if the dispersion (variance) of their relative per capita income levels tends to decrease over time. The concept of δ-convergence can easily be shown to be closely related to that of absolute convergence. The existence of β-convergence will tend to generate declining dispersion, or δ-convergence. However, δ-convergence also depends on the variance of error terms or "shocks" in the growth regression.

There have been two main developments in the basic convergence regression. The first is the idea of so-called "club convergence" – which means only countries that are similar in their structural characteristics and that have similar initial conditions will converge to one another. Thus, the richer OECD countries may form one "convergence club", the developing countries another, and the underdeveloped yet another. The broad inequalities among the different clubs may persist or even increase. The second has been the reformulation of the standard β-convergence to test whether economies converge, not to a common steady state (equalization of incomes) but to their own long-term steady state (equilibrium) relative income level. This concept is also known as *conditional convergence*, which means that the convergence is conditional on the different structural characteristics of each economy, such as societal preferences, technologies, rate of

population growth, and government policy. The countries under one "convergence club" should also display a so-called *absolute convergence*.

In this context, the regional convergence within one country is expected to display an absolute convergence, as regions within a country are much more likely to share similar structural characteristics and behave like a "convergence club". A lot of interesting studies have been done on the regional convergence within countries, such as Canadian provinces, Japanese prefectures, and U.S. states. Long term regional convergence, both β-convergence and δ-convergence, has been identified and their convergence coefficients been calculated.

Next, we talk about the divergence theory that directly contradicts with the convergence hypothesis. The theory of income divergence assumes indivisible or lumpy inputs in some production functions, which leads to scale economies and to external or agglomeration economies and the resulting specialization of some places in production of certain traded goods or services. (Drennan, Tobier and Lewis, 1996) Such theory was based on the theory of scale economies of Ohlin (1933) and applied to convergence and divergence theories by Lucas (1988). There have been two models explaining the sources of income divergence, the models of growth and the models of trade. The models of growth are based on increasing returns in physical or human capital externalities, as advanced by Paul Romer and Robert Lucas respectively. In their models, regions with higher levels of physical or human capital can become even wealthier as increasing returns reinforce their initial advantages. The models of trade predict the possibility of income divergence through divergence in industrial structures. As high-tech, high-wage industries are subject to external economies, the opening up of trade will cause the

concentration of all the high-tech, high-wage industries in a few regions, while leaving the remaining regions with only the low-tech, low-wage industries.

Income and Output Change across Regions

We have two measures of per capita income or product across the U.S. states in different time intervals. The first is per capita personal income. The U.S. Commerce Department has published annual data on nominal personal income for the 48 continental states since 1929. Data available from the Commerce Department's Bureau of Economic Analysis (BEA) is divided into two parts, 1929-1957 and 1959-1996. Our analysis is based on the latter half of the data. The second type of data is per capita Gross State Product (GSP). The main differences between personal income and GSP involve capital income. Personal income includes corporate net income only when individuals receive payment as dividends, whereas GSP includes corporate profits and depreciation. But neither of them includes capital gains. Typically, GSP attributes capital income to the state in which the business activity occurs, while personal income attributes it to the state of the asset holder (Barro and Sala-i-Martin, 1992).

The regional configuration is based on that of the BEA and distributed as follows. New England region includes six states, Connecticut, Maine, Massachusetts, New Hampshire, Rode Island, and Vermont. Mid-East states include Delaware, District of Colombia, Maryland, New Jersey, New York, and Pennsylvania. Great Lakes includes five states, Illinois, Indiana, Michigan, Ohio, and Wisconsin. Plains include seven states, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota.

Southeast include twelve states, Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia. Southwest are four states, Arizona, New Mexico, Oklahoma, and Texas. Rocky Mountain has five states, Colorado, Idaho, Montana, Utah and Wyoming. The rest are six Far East states, Alaska, California, Hawaii, Nevada, Oregon, and Washington.

Table 1.

Per Capita PI Change

Regions	1958	1996	Annual Grow	Increase
United States	2117	24426	0.0272	10.538
New England	2739	33875	0.0280	11.368
Mid-East	2520	26848	0.0263	9.654
Great Lakes	1801	21011	0.0274	10.666
Plains	2055	22917	0.0269	10.152
Southeast	1320	19977	0.0303	14.134
Southwest	1732	22470	0.0285	11.973
Rocky Mountain	2311	28989	0.0282	11.544
Far West	2008	22139	0.0267	10.025

The above Table 1 shows the regional per capita personal income change over time. The annual growth is calculated by taking the logarithm difference between per capita personal income in 1996 and in 1958 and them divided by total number of years, which is39. The increase index is calculated by taking the direct difference between the ending and initial years and divided by number of years. The two measures give different insight in the change of income over time. The figure shows, from 1958 to 1996, United States average per capita personal income increased by some ten folds from $2117 in

1958 to $24426 in 1996, with annual growth rate of 2.72%. In 1958, the two poorest regions are Southeast and Southwest, whose per capita personal incomes were 62% and 81% of national average. While their annual growth rates were also the highest compared with other regions, with Southeast regions seeing an annual average growth of 3.03%, much higher than national average. Towards 1996, Southeast region raised its per capita personal income to 82% of national average, while southwest region raised its income to 92% of national average. The narrowing gap shows that the southern region, with lower initial income level, has been quickly catching up in the past decades.

There have been a number of research studies on the fast economic growth pace of the southern states of the U.S. during the past century and after the World War II in particular. It should also be noted that the regional data is the aggregate of data for all states within that region and thus masks over any difference between states within that region. Actually, some of the southern states have developed so rapidly in the past decades that income for some of them has already surpassed national average.

Let's look into states among regions. When we sort out personal income by states at the initial and ending year, we can see that at initial year of 1958, a higher percentage of the lowest income states were southern states, while in 1996, much smaller number of southern states are among the lowest income states. Actually, a number of southern states have become high-income states. This fact has aroused great interest among economist to explain the unevenness of the regional economic development over time.

Now, let's look at the regional output. Table 2 shows the change of per capita Gross State Product (GSP) aggregated at regional level.

Table 2.

GSP Change Overtime

	1977	1994	Annual Grow	Increase
United States	9017.35	26254.94	0.0258	1.9116
New England	7795.81	26390.54	0.0294	2.3852
Mid-East	11310.43	39476.08	0.0302	2.4902
Great Lakes	9261.29	25431.09	0.0244	1.7460
Plains	8581.71	24322.10	0.0251	1.8342
Southeast	7632.75	22795.92	0.0264	1.9866
Southwest	8655.31	23054.45	0.0236	1.6636
Rocky Mountain	9424.47	24578.03	0.0231	1.6079
Far West	11487.99	29659.30	0.0229	1.5818

The table is based on data published by the BEA. Current data is only available from the year 1977 on. The aggregate data shows some different results as we have witnessed in state per capita personal income. The south regions are not showing obvious higher growth rate than other regions. While higher income regions like New England and Mid-East had been growing at faster speed than other regions and national average. Such phenomenon has been noted by a lot of economist and there has been a lot of literature devoted to the research of the new growth pattern emerged at the end of 1970s. We will talk about it more in our later discussion.

