Fertility decline, baby boom and economic growth

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Abstract

We present new data documenting the secular decline in fertility in the states of the United States, the dramatic convergence in fertility, child schooling, parental schooling, survival probabilities. In addition we document the disparate nature of the Baby Boom in the United States. There were two different regimes, a large Baby Boom and a Small Baby Boom. The large Baby Boom regions also had the smallest increase in child schooling, whereas the small Baby Boom regions had the largest increase in child schooling. We present suggestive evidence that falling mortality risk is strongly positively correlated with falling fertility, rising education levels of parents is strongly negatively related to fetility, and that population density is negatively related

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to fertility. Finally we show the robust negative correlation of mortality risk on child schooling attainment, and positve correlation of population density and child schooling attainment.

As in Lucas (1988) and Becker, Murphy and Tamura (1990), this paper highlights the connection between human capital and growth. We demonstrate the dramatic convergence in income and schooling across the states of the United States from 1850 to 2000.[1] Novel to this paper we show the dramatic convergence in fertility, child schooling attainment, child survival probabilities and to a lesser extent population density across the states during this same time period. During the first century of the data, the secular decline in fertility is strongly correlated with the rising survival probability of children, and negatively correlated with rising population density. By 1930 the regions had essentially converged in survival probabilities at all ages, although state disparities in population density still remained.

This paper identifies three important sources of regional differences in fertility. We have already alluded to the first two, namely variation in child survival and variation in human capital levels. The third is somewhat novel: variation in population density. Variation in population density reflects numerous forces at work. One possible interpretation, adopted here, is that increases in population density reflect increased scarcity of living space. An alternative explanation for the role of population density is that it reflects the move away from agriculture. However, the measure of population density we use – population weighted mean density at the county level – is unlikely to reflect merely movement off the farm.[2] Moreover, the movement out of agriculture was largely complete by 1960. If agriculture is the entire story, population

[1] Income convergence was first noted in Barro and Sala-i-Martin (1992). Income and schooling convergence between 1880 and 1990 was first identified in Tamura (2001), and for the entire time period 1850-2000 in Turner, Tamura, Mulholland and Baier (2007).

[2] Urban counties with their greater populations, will be given greater weight than rural counties.

density should have little impact in later periods.

Also original to this paper, we highlight the disparate behavior of the states during the Baby Boom. Two different types of Baby Booms are identified, a large Baby Boom and a small Baby Boom. In the large Baby Boom fertility typically increased by at least a full child, and the percentage increase in fertility was much larger than the national percentage increase in fertility. By contrast, in the small Baby Boom fertility rose by much less than a child and the percentage increase in fertility was much smaller than the national percentage increase in fertility. We document that this differential increase in fertility coincided with a differential increase in schooling attainment of these Baby Boom children. The large Baby Boom regions had smaller than average schooling attainment gains, and the small Baby Boom regions had larger than average schooling attainment gains. These results, the secular decline in fertility, rising schooling attainment, differential schooling attainment gains associated with differential fertility changes are consistent with the quality-quantity tradeoff highlighted in Becker (1960), Becker and Lewis (1973), Becker, Murphy and Tamura (1990) and Tamura (2006).

In the next section we present the evidence from Turner, Tamura, Mulholland and Baier (2007) of the growth in output per worker and the tremendous convergence of output per worker across the states of the United States from 1840 to 2000. Turner, et. al. also produce estimates of years of schooling by state, which have risen from roughly 1 year in the US in 1840 to 13.5 years in 2000. There has been tremendous convergence in schooling as well. For this paper we use their enrollment rates in primary, secondary and higher education to produce schooling attainment by cohort instead of schooling attainment of the labor force. We do this because we connect the schooling of a birth cohort in order to examine the quality-quantity tradeoff in the data. In the rest of the paper we present our method for calculating fertility at the state level from 1850 to 1880. In order to make this calculation we estimated survival probabilties for infants and children under the age of 5. We show that fertility has a strong secular declining trend with exceptions for the Baby Boom. The following section contains the evidence of schooling attainment of children, as well as schooling of parents by state. We then present the evidence of rising survival probabilities and convergence of these survival probabilties. We follow this by presenting the time series on average population density. We show that population density does not uniformly rise over time. In fact for four of the five regions that we categorize as having large Baby Booms, there is clear evidence of declining population density coincident with the Baby Boom. We show that before 1930 high population density was strongly associated with higher mortality risk. We present some suggestive evidence on the correlation of fertility with parental schooling, population density, and mortality risk and child schooling attainment with these same variables. Finally we present a model capable of producing the observed connection between density and fertility in order to produce a Baby Boom. The final section concludes and suggested future research.

INCOME GROWTH AND CONVERGENCE

Here we present the growth of output per worker and the convergence of output per worker across states of the United States. This data comes directly from Turner, et. al. We leave it to the interested reader to see how the estimates were created. Figure 1 contains the information on real output per worker by state, aggregated to the census region. Appendix A contains the listing of the states by census region. Table 1 contains the average real output per worker for each decadal year. Real output per worker grows at 1.5 percent per year from 1840 to 2000 and by 1.6 percent per year from 1880 to 2000. There is clear convergence across the states.

FERTILITY

The data on fertility by state, children ever born to women between the ages of 35 and 44, are new, and so we describe their construction in some detail. We show that there has been a tremendous decline in the fertility of the average American woman over this century and a half. From six children per woman in 1850 to 2.0 children in 2000. The data comes from various sources, but predominantly from the United States census. In the next subsection we present a description of our data construction process.

Data construction

The data between 1890 and 1990 were taken from published volumes of the Censuses of Population. The Censuses for 1910 and between 1940 and 1990 provide data on children ever born. We filled in the 1920 and 1930 Census years using 1940 Census data on children ever born to ever-married women between the ages of 45 and 54, and ages 55 to 74 respectively. Similarly, we filled in the 1890 and 1900 Census years using 1910 data for women in the same age groups. Data for 2000 – the Census no longer asked the question – were computed using Current Population Survey data for 1998, 2000, 2002 and 2004.[3]

Prior to 1890, we constructed measures of fertility using census data from 1850, 1860, 1870, 1880. Each of these four censuses provide information of the number of children under the age of 1 and also for those between the ages of 1 and 5. Given the significance of mortality during this part of the 19th century, we were lucky that these censuses and the 1890 and 1900 censuses report the number of deaths by age category, by state. We constructed essentially the total fertility rate for women between the

[3] We used four cross-sections to enhance precision. The measures using smaller subsets were all highly correlated with one another.

ages of 15 and 44 for each state, computed as:

$$total\ fertility\ rate_{it} = \frac{6\left\{\frac{pop_{it}(<1)}{\widehat{p}_{it}(<1)} + \frac{pop_{it}(ages\ 1-5)}{\widehat{p}_{it}(0-5)}\right\}}{pop_{it}(females\ 15-44)} \tag{1}$$

where $\widehat{p}_{it}(<1)$ is the survival probability to age 1, and $\widehat{p}_{it}(0-5)$ is the survivor probability of children to age 5. We next present our method for computing these survival probabilities.[4]

Survival probabilities were computed using two sources of data on mortality: official death registrations and Census. When possible, we used official death registration data, available beginning with the 1890 decade and collected at a decadal frequency from various issues of *Statistical Abstracts of the United States* for years prior to 1950, and collected online for years between 1950 and 2000 from the National Center for Health Statistics.. However, death registration data are not available prior to 1890, or after 1890 for states that had not yet begun to register deaths.[5]Census data, which are based on respondents' answers to survey questions, are less reliable than official data. However, they are still useful for cases in which death registration data are not available for the purposes of imputing mortality rates, the procedure for which we now describe.

We began by estimating log survival probabilities as a function of a quadratic trend, by state, for each state during their death registration period. The number of observations on each state varied, ranging from 7 for Texas, the last state to begin registering deaths, to 12 for Massachusetts, for which we had observations between 1890 and 2000. These regressions were used to predict infant survivor probability and the one year child survivor probability between ages 1 and 5. These predictions could, in principle, serve our purpose. However, this would involve the judgment that

[4] To compute $\widehat{p}_{it}(0-5)$, we estimate the average hazard of dying between ages of 1 and 5, p_{1-5}, and combine this with infant mortality, $1-\widehat{p}_{it}(<1)$. Thus we have $\widehat{p}_{it}(0-5) = 1-(1-\widehat{p}_{it}(<1))(p_{1-5})^4$.

[5] Appendix A contains the year in which each state became a death registration state.

the errors inherent in our estimation are less important than the errors in reporting in Census data. We instead calculated the convex combination of the predicted infant survival rate based on the death registration data for each state $\widehat{p}_{it}^{predicted}(<1)$ and survivor probabilities from the Census, $p_{it}^{Census}(<1)$[6] We chose to fit each census year separately in order to match the national infant mortality rate reported in the *Historical Statistics of the United States: Millennial Edition.* We report below in Table 2 the convex combination weights used to fit the national infant mortality rate, where $\widehat{p}_{it}^{predicted}(<1)$ is our extrapolated probability.

$$\widehat{p}_{it}(<1) = \alpha p_{it}^{Census}(<1) + (1-\alpha)\widehat{p}_{it}^{predicted}(<1) \tag{2}$$

We used the same weights for the same years to produce probability of surviving to age 5. From these predicted data on survival probabilities we constructed measures of total fertility rates by state using the age distribution of the population. To gauge whether the resulting estimated total fertility rates are reasonable, Table 3 compares the implied national fertility rate using our data (weighted by state population) with those computed by Haines and reported in *Historical Statistics of the United States: Millennial Edition.* Our imputed fertility rates are slightly higher than Haines' series, 1.1 percent higher in 1870, 2.4 percent in 1850, 3.2 percent in 1860, and 3.4 percent in 1880. Considering the differences in methodology, the relatively close match between the two series is reassuring.

Table 4 and Figure 2 show population-weighted fertility trends in each of the nine Census regions as well as the nation as a whole between 1850 and 2000. A glance

[6] A careful reader will note that some states became a death registration state after 1920. The census stopped reporting deaths by age after the 1900 census. Thus for a few states we have missing observations for 1910, 1920 and possibly as late as 1930. We chose to geometrically interpolate the missing 1910, 1920 and 1930 values, benchmarked by using the 1900 census data and the first year of life table data.

at both the Table and the Figure reveals a strong negative trend, broken only by the Baby Boom. Early on, New England was clearly the lowest-fertility region, with just 4.53 children ever born in 1850. By contrast, fertility averaged 5.91 children ever born in the U.S. as a whole. To add further perspective, consider that New England's 1850 fertility level was reached only in 1870 in the mid-Atlantic region, 1910 in the South Atlantic region, and 1900 in the U.S. as a whole.

The data also reveal a marked degree of convergence over time, both across regions as is evident in Table 4 and Figure 2, as well as within regions, as can be seen in Table 5, which contains regional as well as national standard deviations across states of children ever born. The national standard deviation declined from 1.0-1.1 in 1850-60 to just 0.19 in 2000. Put differently, regional fertility ranged from 4.53 in New England to 7.74 in the (admittedly less populous) Mountain region in 1850, or 3 standard deviations, but from just 1.85 in the South Atlantic to 2.19 in the Mountain region in 2000, or less than 2 standard deviations.[7].

Figure 2 reveals that the Baby Boom peaks around the year 1970. Although this timing may at first appear puzzling, it must be kept in mind that our measure of fertility is children ever born to women between the ages of 35 and 44. Assuming that most women give birth between the ages 20 and 25, a peak of children ever born in 1970 to women in this age group corresponds to a peak in births between the calendar years of 1946 and 1960. Every region of the U.S. experienced a Baby Boom, but the magnitude of those Baby Booms varied considerably. To see this, we computed the absolute as well as the percentage change in fertility between 1950 and 1970 by region. These are reported in Table 6. As can be seen, relatively small Baby Booms

[7] In 1850 there are about 75,000 people in the Mountain region, and barely 100,000 people living in the Pacific census region. If we restrict the regions to those with larger populations, then the region with the highest fertility is the West North Central region at 6.75 and the the lowest fertility region is New England at 4.49.

occurred in the South Atlantic (0.49, or 20.4 percent), East South Central (0.40, or 14.9 percent), West South Central (0.73, or 30.4 percent) and Mountain regions (0.77, or 30.6 percent), compared with a national average increase of 0.83, or 38.9 percent. By contrast, fertility increased by on the order of a child per woman in New England (49.6 percent), the East North Central (51.9 percent), the West North Central (45.5 percent), and Pacific (52.0 percent) regions.

Another way to put the Baby Boom into perspective is to compare the magnitude of fertility increases between 1950 and 1970 in Table 6 with the magnitude of fertility decreases between 1850 and 1950, seen in Table 7. For example, Fertility in New England, the lowest-fertility region, declined by a relatively modest 2.59 children per woman, or by 57.3 percent, but by 5.22 children per woman, or 67.5 percent in the high-fertility (in 1850) Mountain region. Nationally, fertility declined by 64.1 percent over the period, with a range of about 11 percentage points across regions.