We can also see that the Far West region, which has traditionally been a region with higher per capita output, continues to have slow annual growth rate. One explanation of the empirical evidence is that in the past two decades the region has seen

an increasing number of immigration from other states and from other countries and thus its income and output level is low when denominated by total population.

Income Change across Regions in a Continuous Time Series

We now turn to a detailed time-series analysis of the evolution in personal income level across U.S. regions. We are trying to follow the path of state income change in larger time interval. We only want to catch the relative income level of regions and the changing path over time. We thus calculate the relative personal income level for each region by dividing each year's state per capita personal income by U.S. average, them we plot our the relative personal income in a whole time series.

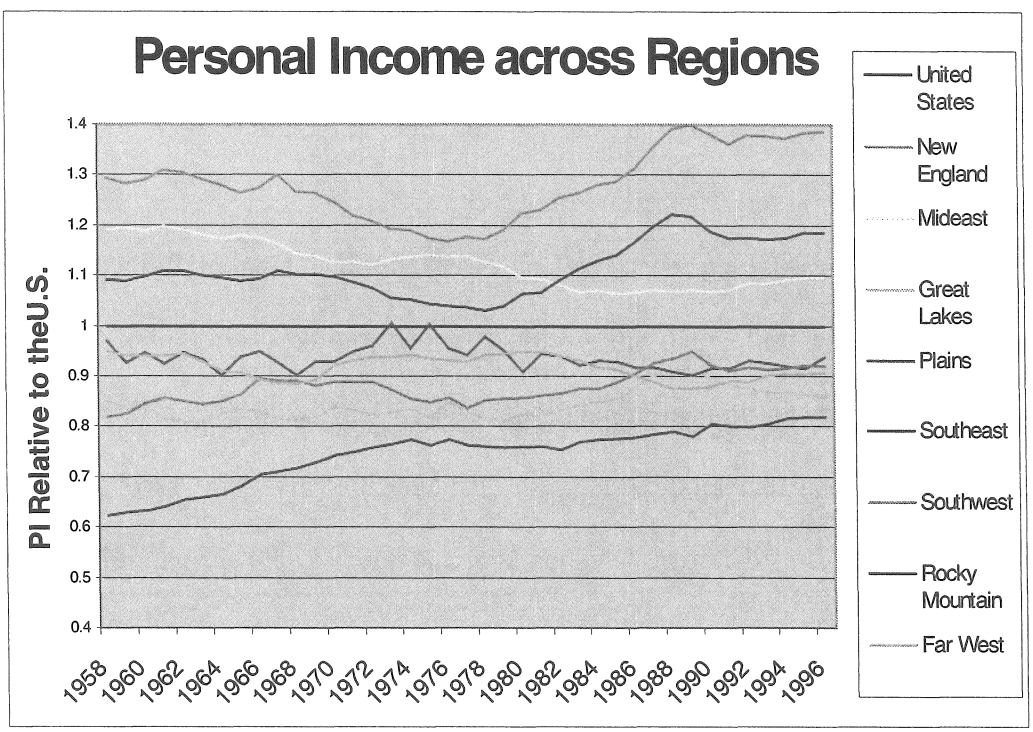


Figure 1.

The above figure is the regional per capita personal income relative to the U.S. in the time interval between 1958 and 1996. This gives us a direct view of regional personal income change and offers a direct test of convergence across regions. The figure clearly shows that per capita personal income for each had been converging to the United States average personal income prior to 1980. The higher income regions of New England, Mid-East and Rocky Mountain had seen a declining personal income relative to the U.S., while low income regions of Southeast, Southwest had been narrowing down their gap with the U.S. average. The middle income regions of Plains, Far West and Great Lakes had seen some fluctuations, but generally been also moving towards the U.S. average. At the end of 1970s, the income gap across regions dropped to the lowest.

It has been observed that at the end of 1970s, the income gap among regions dropped to the lowest and started to disperse again, until the year 1990, the income gap among regions had expanded to a level that was almost equal to that in 1960s. The general impression is that convergence had been prevalent before 1980, while in the 1980s personal income showed divergence. However, the economic literature has largely exaggerated the so-called divergence evidence. Some economists even stated that the era of convergence had gone forever and there came the time of divergence, which is a clear pattern displayed in income change at international level. When we observe the data closely, however, we can still see that such divergence was not really as prevalent as some economists had described. Lower income regions had actually been continued to catch up and are approaching closer to the national average. Also some higher income regions, such as New England, have widened their income gap with the U.S. average and

lower-income regions. It's also obvious that after the 1980s, regional income convergence again resumed.

A number of studies have shown that the fast income growth of the New England and a few other states in the Northeast Census Region actually contributed most to regional income dispersion in 1980s. Wheelock and Coughlin (1993) found that the divergence was due primarily to strength in the high technology and producer services industries of the region. Several researchers have attempted to determine why New England states fared so well during the 1980s, with some placing the 1980s boom in the context of the subsequent deep, prolonged recession. Consistent with Wheelock and Coughlin's findings, these explanation typically focus on the booming defense, high-tech, finances, and real estate sectors. Henderson (1990) found that a surge in defense-related activities coincided with the Massachusetts boom in this period. Rosen and Wenninger (1994) pointed out that there is a strong correlation between total revenues of registered securities dealers and New York State income.

δ-Convergence Testing

The concept of δ-convergence can be defined as follows: a group of economies are converging in the sense of δ if the dispersion of their per capita income levels tends to decrease over time (Sala-i-Martin, 1991). It is defined mathematical as if

$$\delta_{t+T} < \delta_t$$

where δ_t is the time t standard deviation of the logarithm of states per capital personal income for each year from 1958 to 1996.

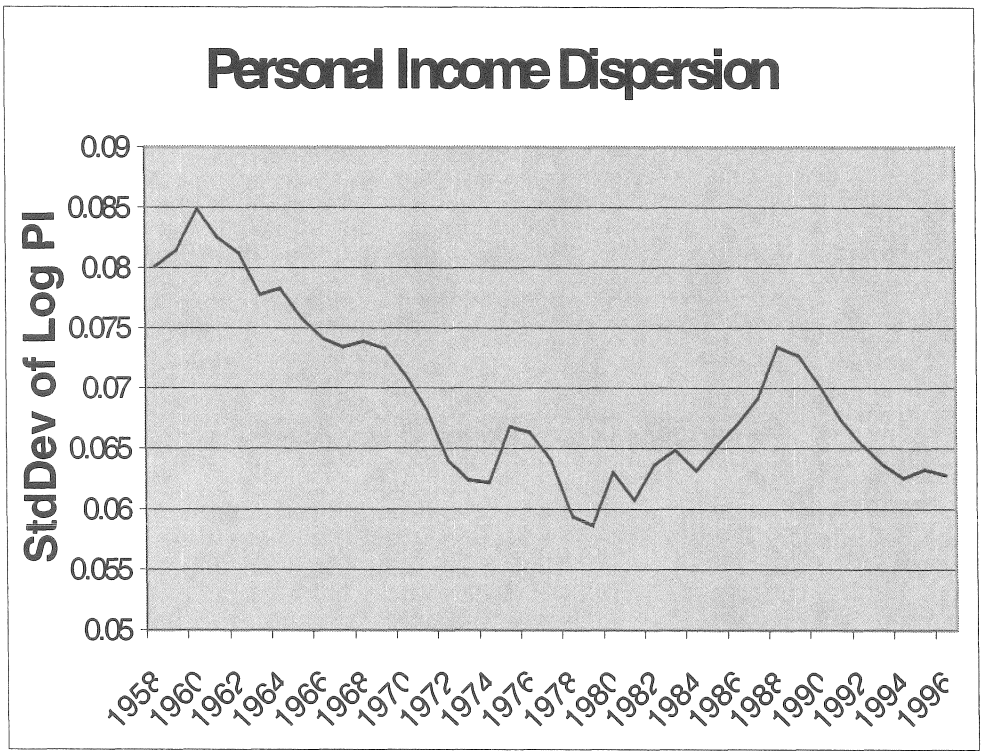


Figure 2.

Figure two shows that the dispersion of per capita personal income across U.S. states had been declining over time. Again, the date of 1980s shows an actual increase in such dispersion, but the decrease trend came back in the 1990s. In a longer time interval, such decrease in income dispersion has been the prevalent trend. In another word, δ-convergence is evident.

Historically, there have been two upward trends in such dispersion, one in 1920s and one in 1980s. The 1920s' rise income dispersion reflects the adverse shock to agriculture. Because the agricultural states were already below national average in per capita income before the shock, the effect of such shock was pronounced. (Barro, 1991)

Barro thus concluded that the rise in income dispersion in 1980s were also caused by a negative shock, which he cited as the plunge in oil price.

β-Convergence Testing

As we have discussed at the beginning, regional economy within a national country is more likely to display long-term absolute β-convergence, which means the regression co-efficient β of income growth over initial level of income is negative.

We will use the following simple model to test β-convergence:

$$PIGR_i = \alpha + \beta * PI_{io}$$

where $PIGR_i$ is the rate of growth of state *i* per capita personal income over time, which is attained by the log different between the end year and initial year personal income then divide it by the number of years. And PI_{io} is logarithm form of state *i*'s per capita personal income in an initial year. The regression coefficient β will be less than 0 if β-convergence exists.

Here we divide our data set into sub data sets and run regression on them separately to get different coefficients. The sub data sets are in the following time interval, 1929-1957, 1958-1967, 1968-1977, 1978-1987, 1988-1996, and 1929-1996. And we run regression on income growth over initial income level and get the following figure.

Table 5.

Regression Coefficients on Initial Income

	Coefficient Estimates	Standard Error	t-Statistics
1929-1957	-0.0323	0.00434	-7.425
1958-1967	-0.0028	0.00524	-0.535
1968-1977	-0.0061	0.00657	-0.092
1978-1987	0.0300	0.00712	4.221
1988-1996	-0.0147	0.00455	-3.231
1929-1996	-0.0146	0.00075	-19.431

Now, let have a close examination of the rate of convergence.

According to Barro, the rate of convergence, or the convergence coefficient β, depends on the productivity of capital and the willingness to save. In particular, the source of convergence in the neoclassical growth model is the assumed diminishing returns to capital, that is, the marginal product to capital tends to rise over time when the ratio of capital (and thus output) to labor in a certain area is low (or say that is below the steady-state ratio). The β coefficient for the sample from 1880 to 1988 is calculated to be some 0.0175, or in the neighborhood of 2 percent a year. Our regression found a higher β for time period from 1929 to 1957, 0.0323, or some 3 percent annually. But the coefficients dropped to below 1 percent in sixties and seventies and it is actually not highly significant statistically, implying convergence fluctuate somewhat. While in 1980s, the β coefficient was a positive 0.03, meaning state personal income actually diverged by 3 percent annually. The coefficient is highly significant statistically and thus strengthens the hypothesis that income stopped to converge in 1980s.

However, when we do regression on larger time interval, from 1929 to 1996, the short-term noise has been smoothed out. The β coefficient is a highly significant 0.0146, or some 1.5 percent annually, which is close to Barro's empirical finding.

1980s: Short Term Divergence?

Researchers generally agree that incomes diverged between 1979 and 1988, but there is no consensus about what caused the divergence.

One major speculation about the reason for increased dispersion during the 1980s focuses on the role of oil prices falling. Researches of such noted economists as Barro and Sala-i-Martin (1991) and Carlino (1992) have all cited the oil price plunge as an explanation. This hypothesis is based on the observation that relative incomes in oil producing states, which tends to have low income, fell substantially during 1980s. Coughlin and Mandelbaum (1988) found that the oil price decline was among the most important factors explaining the divergence. However, when closely examining the timing of oil price change and the timing of the divergence, such explanation is not consistent with the observed evidence. (Carolyn Sherwood-Call, 1996).

Oil prices actually rose sharply in 1980. Given the generally low incomes in energy-producing states, such increase in oil price was supposed to contribute to an accelerating income convergence. But the fact is incomes diverged across states in the early 1980s. The collapse in oil price, which had been credited with generating the divergence, did not occur until 1982, which was four years after the divergence began. Another fact is that in the mid-1970s, there was a sharp rise in oil prices, however, such

rise was not followed by an accelerating convergence in income. An analysis shows that when energy-producing states are omitted from the sample, diverging trend still persisted through most of the 1980s.

In evaluating the divergence in 1980s, three contradictory thoughts prevail the economic literature. One views the increased income dispersion during the 1980s as a anomaly that temporarily departed from the long-run convergence trend evident for most of this century. In this case, the forces that might be expected to cause convergence continued to work throughout the 1980s, but they were offset for a time by a large shock (or a set of shocks) that took some years to dissipate.

The second school of thoughts argues that the 1980s divergence may represent a fundamental change in the long-term downward trend in income dispersion. In other words, there is possibility that incomes have stopped converging ever since. This could occur when each state has approached its long-term steady-state income level, thus δ is near its minimum level and β is close to zero. In this case, convergence or divergence could be expected only in short-term when temporary shocks pull states away from their steady-state income, or change their steady states.

The third school of thoughts suggest that income may be diverging now, as argued by Lucus (1988), because of agglomeration economies. Lucas argument suggests that agglomeration economies make the returns to workers who have accumulated substantial human capital higher in regions where there are other workers rich in human capital. That's to say that workers rich in human capital have the incentive to migrate to regions with large concentrations of like workers. If this hypothesis holds, income difference across regions will get more and more pronounced over time and divergence

trend would dominate. Such hypothesis seems not consistent with the empirical evidence of the income convergence during the long period of time in the U.S.

A study of Drennan and Tobier used industry data of major cities in their analysis and yielded interesting result. Their analysis was based on the comparison of servicing and manufacturing data across 51 largest US cities over the 1980s. They found that cities more specialized in producer services at the beginning of the decade had much better growth than cities more specialized in manufacturing. Thus they concluded that it was the regional specialization in producer services in 1980s that contributed to upward divergence of regional average income. And because producer services are concentrated in cities, the growth of median household income in cities is the most important factor to the regional income change of the decade.

State Price Index Considered

Barro pointed out the importance of price index in analyzing state personal income. Most studies have deflated the nominal income for each state by the national index for consumer prices, due to the lack of useful measures of price levels or price indexes for individual state. As the same price deflator was used for each state, the deflator actually only affect the constant terms in regression. Two potential measurement errors occur, as cited by Barro. First, if relative purchasing power parity does not hold across the states, then the growth rates of real per capita income are mismeasured. Second, if absolute purchasing power parity does not hold, then the levels of per capita income are mismeasured.