SCHOOLING OF CHILDREN AND PARENTS

Here we present the accumulation of schooling of children in the population. We document the rising level of schooling attainment of children, as well as the change in schooling during the Baby Boom. Thus we focus on the quality side of the quality-quantity tradeoff. To calculate schooling attainment we assumed that a child born today is 6. We then used the average primary school enrollment rates from today until 7 years from now. We then use the average secondary enrollment rates 8, 9, 10 and 11 years from today. Finally we use the higher education enrollment rates 12-15 years from today, adjusted for higher education attrition.[8]. For years where these

[8] In Turner, Tamura, Mulholland and Baier (2007) we constructed years of schooling in the states using a similar methodology. We adjusted higher education enrollment rates by state specific, decade specific parameter Θ to account for higher education attrition. That is to say freshman students have a much lower continuation rate than 9th graders or college juniors and seniors. Since

forward enrollment rates are not available we used 100 percent for primary school enrollment rates for all states, and the linear projection of secondary enrollment rates from 1970 onward on a time trend, and a linear projection of higher education adjusted enrollment rates from 1970 onward on a time trend. We used the contemporaneous expected years of schooling for individuals exposed to primary school but no more, the expected years of schooling for individuals exposed to secondary schooling but no more, and the expected years of schooling for individuals exposed to higher education. Again we present the data aggregated to the census region, weighted by the population of each state. In each of the figures the red curve is the national average. There is evidence that years of schooling declined during the 1970s. This would be the tail end of the Baby Boom, as our assumption is that a child is 6 years old in year t.

Table 8 contains the population weighted average schooling attainment by census region. The data is also presented in Figure 3. Since the average years of schooling are rising, we choose to present the coefficient of variation of years of schooling of children instead of the standard deviation of years of schooling of children. This is contained in Figure 4. We present the data in the same manner as fertility and years of schooling of children, by region. For each region we computed the mean and standard deviation of years of schooling of children, unweighted. Thus we are presenting the information about the dispersion across states, without using information about the dispersion within states. With the exception of composition changes in the states of the region, only the West South Central region illustrates periods of rising dispersion across the states of the region. This occurred during the 1870-1900 period.

Given the differential size of Baby Boom fertility across the regions, it is reasonable to ask if there is differential schooling changes across regions. Four of the

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we are trying to capture college exposure we used Θ to capture this phenomenon. For more on this methodology see the appendix of TTMB.

five large Baby Boom regions had smaller absolute changes in years of schooling than the nation, New England, Middle Atlantic, West North Central and East North Central. The fifth region had the same increase as the nation, the Pacific. Of the four small Baby Boom regions, two had larger than national increases in years of schooling of children (South Atlantic and East South Central), one had comparable schooling increases, West South Central, and only one was below the national average, Mountain. Thus within the Baby Boom period there was a quality-quantity tradeoff as predicted by Becker and Lewis (1973). These data are contained in Table 9. What is remarkable about the Baby Boom period is that while fertility rose by roughly 5 sixths of a child, years of schooling of children rose by over 2.25 years! However the 1974 weighted national average years of schooling of children is the local peak in schooling attainment at 14.2 years. It declines by roughly .75 years for 1978 and 1979 before gradually increasing. Not until 1996 does the national weighted average years of schooling of children match the 1974 figure. All years beyond 1996 exceed the 1974 value as schooling attainment has continued to rise.

Table 10 presents the change in schooling by census region between 1850 and 1950. Three of the five large Baby Boom regions had smaller than average average accumulations of schooling relative to the US as a whole. The Pacific and the West North Central regions had larger schooling gains than the nation. All four small Baby Boom regions had greater than average accumulations of schooling relative to the US as a whole. Two of these regions had larger than average fertility declines and the other two regions were within 5 percent of the national decline in fertility. These results generally confirm the quality-quantity tradeoff, after controlling for the initial level of fertility and initial schooling.

We examine the connection between changing schooling attainment and fertility changes over the post Baby Boom period, 1970 to 2000.. The results of this exercise are contained in Table 11. Although national schooling attainment of children rose by about half a year between 1970 and 2000, there were two regions that saw schooling attainment drops, New England and Pacific. By contrast all nine census regions witnessed falling fertility. Comparing the regional changes with the national changes, we see that three regions had smaller increases in schooling attainment relative to the nation, the two aforementioned regions that had declining schooling attainment and the Middle Atlantic region. All three of these regions were members of the large Baby Boom grouping. Of the remaining six regions, all gained relative to the national schooling attainment by between .05 years and .76 years. All four regions of the small Baby Boom grouping are contained in this set. Two of the large Baby Boom group switch into this grouping, West North Central and East North Central. From 1970 to 2000 national fertility fell by almost one full child. Two of the regions with below average schooling changes, Middle Atlantic and Pacific regions are the only two regions that had smaller than average fertility declines. The New England and West South Central regions had comparble fertility declines, with New England having a large deficit in schooling attainment relative to the national change, and the West South Central gaining an extra .2 years relative to the nation. The remaining five regions had fertility declines between .1 and .2 larger than the national average. All of these regions had greater than national average increases in schooling attainment. Thus while a bit weaker than for the Baby Boom, the Baby Bust period also provides evidence of the quality-quantity tradeoff in fertility.

Next we turn to the schooling of the parents of the children. Our measure of fertility from 1890-2000 is for ever married women 35 to 44. From 1850-1880 we constructed a measure of total fertility rates. Overall we treat each mother as 26. Thus we compute a mother's schooling as that arising from the birth cohort 20 years prior. Since our schooling data from TTMB (2007) only goes back to 1840, we extrapolated for each state for the previous 10 to 20 years in order to construct a measure of maternal schooling.[9]

In addition to having schooling measures prior to the existence of children's schooling, the measure of mom's schooling differs across regions because the weights to produce the regional averages differs. Whereas for children years of schooling, we weight by the state population in year t. Whereas for parental schooling we weight schooling from year t-20 by year t population. If states have differential survival probabilities at age 20 and if states differ by the size of the immigrant and domestic migration rates, then the regional average mother's schooling will not be merely children's schooling lagged 20 years. Table 12 presents the weighted averages of mother's schooling by region as well as for the nation.

One thing that is apparent is that the post Baby Boom fertility appears to be negatively correlated with parental schooling. Observe that fertility increases between 1990 and 2000. This occurs at the same time that parental schooling measures are lower in 2000 than their value in 1990. Computing a table similar to Table 11, but for parental schooling changes is contained in Table 13. There are five regions than experienced relative schooling gains greater than 120 percent of the US average. In all five regions their fertility decline exceeded the US average by at least 4 percent, and four out of five exceeded the decline by at least 10 percent. The New England, Middle Atlantic, Pacific and East North Central regions had either smaller schooling gains, comparable or about 40 percent larger than the US average (Middle Atlantic region). Two of these regions had smaller than average fertility declines, and the other two had fertility declines that were within 10 percent of the national average. Again we see that the quality-quantity tradeoff exists in the post Baby Boom era.

[9] Schooling for women differed slightly from schooling for men. In 1850 enrollment rates for men were 50 percent, whereas for women they were 45 percent. This gap narrows to four percentage points in 1860, three percentage points in 1870, about 2.5 percentage points in 1880 and less than one percentage point from 1890 onward. See footnote 5 of TTMB (2007) for more information.

MORTALITY RISK

Falling mortality risk in the population is presented in this section. In order to present results that are economically meaningful we concentrate on survival probabilties. Theoretically speaking, it makes sense that a parent would wish to invest more in their children's human capital, the higher the probability that their child will survive.[10] The key question, the answer to which is not obvious, is survive until what age, or what stage of their life? We calculated four survival probabilities: (1) infant survival; (2) the probability of surviving to age 5; (3) the probability of surviving to age 15 (roughly speaking, the start of the reproductive cycle); and (4) the probability of surviving to age 35 (roughly speaking, the end of the reproductive cycle). The probability of surviving to age 15 is the probability that the child will receive the bulk of her formal schooling and begin their reproductive life cycle, at least for much of the 19th and the 20th centuries.[11]

Figures 6-9 contain the survivor probabilities for age 1, 5, 15 and 35, respectively, while Tables 14 through 16 contain the survivor probabilties for ages 1, 15 and 25, respectively. It is obvious from the graph that there has been a tremendous increase in the probability of a child surviving to age one as well as the tremendous amount of convergence in this survival probability across regions. There is very clear evidence of the unhealthy nature of urban environments for infants before 1920. The two most densely populated regions of the country, the New England region and the Middle Atlantic region lie below the national average from 1850 to 1920. It is not until urban sanitation provides for water treatment that living in a city became comparable to living outside of the urban area.[12] Notice that the southern regions are

[10]See Ehrlich and Lui (1999), Melzter (1999) and Tamura (2006) for models where rising life expectation lead to rising human capital accumulation.

[11]Age 15 is typically the age at which most states ended mandatory schooling.

[12]This is the thesis of Melosi (2000).

either above average, East South Central and West South Central, or at the national average, South Atlantic, and comparable to the Pacific, West North Central and East North Central regions. Recall that these southern regions are much less educated than their western and northern counterparts. However they are not that dissimilar in their population density. Also note that the share of the region that is African American is much larger in these three southern regions than in their western and northern counterparts, see Turner, Tamura and Mulholland (2007).[13]The same pattern holds for the survival probability to age 5. Figure 8 presents the probability of surviving to age 15. Again it is not until 1930 that the Middle Atlantic and New England regions attain survivor probabilities to age 15 comparable to the US average, as well as all other regions, except for the Mountain region. The western regions, Pacific, West North Central and East North Central are above the national average and then comes the East South Central and West South Central. The South Atlantic and after 1880 the Mountain regions are comparable to the national average.

The final set of survival probabilities are the probability of surviving to age 35, or the near completion of reproductive age. It is only towards the end of the reproductive age, 35, that the southern advantage in survivability dissipates. The New England and Middle Atlantic regions remain below the national average until 1930. The Pacific, West North Central and East North Central regions all have survival probabilities that exceed the national average until the onset of World War II.

A common feature in all three tables is the tremendous change in relative survival probabilties in New England and the Middle Atlantic regions, a near mirror image flipping behavior by the East South Central and West South Central regions,

[13]This provides additional evidence presented by Troesken (2004). He argues that it is much more difficult to discriminate in the provision of modern water systems based on race, than it is to discriminate on education provision based on race.

the near continuous leadership in survivability by the Pacific, West North Central and East North Central, and lagging behavior of the South Atlantic and some intermittant switching behavior from the Mountain region. From 1850 through 1920 the typical new born had a lower probability of suriving to age 1, 15 and 35 than the typical new born in the nation. However by 1930 the typical new born in these two regions had attained parity with their national counterparts in infant survival, and had exceeded the national average for survival to age 15 and 35. For the last seven decades these regions have either matched or exceeded the national survival probabilities at these ages, with only two exceptions, both in the Middle Atlantic region. In contrast the East South Central and West South Central regions typically matched or exceeded the national survival probabilities to age 1 and 15 from 1850 to 1920. From 1930 onward these southern regions generally lagged the national average. Unlike infant and teen survival, the probability of surviving through much of the child bearing years, age 35, in these two southern regions were always below the national average. In the three regions of the Pacific, West North Central and East North Central only seven times out of 144 comparisons did survival probabilities to age 1, 15 and 35 fall below the national average. In four of these seven exceptions the deviation was only one tenth of a percent, twice two tenths of a percent and once three tenths of a percent. The remaining two regions, the Mountain and the South Atlantic roughly parallel the nation, although they occasionally switch from being laggards to leaders and back to laggards. In the case of the South Atlantic region, only five times out of 48 do survival probabilities exceed the national average for these three ages. Infant survival lagged from 1850-1890, exceeded in 1900 and 1910, and lagged the remaining years. For age 15 survival, the South Atlantic initially was higher than the nation, as well as in 1870 and 1910, but lagged behind in all other years. The South Atlantic always lagged the nation in survival to age 35 for all 16 observations. The Mountain region displays more switching behavior. For 1850-1880 infant survival was less than the national average, exceeds the national average from 1890-1920, falls behind from 1930-1960 before finally matching or exceeding the national average from 1970 onward. For age 15 survivability, the Mountain region lags from 1850-1890, exceeds the nation from 1900-1910, lags from 1920-1970 and matches or slightly exceeds the national average for the remaining years. This pattern repeats for survival through child bearing age 35, except that the periods of leading the national average are shorter, 1900-1910 and 1990.

Economic theory suggests that higher child survivability should decrease the number of lifetime births, but the effect on the number of children surviving is less clear, ex ante. Figures 10 and 11 graph the mean number of children surviving to age 5 and 15. Although the overall trends are similar to those of children ever born, there is distinct evidence of a small "Baby Boomlet" between 1870 and 1900, a period during which rising probabilities of survival are apparently sufficient to outweigh the declining number of children ever born.