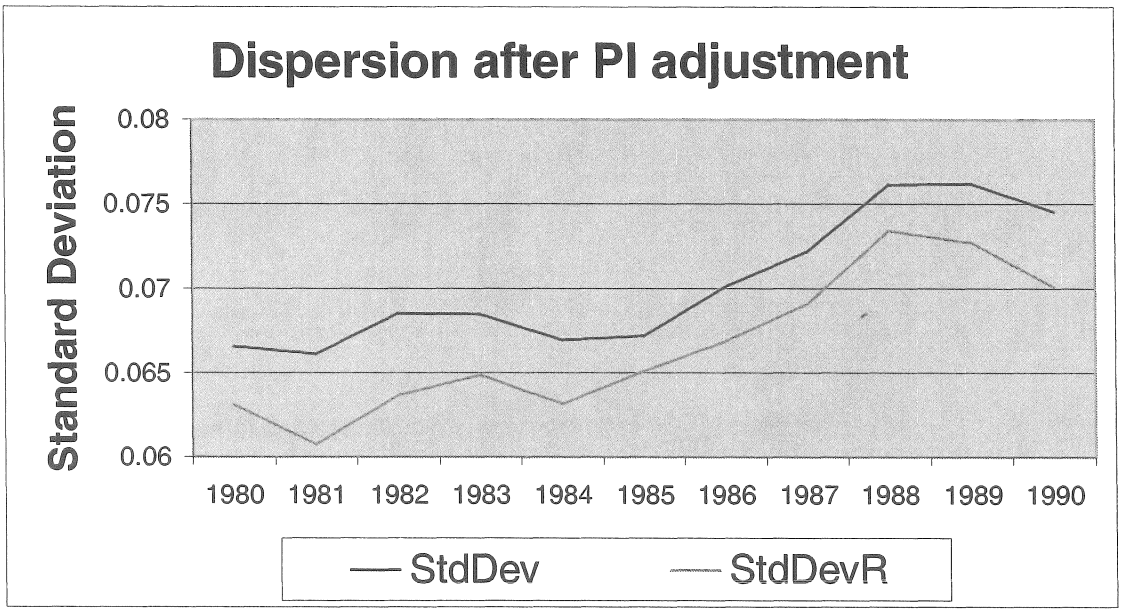
The problem has been noted by a number of economists, who argued that failure to correct the date on state personal income for interstate differences in price levels actually exaggerated the variation among states. Specially, it exaggerated the divergence trend of state personal income in 1980s. Studies using price index corrected income data greatly smoothed out the interstate income dispersion over time. Some even concluded that when corrected by state price indexes, convergence trend persisted in 1980s.

Data on state price levels are not available for the longer time period of time. And direct calculation of state price or cost-of-living indexes is not possible because no organized effort exists to collect the data necessary for such calculation. So far, price indexes come from three individual studies, McMahon and Melton 1978, Fournier and Rasmussen 1986, and McMahon 1991. McMahon and Melton estimate a state cost-of-living index for 1977, and Fournier and Rasmussen provide such an estimate for 1980. McMahon's study provides a state cost-of-living index for the 10-year period from 1981 to 1990. The three studies differ in some respects (detail not discussed in this paper, please refer to individual studies for detail), but the estimated values for the state cost-of-living indexes are strongly correlated across years.

We have tested our data by using the above price index and yield substantially different result as we previously got. However, the lack of continuous time-series of price index greatly restricted our studies towards a consistently convincing result.

The figure 3 is a comparison of state per capita personal income dispersion in 1980s before and after adjusted by state price indexes.

Figure 3.



The immediate impression at examining the figure is that the dispersion of per capita personal income across states, represented by the standard deviation of the logarithm form of state per capita personal income, declined by a considerable amount when corrected by state price index. This empirical evidence is consistent with the assumption make by such economist as Barro. When we plotted the price-adjusted personal income of ten lower income states and ten high-income states from 1980 to 1990, the dominant trend of convergence reappeared. The income gap between ten lower income states and higher income states continued to narrow down in 1980s. However, as it can be observed from Figure 3, although total amount of dispersion dropped considerably after price index adjustment, the general trend of the 1980s, which shows increasing income dispersion, was not thus reversed. From this point of view, price level adjustment can reduce the exaggerated income dispersion across states, but it cannot totally explain the upward trend of income dispersion in 1980s.

Experience shows that price index adjustment greatly reduced income biasedness across states. However, due to the lack of a longer time-series price index data, a comprehensive analysis of state real income and real output is still not possible.

Multiple-Variable Regression and Growth Determinants

The above analysis suggests that income change across states does fluctuate and convergence and divergence interact with each other in a large extend. Though income convergence is the long historical trend, such convergence is far from being guided by some automatic mechanism. On the contrary, there are some other factors, as suggested by endogenous growth theorists, that have been knit closely into the long-term economic growth across regions.

Now we are trying to identify some of these endogenous growth attributes and to run regression on them in order to catch a quantitative measure of their effects on income growth. The model is based on some empirical evidence showing significant correlation between per capita income growth and the explanatory variables.

The model is as follows:

$$PCPI = INIPI + SCHOOL + EDUEXP + POPDENS + POP65$$
$$+ POPMETRO + CRIME + TAX + EMP + NORTHEAST$$

Here, the dependent variable is PCPI, the average growth of per capita personal income over time. It is calculated by subtracting the logarithm of per capita personal income in the beginning year from the logarithm of per capita income in the ending year, then divides it by the total number of years in between. For an accurate measure, we use

the average per capita personal income in five years as the initial and the ending personal income level.

There are ten explanatory variables at the right side of the equation. INIPI is the initial per capita personal income, obtained by average up the per capita personal income of the five years between 1958 and 1962. The variable takes a logarithm form and is expected to have a negative sign. SCHOOL is the percentage of population with above higher school education. The variable is in percentage number and is expected to have a positive sign. EDUEXP is the per capita education expense by state and local governments. The variable is in logarithm form and is expected to have a positive sign. POPDENS is the population density, measured by the number of people per square mile of land. The variable is used in logarithm form also and its sign cannot be decided theoretically. High population density may imply rich in human capital and may contribute to future high growth, while it can also means the high clustering of poor population, which constitutes a drag force behind growth. POP65 is the percentage of population over 65 years old. The sign is expected to be negative, as large portion of elder population is generally regarded as a non-productive force. POPMETRO is the percentage of population living in metropolitan areas. It is also in logarithm form and its sign cannot be decided in theory. Just as population density, high metropolitan population density may be a symbol of fast process of urbanization, while also come with are cluster of poor black population, high crime rate and high burden to local government. CRIME is the crime rate, measured by the number of crimes per million of population. It is in logarithm form and is expected to have a negative sign. TAX is the tax rate, calculated as the ratio of state and local general revenue from own source to state total personal

income. It is expected to have a negative sign. EMP is the employment ratio, calculated by the total employment divided by the total population. Its sign is not easy to decide. Theoretically, high employment ratio may yield high growth. We also used one dummy variable NORTHEAST, which takes value of 1 for northeast states and value of 0 for the rest of the country. It is expected to have a positive sign, as the higher growth rate of northeastern states has been noted by a lot of economists.