POPULATION DENSITY

In this section we present the evidence concerning population density. We measure state population density as the population -eighted average of county population density, measured in thousands of persons per square mile.[14] In order to faciliate ease of analysis, we again graph these by census regions. Each graph also contains the national population density, where we weight each state by its population. The Middle Atlantic census region is clearly more densely population than any other region by a large bit, however one pattern does emerge. For the nation as a whole population density dipped between 1880 and 1890. It peaks in 1920, remains

[14] Such population weighted figures therefore measure the density experienced by the typical state resident, as opposed to unweighted figures, which would measure the density of a typical unit of land.

roughly constant until 1950 and declines until 1980 where it remains roughly constant. Thus examining the average population density of a state resident produces a completely different picture than simply dividing state population by square miles of a state. By that calculation, population density has been rising in the US throughout most of the period.

The New England, Middle Atlantic behave quite similar to the US average. The South Atlantic, East South Central and West South Central have almost monotonically rising population density, and in attenuated form so does the West North Central region. The Pacific region has very rapidly rising density from 1850 to 1880, and then roughly flat density for the remaining 120 years. The Mountain and East North Central regions have mostly rising density, but a short declining portion, 1960-1980 for the Mountain, or a long fairly flat portion from 1920-2000 for the East North Central region.

Table 16 presents the summary densities by census region, as well as the US. One thing is striking, the top four most densely populated regions in 1950 all were among the five regions of the large Baby Boom. Of the four small Baby Boom regions, two were the least densely populated regions in 1950. The only exception to this connection is the West North Central region. It had a large Baby Boom, but was the third lowest population density. The Mountain region and the South Atlantic regions both had higher population densities, but were small Baby Boom regions.

Observe that in 2000 every region is less densely population than its peak census year, except for the East South Central and West South Central. The four of the five regions with Big Baby Booms saw population density either peak in 1940, Middle Atlantic, or 1950, New England, West North Central and Pacific. The one outlier to this pattern is the East North Central with a population density peak in 1970. For the four regions with Small Baby Booms, two saw continuous increases in population density, East South Central and West South Central. Of the remaining two, the South Atlantic population density peaked in 1950 and the Mountain region saw population density peak in 1960. This provides some evidence that availability of space is associated with fertility.

PUTTING IT TOGETHER: FERTILITY, SCHOOLING, DENSITY AND SURVIVAL

Having constructed new measures of fertility at the state level, new measures of survival probabilities, schooling attainment of children and schooling attainment of parents, we present the connection between these variables. We show that there is a strong negative correlation between log state population density, our proxy for the price of housing, and fertility. .We also show that there is a negative relationship between the log probability of survival to age 35 and fertility. Parental education is strongly negatively related to fertility. Child schooling attainment is positively correlated with log state population density for the entire period, and the 1850-1950 period. In the latter period, the Baby Boom era, log state population density ceases to be significantly related to child schooling attainment, however the log of the census regional average of state population density is positively related to child schooling attainment.[15]We find that log probability of survival to age 35 is positively related to schooling attainment, although it ceases to be significant in the 1950-2000 period. The empirical results indicate that there is a quality-quantity tradeoff in the data. By and large the results indicate that state population density is negatively related to fertility. Net mortality risk to age 35 is strongly positively related to fertility as suggested by Becker (1960), Ehrlich and Lui (1999), Soares (2005), Tamura (2006)

[15] With falling mobility costs from 1950 onward we are not surprised by a weakening of the relationship between log state density and child schooling attainment. However we believe that log of regional population density should still be correlated with schooling attainment if mobility is still strongly related to region of birth.

and Simon and Tamura (2007). Schooling of children is positively related to parental schooling, consistent with Becker, Murphy and Tamura (1990), positively related to survival probabilities, consistent with Meltzer (1996), Ehrlich and Lui (1999), and Tamura (2006), and positively related to population density, arising from lower fertility and the quality-quantity tradeoff of Becker and Lewis (1973) and Becker, Murphy and Tamura (1990).

Tables 18-20 contain the results of our regressions of children ever born to women 35 to 44 on parental schooling, log of population density, log of population density in the census region and the log of the age 35 survival probability.[16],[17] Table 18 presents the results for the entire time period, and Tables 19 and 20 present the results from the subsamples of 1850-1950, 1960-2000. We broke up the period in this manner in order to isolate the Baby Boom within a single period, and keep the Demographic Transition within a single period.[18] In all regressions the errors are clustered about the state. Observe that in all three time periods, parental schooling is negatively and significantly related to fertility. A typical high school graduate woman would have about 1.5 fewer children than a woman with no formal education over the entire period. This differential fertility is even larger in the first century of data, 1850-1950, where the typical high school graduate woman would have about 3 fewer children than a woman with no formal education. With the dramatic convergence in schooling across the states, this effect is reduced so that the typical

[16] Recall that our measure of fertility for 1850, 1860, 1870 and 1880 come from our estimates of total fertility rates for each state, rather than survey results on children ever born to ever married women 35 to 44.

[17] We report only the results from OLS regressions, but note that robust regressions, quantile regressions, random effects and fixed effects regressions produce broadly similar results. These results are available on request from the authors.

[18] Since we are interested in children ever born and not total fertility rates, this produces the pre-Baby Boom fertility nadir in 1950, rather than the more typical 1940.

high school graduate woman would have about 1 less child than a woman with no formal education. A college graduate would have about .3 fewer children than a high school graduate woman in the 1950-2000 period. In all eighteen regressions, log of population density is negatively related to fertility, sixteen times at the 5 percent level of significance and thirteen times at the 1 percent level of significance. A one standard deviation increase in the log of population density reduces fertility by about one third of a child, $-.336 = -.168 * 2.0$, this effect is slightly smaller in the first century, average coefficient of $-.157$ versus $-.168$, and still smaller in the final 50 years, $-.0722$. In the case of parental schooling and log of population density, the latter period is less negatively related to fertility than the first period. In each case the effects are reduced by between 56 percent and 70 percent, respectively. These are signficantly different at the 1 percent level.

In contrast with parental schooling and log state density, log of age 35 survival probability is not significantly different between the two periods.[19] A one standard deviation increase in log age 35 survival probability, .25, leads to a reduction in fertility of about .4 children, $-.4 = -.25 * 0.173$. In 1850 the mean of log age 35 survival probability was -.7666, and the mean of log age 35 survival probability in 1950 was -.0741. Hence the reduction in fertilty implied by rising age 35 survivability is about one eighth of a child, $-.12 = -.6925 * 0.173$, . The change in fertility over this period was 3.75 kids, so rising longevity alone explains roughly 3 percent of the reduction in fertility. Rising density explains $-.3 = -.157 * 1.8667$, or roughly 8 percent of the fertility decline. Hence improved survival odds and increasing population density account for about 11 percent of the decline in fertility over the first 100 years. Parental schooling rose from 2 years in 1850 to 10.5 years in 1950. This endogenous change in parental schooling reduced fertility by $-2.19 = -.2578 * 8.5$.

[19] Like the children schooling result below, there is evidence that the magnitude of the coefficient increased in absolute value, although it is not significant at the 10 percent level.

Therefore rising levels of parental education "explains" about 60 percent of the decline in fertility. Combined the three variables "explain" 75 percent of the reduction in mean fertility.

Tables 21-23 contain the results of our regressions of schooling attainment of children on the same variables as used in the fertility regressions. As with the fertility regressions, there are differences between the first 100 years of data and the last 40 years of data. The coefficient on parental schooling became smaller, falling from about .64 to .22, and the coefficient on log population density changed from roughly .1 to essentially 0 and insignificant. Like the fertility regressions, however, log of age 35 survival probability remains the same, although there is some evidence that it increased in magnitude. From 1850 to 1950, children schooling rose from 3 years to 11.6 years. Rising population density increased child schooling attainment by $.20 = .1089 * 1.8664$ years. Rising survival probability increased child schooling attainment by $1.92 = 2.7739 * .6925$ years. Together these two effects explain about 25 percent of the rise in schooling. Rising parental schooling produces an increase of $5.5 = .6373 * 8.6$ years of child schooling attainment. Thus these three factors together "explain" 89 percent of the rise in child schooling attainment.

The falling magnitudes of log state population density in the children ever born regressions and nonsignificance in the children schooling attainment regressions led us to consider adding the log of census region population density. Our view is that falling migration costs could lead to falling measured effects of state population density, even though population density at the regional level maybe of rising importance. Consistent with this view, we find that log regional population density is significant and negatively related to children ever born for all years as well as for each subperiod. Also it is significant and positively related to child schooling attainment in the whole period and both subperiods. From 1850 to 1950 the average log regional population density increased from -2.52 to -0.17. The effects of log regional population density on fertility and child schooling attainment are, a reduction in fertility of $-.53 = -.22 * 2.35$ children. Adding this together with the previous three effects produces a decline of 3.14 children, or roughly 84 percent of the observed decline in fertility. For child schooling, the effect of regional population density is to predict an increase of $.45 = 2.35 * .1896$ years. Together with the other three effects produces an increase of 8.1 years of schooling, or roughly 94 percent of the observed increase in schooling attainment of children.

How much of the Baby Boom increase in fertility and change in schooling, as well as the post Baby Boom decline in fertility and change in schooling are captured by these four variables? These are contained in Table 24. The decline in population density does predict an increase in fertility from 1950 to 1970, but not close to the observed change. Overall rising survival probabilities, rising schooling levels of parents more than offsets the declining population density to produce a predicted decline in fertility of about .2 children, compared with the Baby Boom increase in fertility of .8 kids. The four factors predict an increase in schooling of .37 years, compared to the observed 2.2 year increase, or only 17 percent of the increase. For the Post Baby Boom period, the predicted changes are closer to the actual changes. A decline in fertility of about .39 children is predicted compared to the 1 child decline, and a .7 year increase in schooling compared to the observed .63 year increase.

A MODEL OF SECULAR FERTILITY DECLINE AND BABY BOOM

Finally we present a model, used in Simon and Tamura (2007), to fit secular declining fertility, baby booms and rising schooling and income for 21 countries.[20]

[20] Recent work on the Baby Boom includes Greenwood, Seshadri and Vandenbroucke (2005). In their model a once and for all improvement in the home production technology led to the Baby Boom. They show that their improvement coincides with the adoption of household appliances both in the US as well as in European countries. However Bailey and Collins (2006) show that electrification,

The model utilizes a precautionary demand for fertility that falls as mortality risk declines.[21] As fertility declines the relative price of child quality, schooling attainment, falls. Thus rising schooling attainment occurs during falling fertility. Parents care also about the amount of space their children have growing up. If the price of space falls sufficiently, and in particular during the period with dramatically falling precautionary demand, then a baby boom can be produced. However in order for schooling attainment not to fall during the baby boom, there must be a corresponding drop in the cost of schooling. We present the results of a numerical solution of the model where we choose the time varying price of space and cost of schooling in order to fit the Baby Boom and the rising level of schooling attainment in the population.

Parental preferences are:

$$\alpha \left(c_t^{\psi} S_t^{1-\psi} \right)^{\varphi} \left[(1-\delta) x_t - a \right]^{1-\varphi} + (1-\alpha) h_{t+1}^{\varphi} - \frac{\beta \delta_t}{\left[(1-\delta) x_t - a \right] (1-\delta_t)^{\varepsilon}} \tag{3}$$

where parents choose fertility, x, human capital of their children, h', a composite consumption good, c, and space, S.

We assume that the young adult mortality rate is δ. Further we assume that expected net fertility is what parents care about, $(1-\delta)x - a$, $a \geq 0$. Thus we model the parental fertility choice similar to Jones (2001), where elasticity of substitution of net expected fertility with human capital investments is greater than 1. This in turn exceeds the elasticity of substitution between net expected fertility and space, 1.

which must occur prior or coincident to the adoption of these labor saving household appliances did not correlate with rising fertility. They show that the Amish, who use neither electricity, nor modern appliances, had the same size Baby Boom! Finally the earlier work of Easterlin (1961,1966), which argued for a relative income theory of fertility may be important. We do not examine this theory here.

[21] A precautionary demand for fertility is not required for this result. For example see Jones (2001), and Becker (1960). In these cases a preference for surviving children and a low elasticity of subsitution between surviving children and consumption will produce a Demographic Transition during mortality decline.

The final term, with $\varepsilon > 0$, in the preferences captures something like a precautionary demand for fertility as in Kalemli-Ozcan (2002, 2003) and Tamura (2006). With falling young adult mortality rates, which in the limit reach 0, the final term in preferences disappears.

The budget constraint facing the typical parent is given by:

$$pc_t + r_t x_t S_t = wh_t \left[1 - x_t \left(\theta + \kappa_t \tau_t\right)\right] \tag{4}$$

where θ is the time cost of rearing children, τ is the time spent educating children, κ is the time efficiency of education time, p is the price of consumption and r is the price per unit of space.[22] Finally we assume that the human capital accumulation technology is given by:

$$h_{t+1} = Ah_t \tau_t^{\mu} \tag{5}$$

For any given fertility choice, x, the problem is a well defined concave programming problem. Thus we grid up possible values of fertility and search over the grid for the maxmizing choice of fertility, human capital investments, consumption and space.

We specified young adult mortality δ as the forecast value of the probability of dying before the age of 35 net of infant mortality, $p_{1,35}$, plus one third of the forecast infant mortality rate, $\frac{\widehat{m}}{3}$.[23] We choose this specification because it explicitly

[22] Alternatively we could have specified the first term in preferences as depending on a composite of space, S, and all other consumption goods, c, and net expected fertility: $\alpha X^{\varphi}\left[(1-\delta)x - a\right]^{\lambda-\varphi}$, where $X = \left\{\sigma c^{\frac{1}{\rho}} + (1-\sigma) S^{\frac{1}{\rho}}\right\}^{\rho}$. If ρ were negative, so that goods were stronger complements than the Cobb-Douglas case examined here.

[23] See Simon and Tamura (2007) for more on how the forecasts are made for each country. Typically a regression of log mortality risk against time for years less than 1900 and for years between 1900 and 1950 were used for both infant mortality and young adult mortality. We then used the predicted values for each year as the forecast values. We chose to run this spline regression procedure because a look at the data indicated that a break occurred in 1900 and in 1950 with the introduction of pennicilin.

distinguishes the cost of child death in infancy with a child death after the age of 1. In the former we assume that the woman has sufficient child bearing years remaining to replace the lost child and that the level of human capital investment in the child is much less than a child death after the age of 1. Thus we set

$$\delta = p_{1,35} + \frac{\widehat{m}}{3} \tag{6}$$

Figure 13 contains the result of the numerical solution. It contains both the data on fertility for the US as well as the model predictions. It also contains the years of schooling in the labor force, using the data in Turner, Tamura, Mulholland and Baier. Finally we present the predicted income series and schooling attainment of children. As can be seen the model can be made to fit each of these series extremely well. The time series on rental rates, r, and the cost of children are contained in Figure 14. The measure of rental cost is paired with our time series on average population density in the United States over the 1840 to 2000 period. With the exception of 1940, 1950 and 1960, the series can fit population density eerily well. There is clearly a more elastic response to the decline in population density in the data than exists in the model. Perhaps the marginal rent arising from the opening of the suburbs from 1945 to 1970 are not well captured by the population density. We leave it to future work, but note that this is closely related to the work of Baum-Snow (2007). As for the cost of schooling, κ, we have not tried to fit this time series with anything like schooling expenditures per child as a proportion of income.[24]In future work we anticipate fitting the experience of each of the 50 states and the District of Columbia as was done in Simon and Tamura (2007) for the 21 countries that experienced a baby boom.

The Table 25 produces measures of goodness of fit of the model's solution with the data. We present the results for fertility, schooling in the labor force, income,

[24]We thank Marla Ripoll for this very useful suggestion.

and schooling attainment of children. Thus the typical regression run was:

$$y_t = a + bx_t$$

where y_t is the year t observation on either children ever born or average years of schooling in the labor force, etc.; x_t is the year t observation from the model on children ever born or the average years of schooling in the labor force between the ages of 20 to 65, etc. Under the null hypothesis that the model fits the data, $a = 0$, and $b = 1$. The row marked with F provides the F statistic on the joint test of these hypotheses. It is clear that the model can produce the time series in the data with quite a bit of success.

CONCLUSION

In this paper we present new data on fertility at the state level for the US from 1850 - 2000. Ours are the first data that presents the Demographic Transition for each state of the US, as well as the Baby Boom for each state. We document that the Baby Boom was differential in size both in fertility as well as schooling attaiment of the Baby Boom cohort. We show the secular rise in schooling that is consistent with a standard quality-quantity tradeoff between schooling and fertility. We further produce original estimates of survival probabilities at the state level for 1850 - 2000. We demonstrate the negative relationship between survivor probabilities and fertility, and the positive relationship between survivor probabilities and schooling attainment. Finally we present new estimates of population density for each state, measured as the average population density of a typical resident of the state. This data was calculated using population by county for each county of the US. We show that population density is negatively correlated with fertility and that the Baby Boom was coincident with a decline in population density for many of the states.

Finally we presented a model that was capable of taking all of these inputs and producing a Demographic Transition, rising schooling and a Baby Boom induced by dramatically declining cost of space. While the US data is roughly consistent with the model, the decline in density is not large enough to fit the required decline in the price of space of the model. Better measures of the marginal price of space may lead to a better fit of the model to the existing data on density.

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TABLES

Table 1: Real Output per Worker by Census Region

year	NE	MA	SA	ESC	WSC	Mtn	Pac	WNC	ENC	USA
1840	5267	5528	2342	3683	5042	-	-	3503	4540	4114
1850	9077	7901	3302	5344	7346	10250	43207	4641	7343	6691
1860	9999	8840	3647	5928	7503	12606	24257	5760	7484	7297
1870	9717	10910	3728	4869	6312	15299	16500	7056	7452	7704
1880	10998	12954	4752	5447	5971	10951	13786	9248	11147	9449
1890	13818	16786	5400	5695	6923	13840	15438	10972	12965	11514
1900	13073	14947	5929	5900	7641	13838	14992	12395	13440	11477
1910	14230	16234	7909	6774	8633	11789	14188	13167	14682	12554
1920	15706	18469	9770	7947	11512	13823	17606	13486	15842	14429
1930	19454	21564	11961	9035	11559	14884	19447	14714	17489	16442
1940	21518	22639	14278	10240	12993	17247	22302	15515	20512	18328
1950	24224	26168	20811	17624	22718	24877	27759	24256	25725	24286
1960	26042	29854	26982	24092	28521	28272	35638	26991	31641	29514
1970	34919	40110	37781	33949	38449	37353	45806	35770	39605	39139
1980	38074	43667	42058	37899	43845	40690	47185	36952	40972	42083
1990	45424	51713	49986	46050	48273	46959	50172	44039	47283	48552
2000	61426	64758	60216	54134	59833	56277	61374	51527	54162	58791

Table 2: Weights on Census, Predicted Data

year	Census α	Predicted from life table regression, $1-\alpha$	National infant survival probability, fitted	National infant survival probability, data
1910	1	0	0.8947	0.8986
1900	.73	.27	0.8846	0.8822
1890	.60	.40	0.8475	0.8425
1880	.60	.40	0.8294	0.7815
1870	.60	.40	0.8154	0.8117
1860	.60	.40	0.7956	0.8006
1850	.62	.38	0.7673	0.7639

Table 3: Implied Total Fertility Rates and Haines Total Fertility Rates

year	Implied National Total Fertility Rates	Haines National Total Fertility Rates	Deviation	Percent Deviation
1880	4.80	4.64	0.16	3.4
1870	5.00	4.95	0.05	1.1
1860	5.73	5.55	0.18	3.2
1850	5.95	5.81	0.14	2.4

Table 4: Children Ever Born: By Census Region

year	NE	MA	SA	ESC	WSC	Mtn	Pac	WNC	ENC	USA
1850	4.53	5.56	6.41	6.31	6.03	7.74	4.66	6.79	6.42	5.95
1860	4.25	5.26	6.08	5.96	6.22	6.76	6.22	6.58	6.03	5.73
1870	3.69	4.64	5.20	5.15	5.58	6.14	5.38	5.73	5.16	5.00
1880	3.32	4.11	5.66	5.41	6.38	5.45	4.36	5.12	4.44	4.80
1890	3.44	4.12	5.58	5.79	6.27	5.48	4.20	5.35	4.62	4.91
1900	3.22	3.74	5.38	5.39	5.99	4.81	3.48	4.60	3.93	4.45
1910	2.75	3.10	4.48	4.52	4.94	3.89	2.77	3.71	3.20	3.66
1920	2.52	2.76	3.80	3.91	4.12	3.66	2.63	3.28	2.88	3.22
1930	2.51	2.51	3.35	3.50	3.39	3.29	2.27	2.79	2.54	2.83
1940	2.06	2.02	2.82	3.01	2.78	2.70	1.87	2.35	2.16	2.36
1950	1.93	1.81	2.40	2.68	2.40	2.52	1.89	2.22	2.02	2.14
1960	2.32	2.14	2.57	2.89	2.73	2.88	2.35	2.68	2.47	2.49
1970	2.90	2.68	2.90	3.08	3.13	3.29	2.87	3.23	3.07	2.96
1980	2.56	2.48	2.57	2.75	2.81	2.86	2.51	2.79	2.74	2.65
1990	1.76	1.83	1.87	2.05	2.07	2.10	1.81	2.08	2.01	1.93
2000	1.91	2.01	1.85	1.97	2.17	2.19	2.07	2.11	2.08	2.03

Table 5: Standard Deviation of Children Ever Born: By Census Region

year	NE	MA	SA	ESC	WSC	Mtn	Pac	WNC	ENC	USA
1850	0.43	0.58	0.35	0.28	1.45	0.47	1.78	0.28	0.36	1.00
1860	0.21	0.47	0.38	0.18	1.35	2.78	1.29	0.55	0.53	1.19
1870	0.21	0.55	0.34	0.18	0.69	1.07	0.77	0.19	0.37	0.84
1880	0.19	0.41	0.75	0.33	0.83	0.95	0.75	0.41	0.26	0.98
1890	0.23	0.35	0.88	0.53	0.16	0.90	0.52	0.39	0.44	1.01
1900	0.19	0.30	1.09	0.71	0.19	0.99	0.41	0.64	0.44	1.03
1910	0.07	0.26	0.98	0.62	0.19	0.79	1.01	0.47	0.32	0.86
1920	0.13	0.29	0.85	0.34	0.21	0.61	1.33	0.54	0.22	0.74
1930	0.18	0.31	0.83	0.21	0.23	0.64	1.37	0.49	0.15	0.65
1940	0.30	0.29	0.69	0.15	0.26	0.39	0.50	0.37	0.16	0.48
1950	0.28	0.16	0.52	0.17	0.21	0.36	0.81	0.26	0.16	0.42
1960	0.26	0.10	0.38	0.32	0.26	0.35	0.22	0.31	0.17	0.35
1970	0.21	0.09	0.21	0.30	0.20	0.31	0.20	0.27	0.18	0.29
1980	0.13	0.07	0.18	0.22	0.15	0.32	0.09	0.16	0.09	0.23
1990	0.07	0.05	0.17	0.16	0.08	0.37	0.07	0.12	0.04	0.22
2000	0.01	0.07	0.07	0.11	0.04	0.28	0.12	0.12	0.06	0.19

Table 6: Relative Baby Boom Fertility Changes

region	absolute change from 1950 to 1970	relative to national average change	percentage change from 1950	relative to national percentage change
NE	0.96	1.16	49.6	1.28
MA	0.87	1.05	48.0	1.24
SA	0.49	0.59	20.4	0.52
ESC	0.40	0.48	14.9	0.38
WSC	0.73	0.88	30.4	0.78
Mtn	0.77	0.93	30.6	0.79
Pac	0.98	1.18	52.0	1.34
WNC	1.01	1.22	45.5	1.17
ENC	1.05	1.27	51.9	1.33
USA	0.83		38.9	

Table 7: Relative Fertility Changes 1850-1950

region	absolute change from 1850 to 1950	relative to national average change	percentage change from 1850	relative to national percentage change
NE	-2.59	0.68	-57.3	0.89
MA	-3.75	0.98	-67.4	1.05
SA	-4.00	1.05	-62.5	0.98
ESC	-3.62	0.95	-57.5	0.90
WSC	-3.63	0.95	-60.2	0.94
Mtn	-5.22	1.37	-67.5	1.05
Pac	-2.77	0.73	-59.5	0.93
WNC	-4.57	1.20	-67.3	1.05
ENC	-4.40	1.15	-68.5	1.07
USA	-3.82		-64.1	

Table 8: Average Years of Child Schooling: By Census Region

year	NE	MA	SA	ESC	WSC	Mtn	Pac	WNC	ENC	USA
1850	4.66	4.40	1.72	2.03	1.48	-	1.26	2.96	4.37	3.35
1860	5.12	5.13	2.03	3.15	2.04	2.10	4.58	4.46	5.04	4.09
1870	5.14	5.14	3.13	3.37	2.81	3.33	5.01	4.97	5.10	4.47
1880	5.54	5.43	4.43	4.53	3.20	4.35	5.38	5.41	5.44	5.02
1890	6.55	6.03	5.03	5.18	4.76	5.46	6.09	5.98	6.13	5.75
1900	7.42	6.71	5.54	5.42	5.01	6.36	7.26	6.82	6.95	6.40
1910	8.58	7.74	6.35	6.31	6.67	8.15	9.47	8.22	8.15	7.61
1920	9.59	9.07	7.88	7.51	8.27	9.51	10.4	9.57	9.48	8.97
1930	11.1	10.9	9.52	8.55	9.79	11.1	12.3	10.8	11.0	10.5
1940	11.5	11.4	10.1	9.33	10.2	11.5	12.1	11.0	11.1	10.9
1950	12.1	11.6	11.1	10.6	11.1	12.1	12.3	11.9	11.7	11.6
1960	13.4	12.9	13.0	12.4	13.2	14.3	14.0	13.3	12.9	13.1
1970	14.2	13.9	14.1	13.1	13.4	14.2	14.6	13.9	13.6	13.9
1980	12.6	13.0	13.6	13.2	13.2	14.5	13.3	14.2	13.7	13.5
1990	13.3	13.5	14.2	13.7	13.5	14.5	13.7	14.5	13.9	13.8
2000	13.9	14.0	15.0	14.4	14.2	14.8	14.1	15.0	14.4	14.4