The table 4 shows the regression results on per capita personal income. The total R-square is 0.44, which is not high enough. But given only 51 observation on the regression, it's normally difficult to get a high R-square, thus the accuracy of regression coefficients has to be compromised somewhat. The ten variables generally yield their expected signs and their implications give us some inspiration as to what caused high growth to states.

Table 4.

Regression on Personal Income

Variables	Parameters Estimate	Standard Error	T for H0: Parameter
INTERCEP	0.095686	0.014131	6.771
INIPI	-0.005264	0.001632	-3.226
SCHOOL	3.128869	5.551487	0.564
POPDENS	0.000005	0.000340	0.014
POP65	-0.017532	0.015899	-1.103
POPMETRO	-0.001286	0.001053	-1.221
CRIME	-0.000012	0.000983	-0.012
TAX	-0.022564	0.022051	-1.023
EDUEXP	0.000333	0.002191	0.152
EMP	-0.013648	0.008168	-1.671
NORTHEST	0.000801	0.000775	1.033

The INIPI, initial per capita personal income, has a positive sign and is highly significant. It once again confirms the convergence hypothesis that lower income states tends to growth faster and narrow their income gap with higher income states. Barro's study on a whole period between 1880 and 1988 showed that regression coefficient of initial income on income growth is between 1 to 2 percent, which is low-income states tend to narrow their gap with high-income states by 1-2 percent annually. Our regression yields a much lower coefficient, some 0.5 percent annually. The lower catch-up rate is firstly due to a shorter time interval. Secondly, it is largely disturbed by the slower convergence rate in 1970s and the actual divergence trend in 1980s. Still, the coefficient strengthens the long-term convergence hypothesis.

The SCHOOL variable yielded a positive sign, showing it is positively correlated with income growth. It is measured by percentage of population with above high school education, which is an effective measure of human capital endowment for a given state. New growth theories have treated human capital as one of the most important long-term attributes to higher growth. Our regression confirms such hypothesis. Another measure of human capital endowment is the education expense, EDUEXP, which measures the amount of money that state and local governments put into education. It is also positively related to income growth, as such education expense will turn into long-term human capital competence for states. Here, EDUEXP variable has lower significant level. The reason may be that SCHOOL and EDUEXP are correlated with each other and thus disturbed our coefficient estimates. The Pearson Correlation Coefficient for the two variables is 0.64. When regression is run on the two variables separately, both of them yield highly significant coefficients.

Now, we turn to population measures. Population density has a positive sign, which tells that the increase of population in a given state raises growth rate, while high population in metropolitan areas has a negative effect on income growth. This finding is consistent with theoretical studies in the field. In most of the big cities in the U.S., high population density is caused by a cluster of poor black population, who is always low educated and large portion of it depends on state welfare. It's a negative force behind state income growth over time. The portion of population over 65 year old is also calculated as a negative force behind income growth, and the negative coefficient is consistent with theoretical observation.

Tax rate is one of the most significant single endogenous growth attributes cited by new growth theorists. There has been much economic literature devoted to the study of the influences of tax rate on long-term growth. Theoretically, taxes raise the cost or lower the return s to a taxed activity. Taxes therefore create incentives for individuals or businesses to seek out activities that minimize their tax payments. (Zsolt, 1996) Some also argue, in the contrary, that higher taxes may stimulate economy activity if used to finance appropriate expenditure rather than finance welfare transfers. (Helms, 1985) Our empirical findings support a negative correlation between tax rate and income growth.

Crime rate is expected to be negatively related to income growth, but its theoretical base is not clear. High crime rate may actually be caused by fast growth, which attract large number of immigrants and floating population. Our regression yield a negative coefficient for crime variable, but it's not statistically significant. The insignificance may be caused by some correlation between crime variable and other variables such as population density and metropolitan population. The Pearson

Correlation Coefficient is 0.28 for crime rate and population density and 0.75 for crime rate and metropolitan population. The latter is high enough to cause biasedness in our coefficient estimates.

The employment ratio is a variable that cannot be justified by economic theories. We expect to have a positive sign on the coefficient, as high number of employment relative to the total population is expected to contribute to income growth. However, our regression yields a negative coefficient that is significant at 10 percent confidence level. A reasonable explanation is that employment ratio does not work the same way as unemployment rate. While low employment ratio does not mean high unemployment rate, which normally does harm to economic growth, high employment ratio may actually implies a clustering of low-tech, low-wage jobs, which is a clear sign of low income growth. It's thus possible that high-income states tend to have low employment ratio against their total population.

Finally, we examine our only dummy variable, the Northeast states. Originally, I put South states as a dummy but yielded a consistently insignificant coefficient. Although economists have speculated the higher growth rate for southern states, our empirical finding does not support such hypothesis. On the other hand, it shows that it is northeastern states that have developing faster than national average. The coefficient here is not highly significant, however, when I ran another series of regressions by taking away some multiple correlation between variables, the northeast dummy got all highly significant. This finding is consistent with our observation in the previous sections of this paper, especially that in 1980s the northeast states had been grown with unusually high rate and their per capita income well surpassed national level.

Summary and Conclusion

Mainstream economic theories have supported the convergence hypothesis. Our empirical studies yield a result that is consistent with the hypothesis. Convergence has been the major trend of U.S. state income growth in the past decades, while at the same time, there is some divergence trend emerging under special economic conditions, namely, the structural change across U.S. states in 1980s contribute to a short-term income divergence. While convergence being the dominant trend in the time interval we have studied, the convergence has not been realized in an automatic mechanism. Rather, there have been a number of attributes that caused such convergence. The attributes are mainly technology and human capital measures.

Notes and Additional Information

State Price Index is an important concept and deserves some more explanation. Further research on the topic will be both worthwhile and fruitful.

All the three studies we mentioned in this paper used the cost-of-living index, calculated by the Bureau of Labor Statistics for a sample of standard metropolitan statistical areas (SMSAs), to project these to state cost-of-living indexes. The projections were performed by using a set of independent variables to explain the inter-SMSA variations in cost of living. The coefficients found for these variables were applied to

state data to get the estimated state cost-of-living index. McMahon (1991) described the selection of variables in this way:

"Attention is confined to those explanatory variables that have a logical relationship to the cost of living within each of the SMSAs because as much as stability as possible in their predictive capability is sought, and also to variables for which data are available on an annual statewide basis for 1981-1991. For these reasons there are some differences in the explanatory variables from those used by the Fournier and Rasmussen analysis as well as in the original McMahon-Melton estimates for 1997."

Cost of living disperses among states and fluctuates over time. For example, in California, the cost-of-living index had risen from 103.4 in 1980 to 119.0 in 1990. In Arizona, however, the cost-of-living index had fallen from 97.7 in 1980 to 89.5 in 1990. Note that the only direct comparison here is that living in California was more expensive than in Arizona by about 5.7% in 1980 and by almost 30% in 1990. Indirectly, it is possible to conclude that the rate of inflation in California was above the national average, whereas in Arizona, it was below the national average. We cannot conclude, however, that the absolute cost of living (or the general price level) in Arizona had decreased over this time.