Table 9: Relative Baby Boom Years of Schooling Changes

region	absolute change from 1950 to 1970	relative to national average change	percentage change from 1950	relative to national percentage change
NE	2.13	0.92	17.7	0.88
MA	2.22	0.96	19.1	0.96
SA	3.02	1.30	27.2	1.36
ESC	2.50	1.08	23.6	1.18
WSC	2.31	1.00	20.7	1.04
Mtn	2.18	0.94	18.1	0.91
Pac	2.33	1.00	18.9	0.94
WNC	1.99	0.86	16.8	0.84
ENC	1.90	0.82	16.2	0.81
USA	2.32		20.0	

Table 10: Schooling Changes over 1850 - 1950

region	absolute change from 1850 to 1950	relative to national average change	percentage change from 1850	relative to national percentage change
NE	7.40	0.90	159	0.65
MA	7.23	0.88	164	0.67
SA	9.37	1.14	545	2.22
ESC	8.57	1.04	421	1.72
WSC	9.66	1.18	654	2.67
Mtn*	9.95	1.21	474	1.93
Pac	11.04	1.34	876	3.58
WNC	8.91	1.08	301	1.23
ENC	7.31	0.89	167	0.68
USA	8.22		245	

*Change is from 1860 to 1950

Table 11: Paired Child Schooling Changes and Fertility Changes

region	schooling change 1970 to 2000	fertility change 1970 to 2000	schooling change relative to national 1970 to 2000	fertility change relative to national 1970 to 2000
NE	-0.25	-0.98	-0.78	-0.05
MA	0.17	-0.67	-0.36	0.26
SA	0.87	-1.05	0.34	-0.12
ESC	1.29	-1.12	0.76	-0.19
WSC	0.71	-0.96	0.18	-0.03
Mtn	0.58	-1.09	0.05	-0.16
Pac	-0.54	-0.80	-1.07	0.13
WNC	1.14	-1.11	0.61	-0.18
ENC	0.83	-0.99	0.30	-0.06
USA	0.53	-0.93		

Table 12: Average Years of Parental Schooling: By Census Region

year	NE	MA	SA	ESC	WSC	Mtn	Pac	WNC	ENC	USA
1850	3.88	2.99	0.74	0.52	0.41	0.81	0.96	0.72	2.46	1.97
1860	4.39	3.64	1.12	0.98	0.68	1.67	1.41	1.47	2.85	2.40
1870	4.65	4.38	1.85	2.02	1.39	2.67	1.43	3.05	4.30	3.38
1880	5.09	5.10	2.20	3.16	2.00	3.12	4.67	4.00	5.04	4.05
1890	5.14	5.14	3.10	3.37	2.81	3.62	4.99	4.72	5.10	4.40
1900	5.53	5.43	4.43	4.52	3.11	4.45	5.48	5.26	5.44	4.97
1910	6.54	6.03	5.03	5.16	4.69	5.38	6.15	5.91	6.13	5.72
1920	7.40	6.71	5.54	5.41	4.90	6.30	7.32	6.77	6.95	6.40
1930	8.56	7.74	6.37	6.31	6.71	8.11	9.56	8.21	8.14	7.67
1940	9.58	9.09	7.93	7.51	8.29	9.45	10.3	9.56	9.47	8.99
1950	11.1	11.0	9.60	8.56	9.82	11.1	12.3	10.8	11.0	10.6
1960	11.6	11.4	10.3	9.34	10.2	11.6	12.1	11.0	11.1	11.0
1970	12.1	11.6	11.2	10.6	11.1	12.1	12.3	11.9	11.7	11.6
1980	13.5	12.9	13.1	12.4	13.3	14.3	14.0	13.3	12.9	13.2
1990	14.2	13.9	14.2	13.1	13.5	14.3	14.6	13.9	13.6	14.0
2000	12.7	13.0	13.6	13.2	13.2	14.5	13.3	14.2	13.7	13.5

Table 13: Paired Parental Schooling Changes and Fertility Changes

region	schooling change 1970 to 2000	fertility change 1970 to 2000	schooling change relative to national 1970 to 2000	fertility change relative to national 1970 to 2000
NE	0.58	-0.99	0.59	1.06
MA	1.39	-0.67	1.42	0.72
SA	2.41	-1.04	2.46	1.12
ESC	2.58	-1.12	2.63	1.20
WSC	2.18	-0.97	2.22	1.04
Mtn	2.39	-1.09	2.44	1.17
Pac	1.04	-0.80	1.06	0.86
WNC	2.36	-1.12	2.41	1.20
ENC	0.55	-1.00	0.56	1.08
USA	0.98	-0.93		

Table 14: Probability of Surviving to Age 1: By Census Region

year	NE	MA	SA	ESC	WSC	Mtn	Pac	WNC	ENC	USA
1850	0.730	0.732	0.758	0.818	0.805	0.598	0.808	0.814	0.791	0.767
1860	0.751	0.769	0.780	0.831	0.808	0.692	0.847	0.838	0.819	0.796
1870	0.777	0.775	0.813	0.858	0.820	0.791	0.843	0.853	0.833	0.815
1880	0.792	0.795	0.820	0.862	0.835	0.823	0.863	0.862	0.842	0.829
1890	0.797	0.806	0.843	0.879	0.857	0.856	0.877	0.885	0.859	0.848
1900	0.819	0.848	0.891	0.908	0.904	0.907	0.914	0.919	0.891	0.885
1910	0.845	0.853	0.906	0.920	0.930	0.914	0.916	0.926	0.892	0.895
1920	0.890	0.893	0.900	0.920	0.925	0.909	0.915	0.926	0.905	0.907
1930	0.931	0.929	0.917	0.929	0.929	0.913	0.939	0.943	0.936	0.931
1940	0.952	0.951	0.933	0.937	0.932	0.932	0.954	0.956	0.954	0.946
1950	0.976	0.975	0.967	0.963	0.964	0.966	0.974	0.974	0.973	0.971
1960	0.977	0.976	0.970	0.968	0.972	0.973	0.976	0.977	0.976	0.974
1970	0.982	0.980	0.978	0.977	0.979	0.980	0.982	0.981	0.980	0.980
1980	0.989	0.987	0.986	0.986	0.987	0.989	0.989	0.989	0.987	0.987
1990	0.993	0.990	0.989	0.989	0.991	0.991	0.992	0.991	0.990	0.991
2000	0.994	0.993	0.992	0.991	0.993	0.993	0.994	0.993	0.992	0.993

Table 15: Probability of Surviving to Age 15: By Census Region

year	NE	MA	SA	ESC	WSC	Mtn	Pac	WNC	ENC	USA
1850	0.569	0.565	0.616	0.666	0.647	0.450	0.667	0.652	0.643	0.612
1860	0.616	0.617	0.646	0.687	0.666	0.572	0.711	0.699	0.686	0.656
1870	0.648	0.630	0.695	0.739	0.701	0.663	0.714	0.733	0.715	0.690
1880	0.666	0.658	0.698	0.746	0.722	0.688	0.762	0.743	0.727	0.707
1890	0.685	0.685	0.742	0.778	0.764	0.744	0.787	0.798	0.760	0.745
1900	0.727	0.749	0.804	0.816	0.796	0.817	0.841	0.847	0.813	0.797
1910	0.773	0.772	0.834	0.846	0.844	0.841	0.859	0.865	0.827	0.823
1920	0.832	0.832	0.844	0.863	0.866	0.847	0.860	0.878	0.848	0.850
1930	0.900	0.896	0.877	0.887	0.887	0.864	0.903	0.910	0.902	0.895
1940	0.937	0.934	0.911	0.912	0.906	0.905	0.935	0.937	0.936	0.926
1950	0.967	0.965	0.955	0.950	0.950	0.952	0.964	0.963	0.963	0.960
1960	0.970	0.968	0.960	0.958	0.962	0.962	0.968	0.969	0.968	0.966
1970	0.976	0.974	0.970	0.968	0.970	0.972	0.976	0.975	0.973	0.973
1980	0.985	0.983	0.980	0.980	0.981	0.983	0.984	0.983	0.982	0.982
1990	0.989	0.986	0.985	0.985	0.986	0.987	0.988	0.987	0.986	0.986
2000	0.992	0.991	0.988	0.986	0.989	0.990	0.991	0.990	0.989	0.990

Table 16: Probability of Surviving to Age 35: By Census Region

year	NE	MA	SA	ESC	WSC	Mtn	Pac	WNC	ENC	USA
1850	0.452	0.445	0.441	0.470	0.441	0.316	0.514	0.482	0.503	0.461
1860	0.496	0.503	0.474	0.494	0.475	0.433	0.577	0.557	0.558	0.511
1870	0.531	0.513	0.535	0.560	0.531	0.530	0.571	0.603	0.591	0.553
1880	0.555	0.544	0.541	0.570	0.566	0.547	0.626	0.620	0.607	0.574
1890	0.582	0.577	0.593	0.615	0.626	0.611	0.665	0.692	0.650	0.622
1900	0.635	0.643	0.677	0.671	0.680	0.705	0.731	0.756	0.716	0.688
1910	0.697	0.688	0.721	0.721	0.749	0.740	0.769	0.785	0.742	0.730
1920	0.753	0.743	0.734	0.751	0.781	0.741	0.765	0.801	0.757	0.758
1930	0.847	0.836	0.787	0.793	0.814	0.779	0.839	0.854	0.840	0.826
1940	0.904	0.896	0.849	0.848	0.851	0.852	0.891	0.901	0.896	0.881
1950	0.947	0.941	0.919	0.911	0.916	0.918	0.935	0.938	0.936	0.931
1960	0.952	0.947	0.931	0.928	0.935	0.933	0.946	0.946	0.946	0.942
1970	0.955	0.948	0.938	0.935	0.940	0.940	0.949	0.949	0.947	0.945
1980	0.966	0.960	0.954	0.954	0.953	0.956	0.959	0.962	0.960	0.958
1990	0.973	0.963	0.959	0.958	0.960	0.964	0.965	0.968	0.965	0.963
2000	0.979	0.974	0.967	0.962	0.967	0.969	0.976	0.972	0.971	0.971

Table 17: Average Population Density: By Region

year	NE	MA	SA	ESC	WSC	Mtn	Pac	WNC	ENC	USA
1850	0.598	2.583	0.056	0.033	0.093	0.002	0.008	0.034	0.051	0.759
1860	0.897	5.007	0.073	0.038	0.108	0.004	0.190	0.047	0.065	1.322
1870	1.533	5.868	0.117	0.045	0.111	0.006	0.838	0.079	0.089	1.552
1880	2.645	8.154	0.149	0.053	0.093	0.042	1.242	0.071	0.127	2.018
1890	1.730	6.092	0.199	0.063	0.091	0.179	1.121	0.109	0.233	1.509
1900	1.591	6.766	0.243	0.077	0.094	0.197	1.008	0.143	0.376	1.676
1910	1.961	9.904	0.290	0.090	0.102	0.315	1.007	0.193	0.567	2.465
1920	2.147	15.927	0.405	0.102	0.133	0.360	1.179	0.235	0.854	3.848
1930	2.227	13.607	0.461	0.139	0.163	0.411	1.368	0.307	1.283	3.544
1940	2.131	13.855	0.649	0.154	0.185	0.461	1.186	0.335	1.296	3.538
1950	2.154	13.542	0.828	0.207	0.263	0.555	1.347	0.425	1.494	3.481
1960	1.773	11.028	0.735	0.279	0.373	0.593	1.261	0.432	1.694	2.918
1970	1.633	9.842	0.775	0.324	0.476	0.434	1.263	0.501	1.746	2.646
1980	1.388	7.936	0.939	0.324	0.561	0.287	1.202	0.672	1.535	2.111
1990	1.396	8.115	0.954	0.331	0.648	0.291	1.328	0.679	1.466	2.077
2000	1.448	8.714	0.995	0.353	0.769	0.353	1.419	0.682	1.494	2.127

Table 18: Children Ever Born (35-44)

variable	children	children	children	children	children	children
mom's schooling	-0.1747^{***}	-0.1600^{***}	-0.1370^{***}	-0.1251^{***}	-0.0571	-0.0736^{*}
	(0.0222)	(0.0205)	(0.0214)	(0.0196)	(0.0512)	(0.0374)
ln(density)	-0.1835^{***}	-0.1035^{**}	-0.2041^{***}	-0.1571^{***}	-0.2024^{***}	-0.1578^{***}
	(0.0384)	(0.0469)	(0.0396)	(0.0427)	(0.0383)	(0.0414)
ln(density|region)	–	-0.2219^{***}	–	-0.4212^{***}	–	-0.4057^{***}
		(0.0677)		(0.0860)		(0.0802)
ln(survive to 35)	-1.6367^{***}	-1.4434^{***}	-2.2156^{***}	-1.2553^{***}	-1.7650^{***}	-0.9983*
	(0.4046)	(0.3961)	(0.3862)	(0.4420)	(0.4991)	(0.5341)
type	*OLS*	*OLS*	*OLS*	*OLS*	*OLS*	*OLS*
cluster	*state*	*state*	*state*	*state*	*state*	*state*
region effects	*no*	*no*	*yes*	*yes*	*yes*	*yes*
year trend	*no*	*no*	*no*	*no*	*yes*	*yes*
N	772	772	772	772	772	772
$\overline{R}^2$	.7667	.7893	.7948	.8212	.7989	.8229