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Per Capita Personal Income over Time

STATES	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
United States	**10062**	**11144**	**11729**	**12384**	**13588**	**14448**	**15185**	**15990**	**17062**	**18172**	**19191**
Alabama	11627	12614	12745	13179	14117	14958	15715	16469	17713	19104	20242
Alaska	10864	12047	12881	13695	15083	16109	17148	18258	19740	21118	22344
Arizona	7856	9108	9537	9781	11116	11448	12048	12699	13183	14033	15490
Arkansas	9917	11073	11872	13048	14542	15891	17136	18422	19764	20584	20768
California	10219	11144	11569	12189	13451	14278	15036	15762	16762	17838	18750
Colorado	9955	11039	11760	12616	13944	14945	15914	16929	18088	19263	20054
Connecticut	7738	8528	8950	9519	10425	11153	11777	12420	13303	14278	15233
Delaware	10616	11658	12449	13206	14321	15520	16393	17500	18919	20596	21649
District of Columbia	12412	13544	14583	15316	16651	17599	18469	19636	21822	23469	25700
Florida	11777	13072	14018	15119	16704	17861	19014	20457	22336	23778	24988
Georgia	8253	9171	9704	10088	10865	11617	11874	12286	12878	13628	14497
Hawaii	9512	10709	11250	11722	13023	13771	14446	15188	15792	16874	17830
Idaho	10788	11794	12272	12949	13760	14467	15316	15984	16908	18231	19637
Illinois	9330	10207	10512	11022	12212	12870	13568	14356	15249	16310	17192
Indiana	9490	10788	11004	11232	12466	13066	13741	14535	14888	16060	16896
Iowa	10926	12101	12899	13883	15299	16497	17549	18715	20105	21490	22517
Kansas	10780	11978	12964	14046	15726	16892	18202	19658	21447	22657	23249
Kentucky	11043	12298	13210	14075	15638	16663	17811	18927	20463	21844	23146
Louisiana	8092	9003	9452	10191	11375	12166	12961	13752	14828	15840	16673
Maine	13843	15524	17315	17981	18087	18930	18497	18043	18452	19973	21089
Maryland	9959	11085	11649	12525	13510	14442	15256	16089	17137	18440	19185
Massachusetts	9360	10376	10599	11309	12394	13323	14069	14682	15272	15939	16640
Michigan	9936	11170	11913	12286	13426	14142	14756	15362	16058	16814	17963
Minnesota	10298	11061	11370	12167	13476	14575	15411	15942	16973	18005	18731
Mississippi	7765	10049	10694	11079	11872	12308	12642	13047	12138	13662	15262
Missouri	10158	11142	11785	12333	13991	14789	15594	16518	17134	18418	19374
Montana	8056	8665	9076	9433	10168	10665	11215	11658	12412	13159	14194
Nebraska	6938	7731	8093	8388	9133	9565	9930	10506	11250	12008	12724
Nevada	9304	10316	10906	11716	12872	13787	14633	15505	16616	17746	18652
New Hampshire	7484	8429	8777	9285	10274	10940	11452	11867	12652	13366	14045
New Jersey	8433	9364	9958	10764	12045	12958	13823	14594	15611	16482	17411
New Mexico	8147	8990	9433	10021	11131	11890	12667	13508	14496	15449	16327
New York	10916	11630	12133	13052	13754	14527	15394	16302	17836	19413	21563
North Carolina	9893	10759	11221	11877	13093	13878	14533	15199	16210	17221	18147
North Dakota	9369	10445	11006	11676	12876	13774	14461	15131	15934	16981	17672
Ohio	8115	9014	9466	9714	10843	11301	11759	12469	13201	14215	15105
Oklahoma	9937	11355	11909	12223	13237	14004	14024	14296	15134	16122	17310
Oregon	7822	8657	9082	9530	10527	11147	11734	12448	13308	14252	15128
Pennsylvania	8576	9245	9456	10134	10789	11354	11708	12292	13122	14294	15366
Rhode Island	11831	12986	13556	14288	15611	16564	17339	18223	19287	20245	21413
South Carolina	9460	10848	11630	11534	12385	12916	12963	13094	13848	14703	15634
South Dakota	8805	9870	10297	10643	11225	11483	12160	12647	12962	14197	15053
Tennessee	9963	10595	10784	11470	12422	13095	13723	14319	15331	16401	17448
Texas	8019	8790	9190	9597	10436	11037	11424	11886	12461	13246	14230
Utah	9899	10715	11240	11820	12957	13620	14358	15060	15828	16843	17721
Vermont	10747	12080	12860	13491	14617	15260	15645	16190	17008	18128	19323
Virginia	10031	11036	11680	12228	13218	14147	14936	15817	16954	18286	19410
Washington	9437	10773	11337	11619	12560	13245	13307	13565	14389	15311	16430
West Virginia	9685	10735	11493	12323	13558	14443	15415	16460	17925	19203	19728
Wisconsin	8782	9969	10456	10743	11436	11900	11846	12036	12844	13633	14800
Wyoming	11489	12573	12641	12391	13007	13709	13530	13631	14347	15562	17220

Per Capita Personal Income Change

Regions	1958	1996	Annual Growth	Percent Increase		
United States	2117	24426	0.0272	10.538	1	1
New England	2739	33875	0.0280	11.368	**1.293812**	**1.386842**
Mideast	2520	26848	0.0263	9.654	**1.190364**	**1.099157**
Great Lakes	1801	21011	0.0274	10.666	**0.850732**	**0.86019**
Plains	2055	22917	0.0269	10.152	**0.970713**	**0.938222**
Southeast	1320	19977	0.0303	14.134	**0.623524**	**0.817858**
Southwest	1732	22470	0.0285	11.973	**0.818139**	**0.919921**
Rocky Mountain	2311	28989	0.0282	11.544	**1.091639**	**1.186809**
Far West	2008	22139	0.0267	10.025	**0.948512**	**0.90637**

State Price Index by three Separate Studies

States	1977	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Alabama	92.6	90.9	94.36	94.6	94.85	94.43	93.35	92.87	91.73	90.67	90.51	89.8
Alaska			121.66	119.08	115.52	109.68	108.32	107.27	110.54	118.29	125.46	131.15
Arizona	105.4	97.9	93.82	93.8	93.89	94.85	94.4	93.42	92.24	90.95	89.89	89.5
Arkansas	90.9	89.9	93.36	93.9	94.05	93.79	93.81	92.56	90.51	89.32	88.88	88.68
California	114.6	103.4	110.86	110.68	110.46	110.11	110.86	110.96	111.48	115.22	118.14	119.01
Colorado	106.9	99.5	101.26	101.66	101.47	102.43	101.9	101.47	101.01	100.15	100.08	99.99
Connecticut	127.8	110.9	111.6	112.21	113.44	114.92	116.7	120.92	125.25	126.85	125.98	122.89
Delaware	118.1	105.2	104.88	104.92	103.8	105.73	106.02	106.55	109.37	109.12	108.11	107.91
District of Columbia	111.2		120.53	120.61	120.14	118.62	117.59	113.73	118.35	121.11	123.27	122.86
Florida	98	92.7	95.29	93.77	95.49	93.48	96.14	93.65	94.9	94.34	94.39	94.91
Georgia	96.2	92.4	95.49	95.8	96.2	96.66	95.96	95.98	95.13	94.33	94.2	92.16
Hawaii			114.42	112.54	112.77	111.39	114.2	114.86	115.59	120.04	127.44	136.17
Idaho	102.5	95.6	90.74	90.7	91.96	91.56	90.81	90.32	90.22	89.78	89.18	89.85
Indiana	102.4	97.9	99.21	98.94	99.1	98.81	98.14	97.71	96.63	93.69	93.67	95.41
Iowa	101.6	100.6	101.6	100.84	99.74	99.48	98.82	98.79	97.15	95.39	94.98	95.3
Kansas	99.7	99.6	99.44	101.5	93.32	100.49	99.62	99.61	99.26	98.12	97.12	95.83
Kentucky	100.6	91.1	93.03	94.68	93.96	94.16	93.22	94.63	94.16	93.84	92.18	91.63
Illinois	109.5	102.3	105.17	105.2	104.95	104.62	103.86	103.41	102.45	102.7	102.49	102.6
Louisiana	95.8	92.5	97.81	97.75	96.88	96.37	95.93	93.59	92.19	91.84	90.97	91.03
Maine	97.6	102	95.71	95.85	96.99	97.14	97.44	100.17	101.89	102.75	103.33	101.2
Maryland	120.4	109.2	104.92	106.14	106.33	106.13	106.48	105.49	105.45	105.57	106.25	106.07
Massachusetts	114.5	108.8	107.11	107.67	107.59	110.28	113.23	116.61	118.85	120.34	119.87	118.03
Michigan	107.1	101	100.84	100.63	101.11	101.33	101.5	100.94	99.31	98.36	97.89	97.91
Minnesota	107.2	103.1	104.03	104.2	103.85	104.22	103.81	103.17	102.12	100.98	100.27	99.93
Mississippi	91.1	90.9	93.3	93.46	95.08	94.31	93.07	91.14	89.62	88.54	87.51	96.53
Missouri	102.6	97.4	100.27	100.81	100.67	100.6	100.57	100.01	98.66	97.89	96.89	96.16
Montana	102.8	98.1	96.43	96.04	95.5	94.06	91.91	92.12	91.95	91.44	91.34	91.74
Nebraska	101.3	101.3	101.08	100.66	99.6	99.13	95.02	98.85	98.02	96.53	95.13	94.16
Nevada	113.6	100.5	92.96	93.06	94.5	96.63	97.68	98.12	96.88	93.61	95.2	96.72
New Hampshire	113.3	104.8	96.14	97.14	93.34	102.1	102.18	104.52	106.22	107.7	105.93	103.57
New Jersey	124	109.9	108.69	109.13	110.83	112.08	113.32	115.11	119.2	121.17	121.07	120.69
New Mexico	101.1	95.5	95.66	95.83	94.18	93.51	93.53	92.53	91.52	90.63	90.09	89.91
New York	117.4	113.5	106.47	106.39	106.95	107.27	108.19	109.16	110.02	111.26	111.53	111.34
North Carolina	93.9	91.1	98.12	98.4	98.71	98.46	98.12	98.18	98.22	96.87	97.25	97.02
North Dakota	103.5	100.9	98.96	97.98	96.63	95.37	94.36	94.26	93.5	91.72	92.22	91.47
Ohio	106.4	99.6	101.59	101.76	101.84	101.25	100.62	99.85	98.39	97.31	96.86	96.73
Oklahoma	91.2	91.6	97.21	96.72	94.14	94.47	94.65	93.64	93.76	93.93	92.91	92.99
Oregon	104.3	99.3	95.22	96.27	98.23	99.02	98.74	97.77	96.25	95.07	94.16	95.4
Pennsylvania	101.2	103.3	103.06	102.96	102.36	101.86	102.06	101.96	101.78	101.3	100.75	100.18
Rhode Island	110.1	105.1	101.25	101.52	102.32	102.44	102.15	104.22	108.08	108.58	107.52	106.91
South Carolina	94	90.8	92.85	93.09	93.48	93.18	92.89	92.44	91.23	90.09	89.65	89.81
South Dakota	99.7	99	98	97.27	95.97	95.01	93.57	93.26	91.97	89.83	89.94	89.91
Tennessee	93.2	91.2	94.55	93.37	95.7	96.12	95.67	94.9	94.27	93.62	92.91	91.81
Texas	93	92	96.38	96.3	95.05	95.62	93.66	94.12	93.62	94.19	93.81	94.01
Utah	105.1	96.4	90.92	88.98	88.99	89.67	90.41	90.13	89.66	89.15	88.83	88.21
Vermont	107.6	104.9	93.72	95.62	96.05	96	97.44	100.17	101.85	102.91	102.72	101.32
Virginia	99.7	93	101.31	101.85	103.42	103.92	104.83	106.61	109.66	110.31	109.38	108.61
Washington	108.6	98.9	97.27	97.85	99.39	100.03	99.98	99.56	97.97	96.76	97.43	99.33
West Virginia	90.6	91.3	94.12	94.83	94	93.28	92.93	92.45	91.55	91.21	91.69	91.76
Wisconsin	106	102	100.81	100.98	100.79	100.64	100.04	99.23	97.84	96.46	97.78	97.31
Wyoming	104.4	102.3	90.51	90.03	90.01	92.13	94.28	94.14	95.1	96.55	94.83	95.14
United States	100	100	100	100	100	100	100	100	100	100	100	100