Table 19: Children Ever Born (35-44) Before 1960

variable	children	children	children	children	children	children
mom's schooling	-0.3699^{***}	-0.3326^{***}	-0.2986^{***}	-0.2774^{***}	-0.1278^{**}	-0.1403^{**}
	(0.0425)	(0.0434)	(0.0372)	(0.0335)	(0.0592)	(0.0545)
ln(density)	-0.1646^{***}	-0.1088^{**}	-0.1998^{***}	-0.1630^{***}	-0.1603^{***}	-0.1453^{***}
	(0.0454)	(0.0482)	(0.0448)	(0.0502)	(0.0417)	(0.0447)
ln(density|region)	–	-0.1637^{**}	–	-0.3248^{**}	–	-0.1818^{*}
		(0.0719)		(0.1290)		(0.1039)
ln(survive to 35)	−0.4113	−0.4515	-1.2429^{***}	−0.5229	0.7518	0.8386
	(0.4705)	(0.4339)	(0.4577)	(0.5591)	(0.8068)	(0.7564)
type	*OLS*	*OLS*	*OLS*	*OLS*	*OLS*	*OLS*
cluster	*state*	*state*	*state*	*state*	*state*	*state*
region effects	*no*	*no*	*yes*	*yes*	*yes*	*yes*
year trend	*no*	*no*	*no*	*no*	*yes*	*yes*
N	518	518	518	518	518	518
$\overline{R}^2$	.7682	.7823	.7999	.8163	.8330	.8375

Table 20: Children Ever Born (35-44) After 1950

variable	children	children	children	children	children	children
mom's schooling	-0.1181^{***}	-0.1212^{***}	-0.1322^{***}	-0.1292^{***}	-0.0628^{*}	-0.0624^{*}
	(0.0396)	(0.0377)	(0.0465)	(0.0463)	(0.0317)	(0.0315)
ln(density)	-0.0940^{***}	-0.0872^{**}	-0.0590	-0.0587	-0.0673^{***}	-0.0670^{***}
	(0.0284)	(0.0360)	(0.0372)	(0.0372)	(0.0247)	(0.0249)
ln(density|region)	–	-0.0243	–	-0.2088^{**}	–	-0.1189
		(0.0505)		(0.0615)		(0.0762)
ln(survive to 35)	-8.1968	-7.7910	-9.6855^{*}	-9.7760^{*}	0.9536	0.7005
	(5.0183)	(4.9272)	(5.7255)	(5.7105)	(5.1603)	(5.1940)
type	*OLS*	*OLS*	*OLS*	*OLS*	*OLS*	*OLS*
cluster	*state*	*state*	*state*	*state*	*state*	*state*
region effects	*no*	*no*	*yes*	*yes*	*yes*	*yes*
year trend	*no*	*no*	*no*	*no*	*yes*	*yes*
N	254	254	254	254	254	254
$\overline{R}^2$	.4217	.4227	.5013	.5062	.5655	.5670

Table 21: Schooling of Children Ever Born (35-44)

variable	schooling	schooling	schooling	schooling	schooling	schooling
mom's schooling	0.6827***	0.6771***	0.6500***	0.6386***	0.4483***	0.4626***
	(0.0272)	(0.0273)	(0.0241)	(0.0238)	(0.0322)	(0.0287)
ln(density)	0.0586*	0.0283	0.1415***	0.0967***	0.1374***	0.0990***
	(0.0312)	(0.0394)	(0.0281)	(0.0262)	(0.0238)	(0.0233)
ln(density|region)	–	0.0840**	–	0.4015***	–	0.3485***
		(0.0369)		(0.0542)		(0.0568)
ln(survive to 35)	4.5592***	4.4860***	4.8030***	3.8876***	3.6666***	3.0080***
	(0.4847)	(0.5129)	(0.4455)	(0.5322)	(0.4168)	(0.4389)
type	*OLS*	*OLS*	*OLS*	*OLS*	*OLS*	*OLS*
cluster	*state*	*state*	*state*	*state*	*state*	*state*
region effects	*no*	*no*	*yes*	*yes*	*yes*	*yes*
year trend	*no*	*no*	*no*	*no*	*yes*	*yes*
N	772	772	772	772	772	772
$\overline{R}^2$	.9550	.9554	.9573	.9606	.9609	.9633

Table 22: Schooling of Children Ever Born (35-44) Before 1960

variable	schooling	schooling	schooling	schooling	schooling	schooling
mom's schooling	0.7579***	0.7423***	0.7029***	0.6795***	0.4657***	0.4756***
	(0.0450)	(0.0438)	(0.0432)	(0.0400)	(0.0357)	(0.0376)
ln(density)	0.0722*	0.0490	0.1735***	0.1331***	0.1187***	0.1068***
	(0.0422)	(0.0494)	(0.0382)	(0.0363)	(0.0292)	(0.0289)
ln(density|region)	–	0.0681*	–	0.3567**	–	0.1439**
		(0.0393)		(0.0527)		(0.0624)
ln(survive to 35)	3.5848***	3.6015***	3.9462***	3.1554***	1.2264**	1.1291**
	(0.4705)	(0.5522)	(0.5037)	(0.5954)	(0.5579)	(0.4915)
type	*OLS*	*OLS*	*OLS*	*OLS*	*OLS*	*OLS*
cluster	*state*	*state*	*state*	*state*	*state*	*state*
region effects	*no*	*no*	*yes*	*yes*	*yes*	*yes*
year trend	*no*	*no*	*no*	*no*	*yes*	*yes*
N	518	518	518	518	518	518
$\overline{R}^2$	.9298	.9303	.9350	.9397	.9502	.9508

Table 23: Schooling of Children Ever Born (35-44) After 1950

variable	schooling	schooling	schooling	schooling	schooling	schooling
mom's schooling	0.3054***	0.3032***	0.1782***	0.1683***	0.1724***	0.1701***
	(0.0618)	(0.0614)	(0.0668)	(0.0660)	(0.0633)	(0.0626)
ln(density)	−0.0991**	−0.0943*	−0.0438	−0.0447	−0.0431	−0.0450
	(0.0384)	(0.0506)	(0.0606)	(0.0604)	(0.0634)	(0.0618)
ln(density|region)	–	−0.0176	–	0.6828***	–	0.6852***
		(0.0685)		(0.2203)		(0.2274)
ln(survive to 35)	3.4960	3.7895	12.6567*	12.9528*	11.7704	13.2286
	(6.4712)	(6.2774)	(6.7360)	(6.6937)	(9.4809)	(9.2008)
type	*OLS*	*OLS*	*OLS*	*OLS*	*OLS*	*OLS*
cluster	*state*	*state*	*state*	*state*	*state*	*state*
region effects	*no*	*no*	*yes*	*yes*	*yes*	*yes*
year trend	*no*	*no*	*no*	*no*	*yes*	*yes*
N	254	254	254	254	254	254
$\overline{R}^2$	.3504	.3506	.4205	.4392	.4207	.4392

Table 24: Proportion of Baby Boom and Post Baby Boom Changes Explained

variable	Δ fertility Baby Boom	Δ schooling Baby Boom	Δ fertility Post Baby Boom	Δ schooling Post Baby Boom
mom's schooling	-0.1158	0.2400	-0.2050	0.4250
ln(density)	0.0206	-0.0176	-0.0193	-0.0165
ln(density|region)	0.0024	-0.0094	-0.0086	0.0330
ln(survive to 35)	-0.0900	0.1541	-0.1534	0.2627
overall change	0.7944	2.1934	-1.0453	0.6334
predicted change	-0.1828	0.3671	-0.3863	0.7042
share of overall change		0.1674	0.3696	1.1118

Table 25: Regressions of Actual and Model Solutions for Children Ever Born, Years of Schooling & Income

United States

variable	fertility	schooling years	log of income	years of schooling young
b	0.9737	0.9924	0.9903	0.9663
	(0.0130)	(0.0028)	(0.0131)	(0.0041)
a	0.0439	0.0650	0.0959	-0.0827
	(0.0428)	(0.0195)	(0.1212)	(0.0371)
N	90	201	21	201
$\overline{R}^2$	.9843	.9984	.9965	.9964
F	4.37	5.56	0.43	185.14
$prob > F$	.0155	.0045	.6550	.0000