Regression State Data

STATES	Northeast	PCPI	PI1970	High Schoo	Pop Densit	65 Year Ol	Metro Pop	Crime Rate	TaxRate	EduExp	Emp	South	GSPGR(77	GSP1977	Growth	Avg62
Alabama	0	0.03972	3562.8	41.2	67.9	9.5	66	1865.5	0.13746	219.37	0.40956	1	0.02662	6977.75	0.02964	2854.8
Alaska	0	0.03865	4521.2	66.7	0.5	2.3	41.8	2690.1	0.21352	661.79	0.4896	0	0.01693	18730.98	0.03218	2607.2
Arizona	0	0.0421	2530	58.1	15.6	9.1	74.5	3445.7	0.15836	338.23	0.41462	1	0.02584	7896.81	0.03252	1843
Arkansas	0	0.04393	4279	39.9	37	12.4	38	1603.8	0.12792	187.71	0.41722	0	0.02689	6760.06	0.03362	2210.4
California	0	0.04042	3152.4	62.7	127.6	9	96.3	4306.9	0.15618	312.24	0.45233	0	0.02414	10267.85	0.03112	2429.8
Colorado	0	0.04335	2446.4	63.9	21.3	8.5	80.2	3661.3	0.14781	345.33	0.46391	0	0.02589	9316	0.03477	1941.6
Connectic	1	0.03844	4208.6	56	623.6	9.5	93	2574	0.12325	297.45	0.46544	0	0.03056	9509.41	0.03463	1557
Delaware	1	0.04072	3472.2	54.7	276.5	8	70.4	2973.8	0.14979	446.64	0.49894	0	0.03267	9737.38	0.03069	2811
Florida	0	0.036	4136	52.5	125.5	14.6	91.5	3600	0.12793	259.08	0.4333	1	0.02696	7446.2	0.03343	2883.2
Georgia	0	0.03875	4317.8	40.6	79	8	61.2	2207.2	0.13575	248.27	0.46049	1	0.02858	7927.25	0.03293	2755.6
Hawaii	0	0.04196	3321	61.8	119.6	5.7	81.9	3395.7	0.15893	380.9	0.56828	0	0.02691	10264.82	0.03087	1913
Idaho	0	0.04212	2915.4	59.3	8.6	9.5	15.7	1785.4	0.1485	256.67	0.45192	0	0.02376	7949.55	0.03211	2140.6
Illinois	0	0.04109	4081	52.6	199.4	9.8	82.1	2347.1	0.13217	299	0.46238	0	0.02488	10114.31	0.03132	2469.2
Indiana	0	0.03902	2991.2	53	143.9	9.5	68.4	2270.2	0.13805	299.27	0.44024	0	0.02435	8761.77	0.03138	2208.2
Iowa	0	0.03935	2934.8	58.9	50.5	12.4	40.8	1435.6	0.15192	333.85	0.45769	0	0.02362	9060.13	0.03144	2123
Kansas	0	0.03853	3420.8	59.9	27.5	11.8	49.3	2145.4	0.14216	286.45	0.45284	0	0.02437	8819	0.03306	2409.6
Kentucky	0	0.04055	3398.2	38.6	81.2	10.5	48.1	1924.6	0.13607	237.51	0.41361	1	0.02514	7975.38	0.0332	2520.4
Louisiana	0	0.04021	3319	42.2	81	8.4	66.9	2404.6	0.16935	239.77	0.39161	1	0.02113	9764.21	0.0318	2762.2
Maine	1	0.04185	2716.2	54.6	32.1	11.6	36.8	1141.1	0.14232	252.21	0.44733	0	0.02717	6827.58	0.03512	1644.2
Maryland	1	0.04298	2724.8	52.3	396.6	7.6	93.5	3346.7	0.1404	329.17	0.43226	0	0.02765	8438.39	0.03078	2598.8
Massachu	1	0.03979	3302.2	58.4	727	11.2	92.6	3004	0.13906	258.1	0.46969	0	0.03052	8699.54	0.03351	2025.2
Michigan	0	0.04032	3856.2	52.8	156.3	8.5	82.9	3790.1	0.15152	340.88	0.39998	0	0.02354	9552.76	0.03164	2042
Minnesota	0	0.03911	3951.4	57.6	48	10.7	63.9	2103.8	0.16371	385.53	0.44532	0	0.02651	9084.78	0.03161	2214
Mississipp	0	0.03861	3770.6	41	46.9	10	25.5	863.4	0.16715	217.68	0.41276	1	0.02607	6435.46	0.03159	2370.6
Missouri	0	0.04078	3483.6	48.8	67.8	12	67.8	2764.9	0.11947	245.16	0.47028	0	0.02488	8667.62	0.03179	1886.6
Montana	0	0.0443	2205.8	59.2	4.8	9.9	24.4	1638	0.15249	318.86	0.43181	0	0.02095	8262.09	0.03317	2163.4
Nebraska	0	0.03917	3341.4	59.3	19.4	12.4	43.8	1518.6	0.15404	281.93	0.48066	0	0.02573	8758.63	0.03265	1649.2
Nevada	0	0.03873	3060.6	65.3	4.4	6.3	80.7	3996.8	0.16384	279.18	0.51932	0	0.02433	10952.11	0.03537	1271.6
New Ham	1	0.04372	2575	57.5	81.7	10.6	54.8	1193.1	0.12136	256.09	0.44976	0	0.03054	7301.63	0.03416	1903.8
New Jersı	1	0.0377	4105.2	52.5	953.1	9.7	100	2743	0.12374	285.43	0.43455	0	0.0306	9070.25	0.03469	1454.8
New Mexi	0	0.0403	3476.4	55.1	8.4	7	44.8	2866.2	0.17626	340.21	0.38985	0	0.02398	8440.76	0.03506	1707.2
New York	1	0.0391	4247	52.7	381.3	10.8	91.3	3921.7	0.16931	358.1	0.46343	0	0.02788	9878.94	0.03515	1640.8
North Car	0	0.03909	2732.4	38.5	104.1	8.1	54.2	1862.9	0.13133	238.35	0.4841	1	0.02863	7828.71	0.03338	2246.8
North Dak	0	0.03764	4277.4	50.6	8.9	10.7	31.7	846.2	0.18925	313.48	0.4548	0	0.02264	8252.1	0.03094	2357.8
Ohio	0	0.0422	2780	53.2	260	9.4	80.4	2377.5	0.11871	245.82	0.43893	0	0.02423	9074.17	0.03172	2177.8
Oklahoma	0	0.04241	2796.4	51.7	37.2	11.7	56	1949.3	0.1338	245.71	0.4363	1	0.02165	8292.93	0.03344	1667.2
Oregon	0	0.03807	3612	59.9	21.7	10.9	67.7	2987.1	0.14417	333.18	0.44083	0	0.02319	9189.72	0.03258	2002
Pennsylva	1	0.04252	2971.4	50.2	262.3	10.8	85.6	1541.6	0.12992	272.1	0.44245	0	0.02574	8401.55	0.03467	1558
Rhode Isl	1	0.03836	3464.4	46.4	902.5	11	91.4	2926.1	0.13368	275.52	0.46334	0	0.02763	7622.02	0.03145	1943.2
South Car	0	0.03917	3539.2	37.8	85.7	7.4	58	2066.7	0.12878	231.2	0.46031	1	0.02827	6802.99	0.02978	2800.8
South Dal	0	0.03911	3604.4	53.5	8.8	12	23.2	1153	0.17756	340.66	0.45587	0	0.02811	7429.69	0.03143	1924.4
Tennesse	0	0.04033	3169.6	41.7	94.9	9.8	67	1888.3	0.12807	217.78	0.45337	1	0.02816	7620.73	0.02991	2122.2
Texas	0	0.04031	2810	47.4	42.7	8.9	77.8	2705.7	0.12666	251.58	0.44901	1	0.0231	9990.76	0.03087	2293.6
Utah	0	0.04209	2734.4	67.5	12.9	7.4	77.6	2372.4	0.15615	353.86	0.42659	0	0.02446	7899.45	0.03017	2032.8
Vermont	1	0.04269	3135.4	57.9	47.9	10.6	22.3	1270.2	0.1685	323.31	0.45934	0	0.02922	6814.66	0.03148	2253
Virginia	0	0.03699	2901.6	47.8	116.9	7.9	70.5	2148.8	0.1254	264.85	0.46302	1	0.02805	8484.54	0.03223	2337.4
Washingt	0	0.03913	3924.4	63	51.2	9.4	80.6	3157	0.15618	378.07	0.43634	0	0.02504	9522.42	0.03214	2293.8
West Virg	0	0.04305	3252.2	41.7	72.5	11.1	39.1	959.2	0.13542	239.26	0.37759	1	0.02223	7569.68	0.03282	1881.8
Wisconsir	0	0.03925	3829.2	54.5	81.1	10.7	68.3	1515.8	0.16857	353.21	0.44147	0	0.02484	8803.46	0.03236	2252.4
Wyoming	0	0.04115	2628.2	63.1	3.4	9	32.4	1746	0.1871	408.03	0.47748	0	0.02116	13695.23	0.03287	1730.4