FIGURES

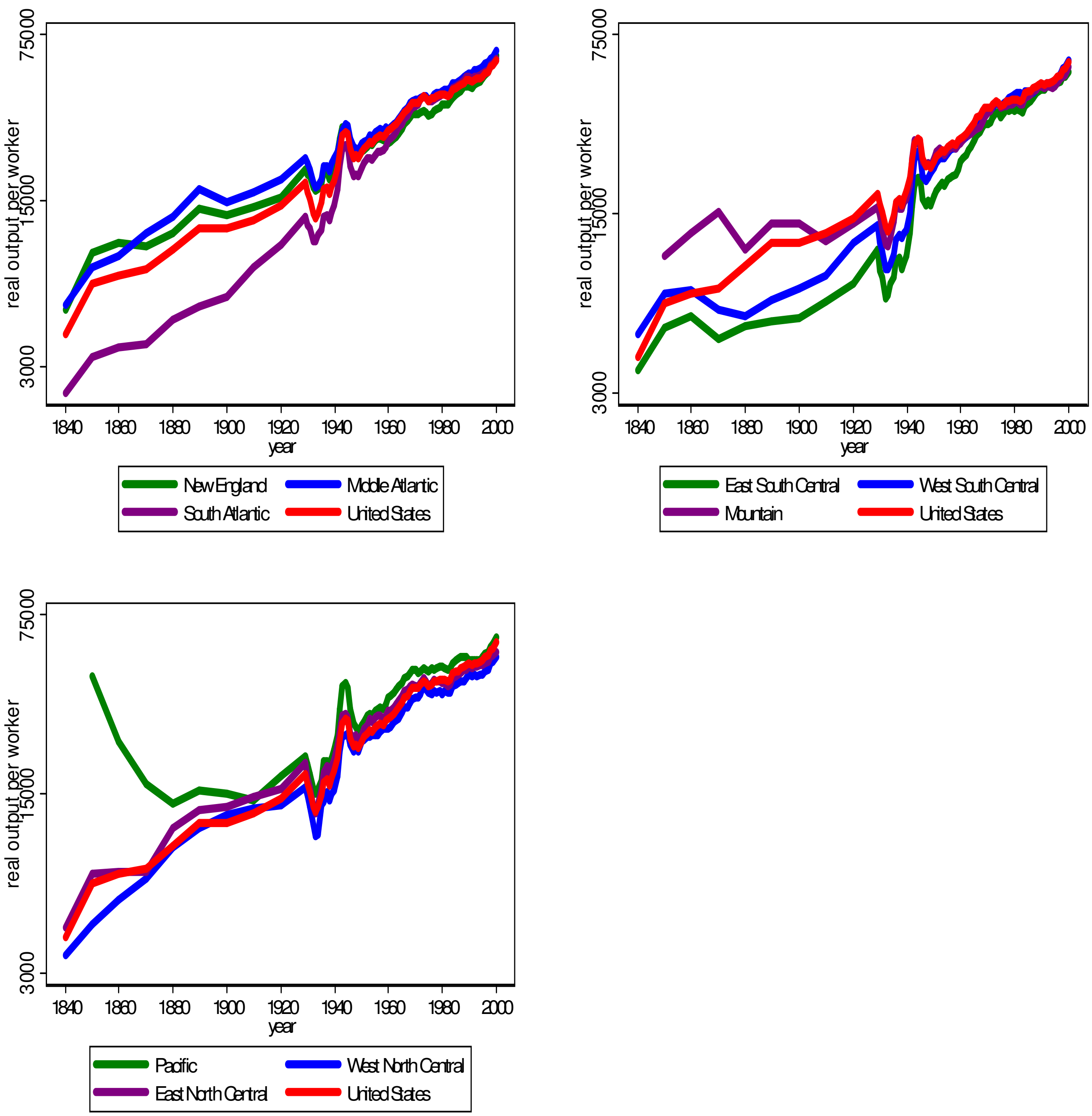

Figure 1: Real Output per Worker

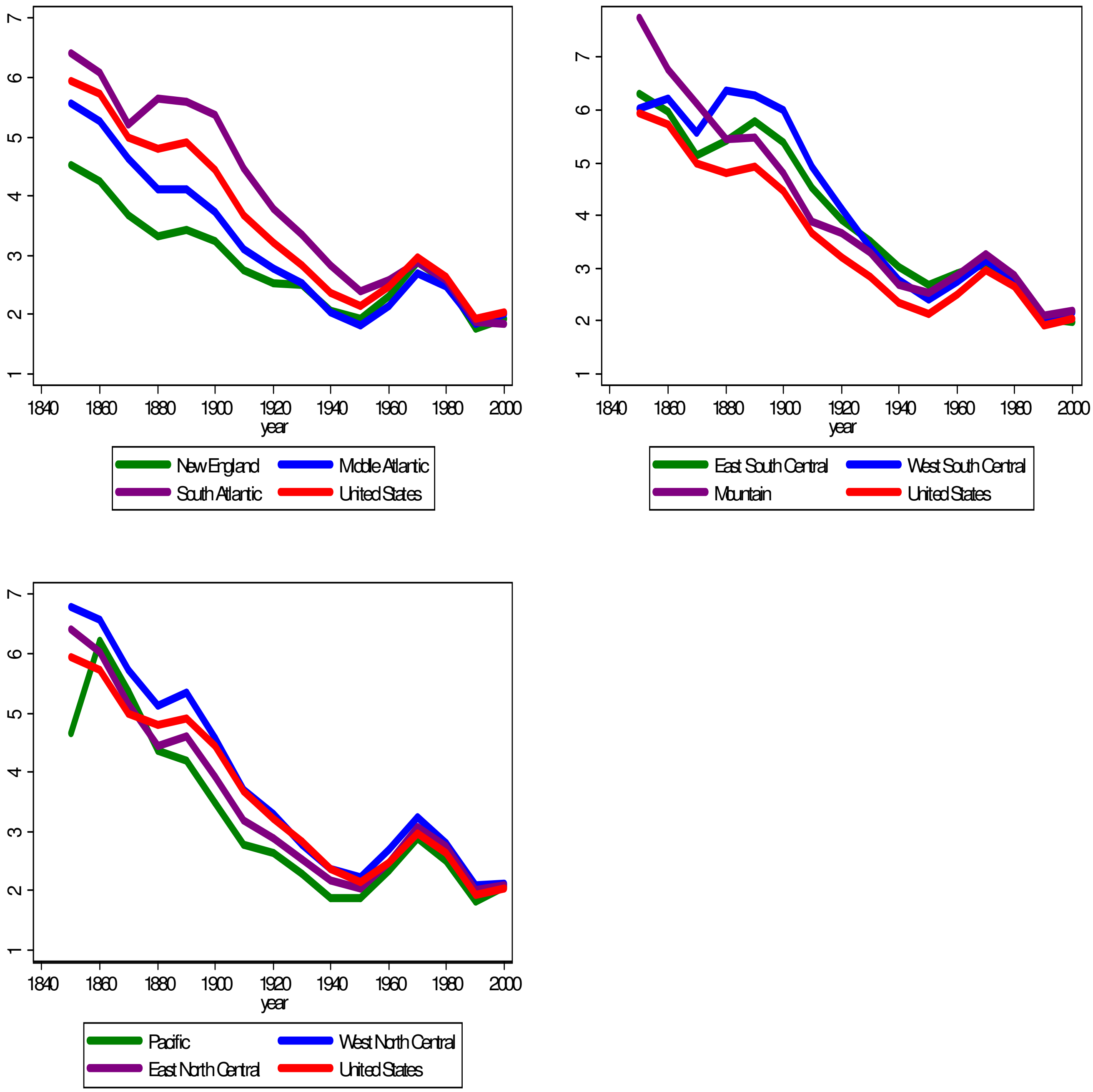

Figure 2: Children Ever Born

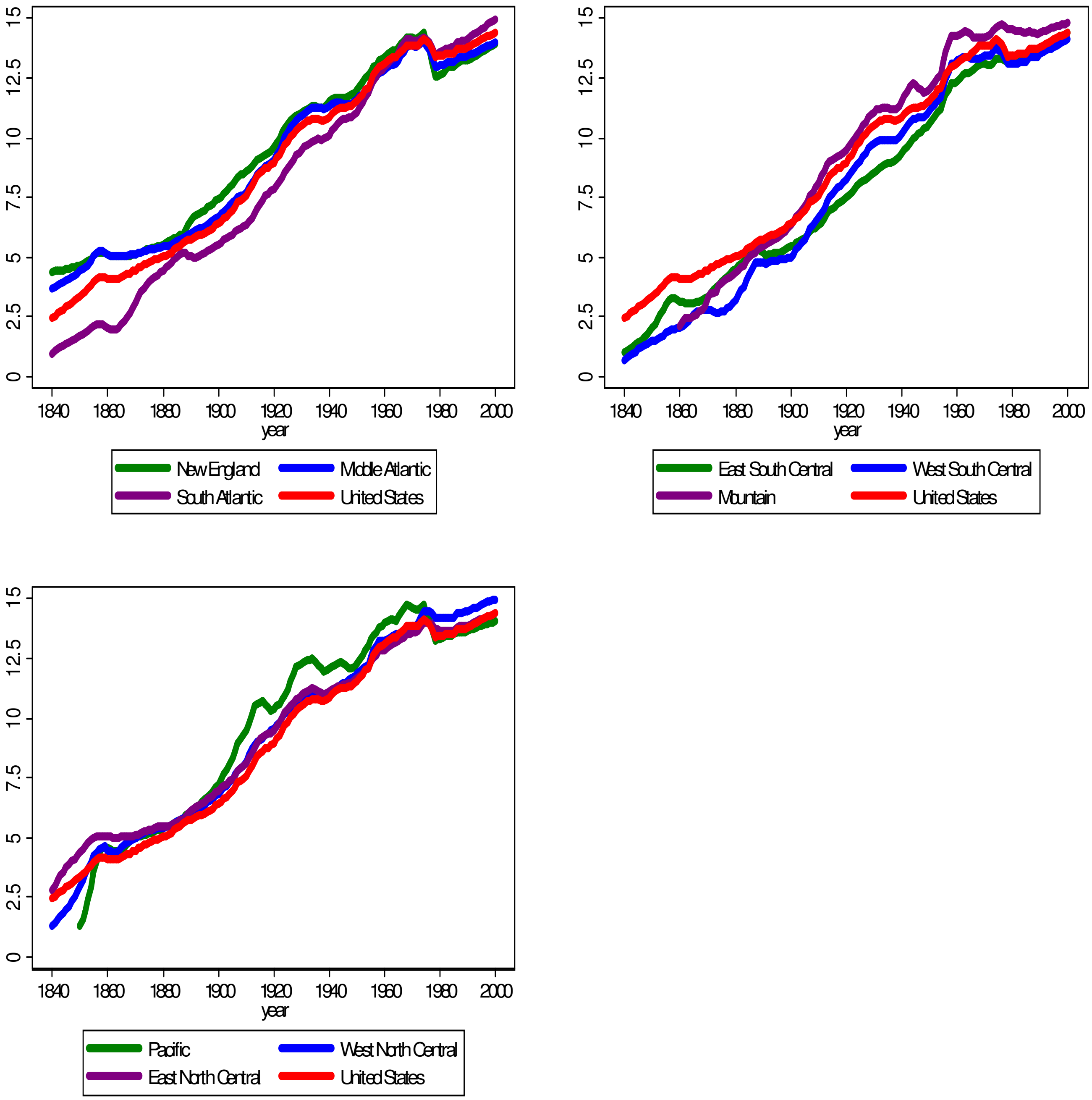

Figure 3: Child Schooling Attainment

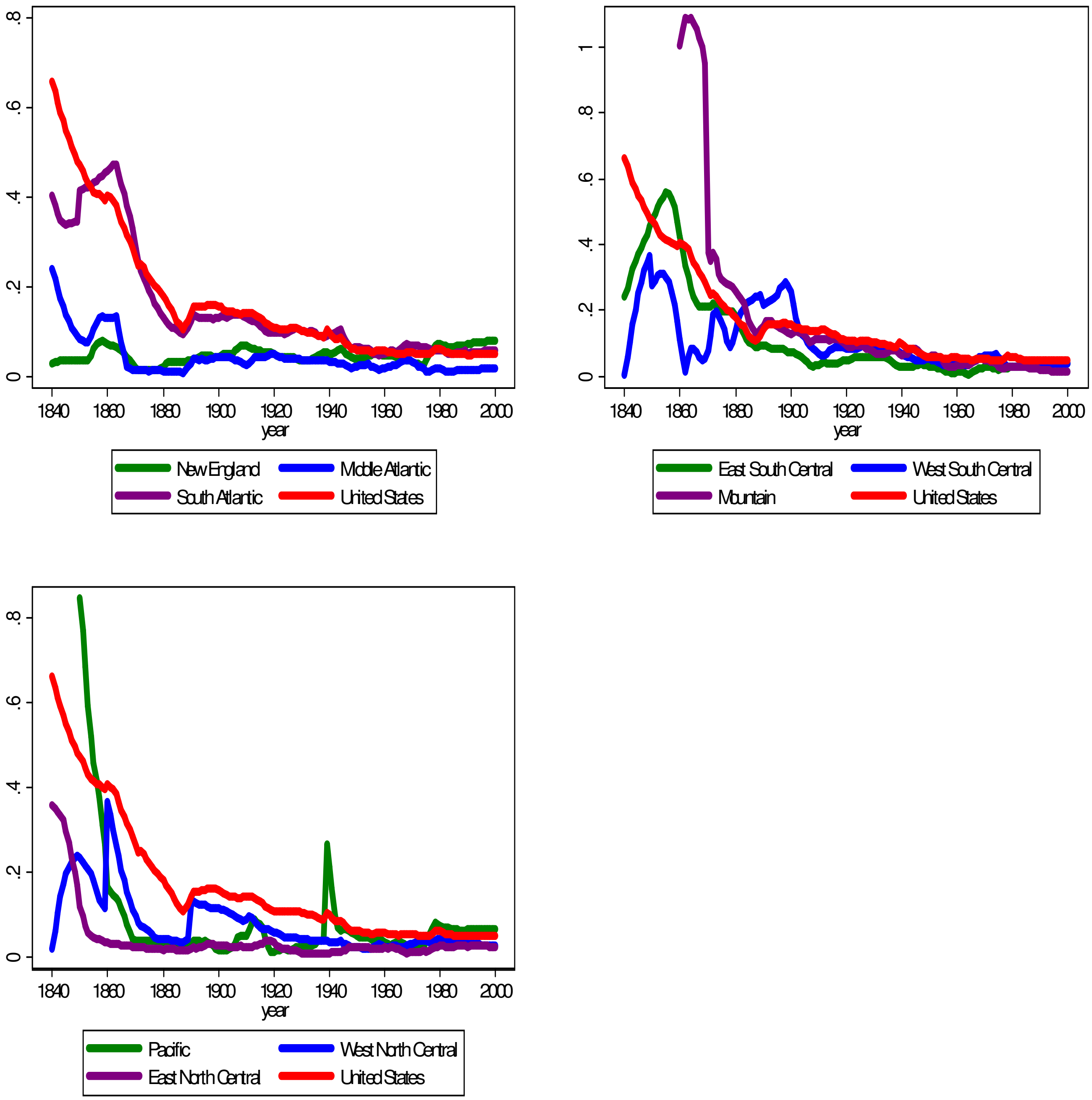

Figure 4: Coefficient of Variation of Child Schooling Attainment

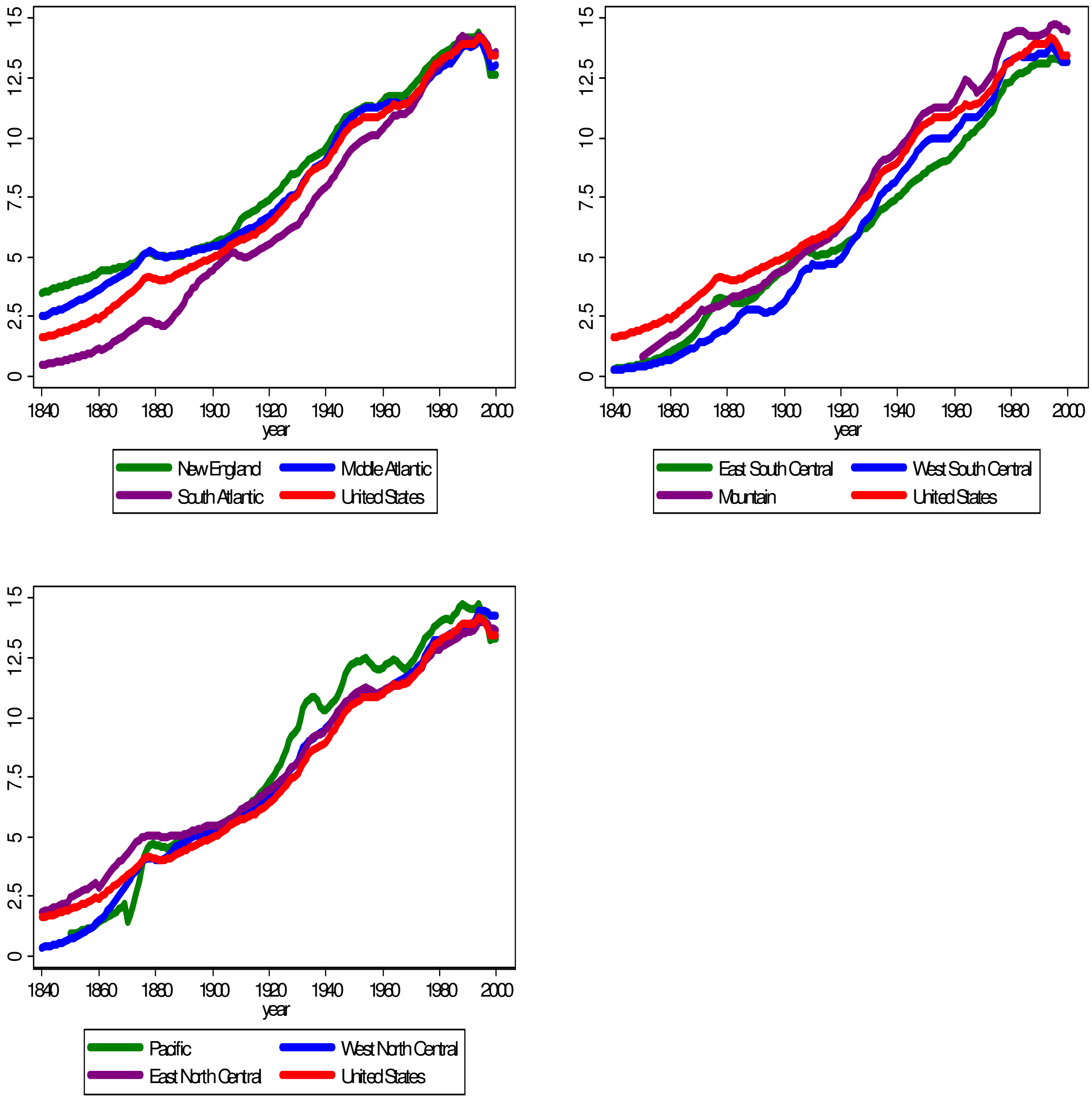

Figure 5: Parental Schooling Attainment

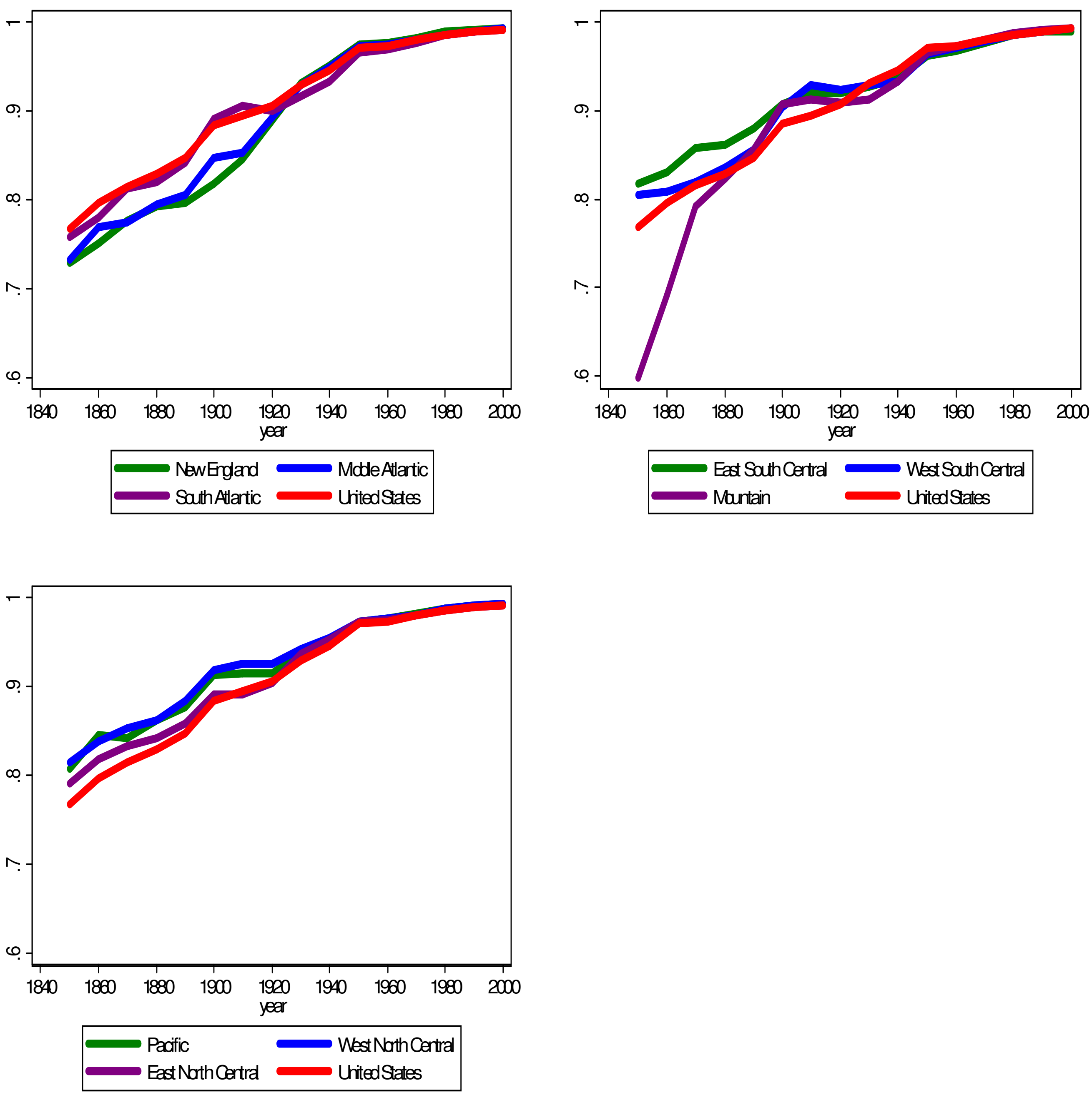

Figure 6: Probability of Surviving to Age 1

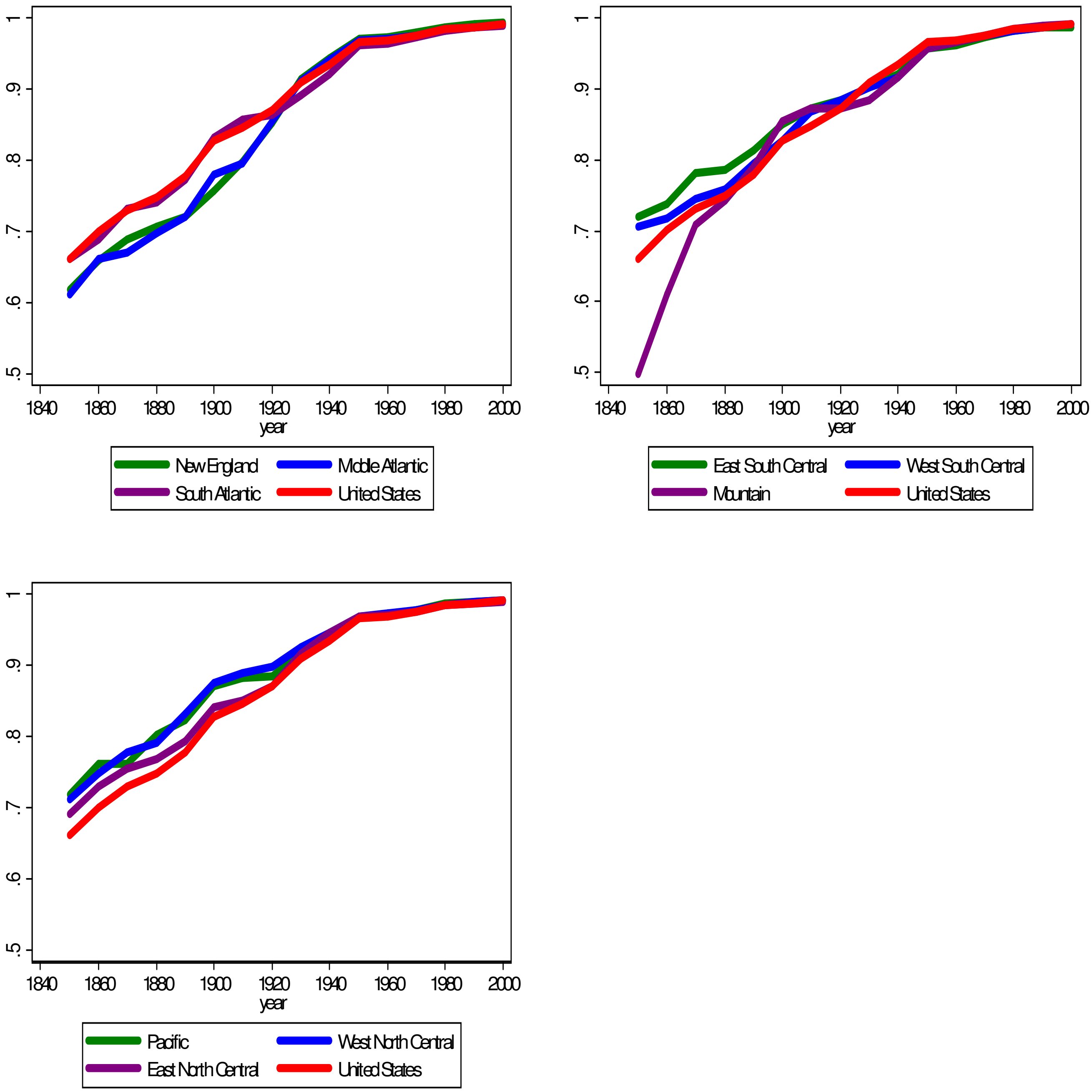

Figure 7: Probability of Surviving to Age 5

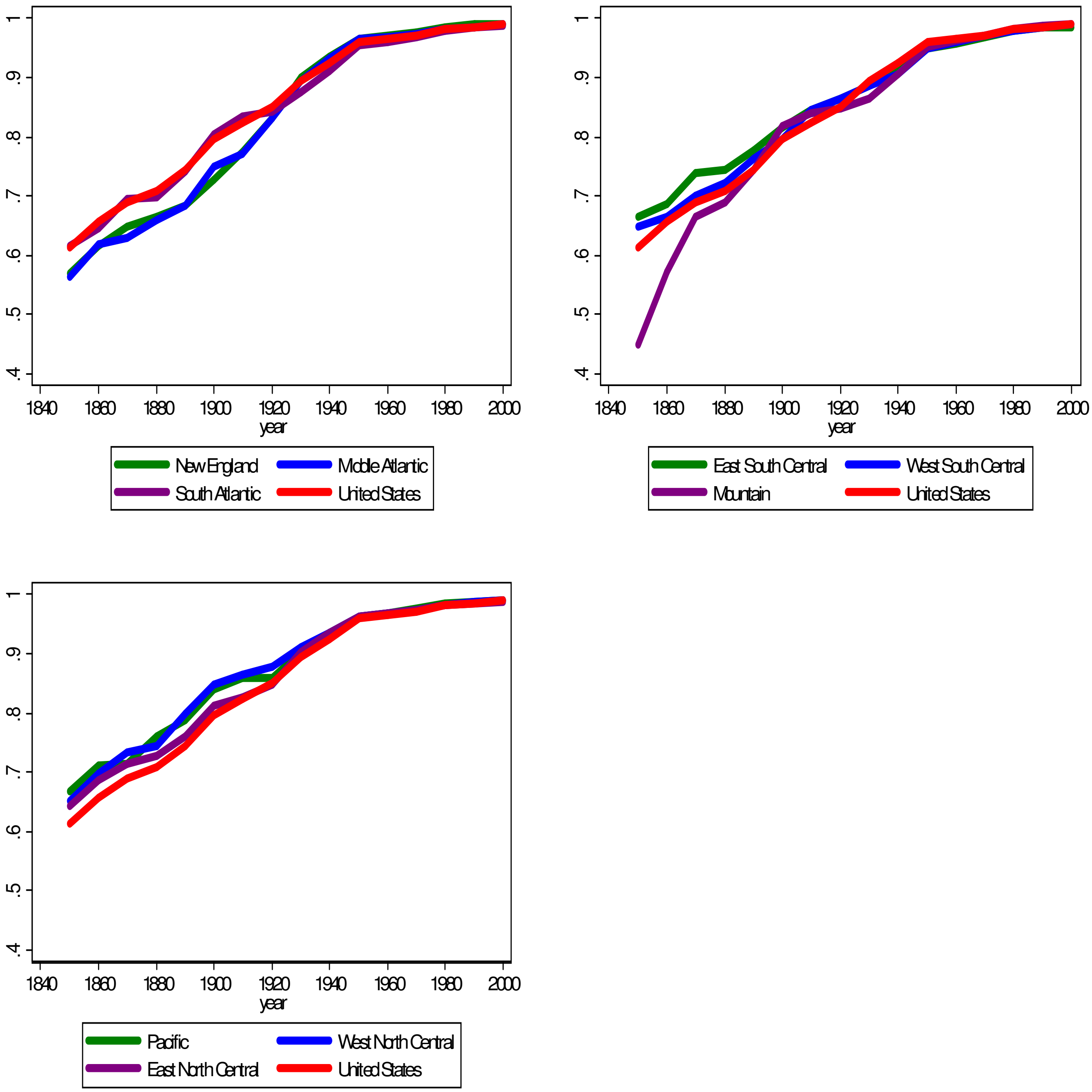

Figure 8: Probability of Surviving to Age 15

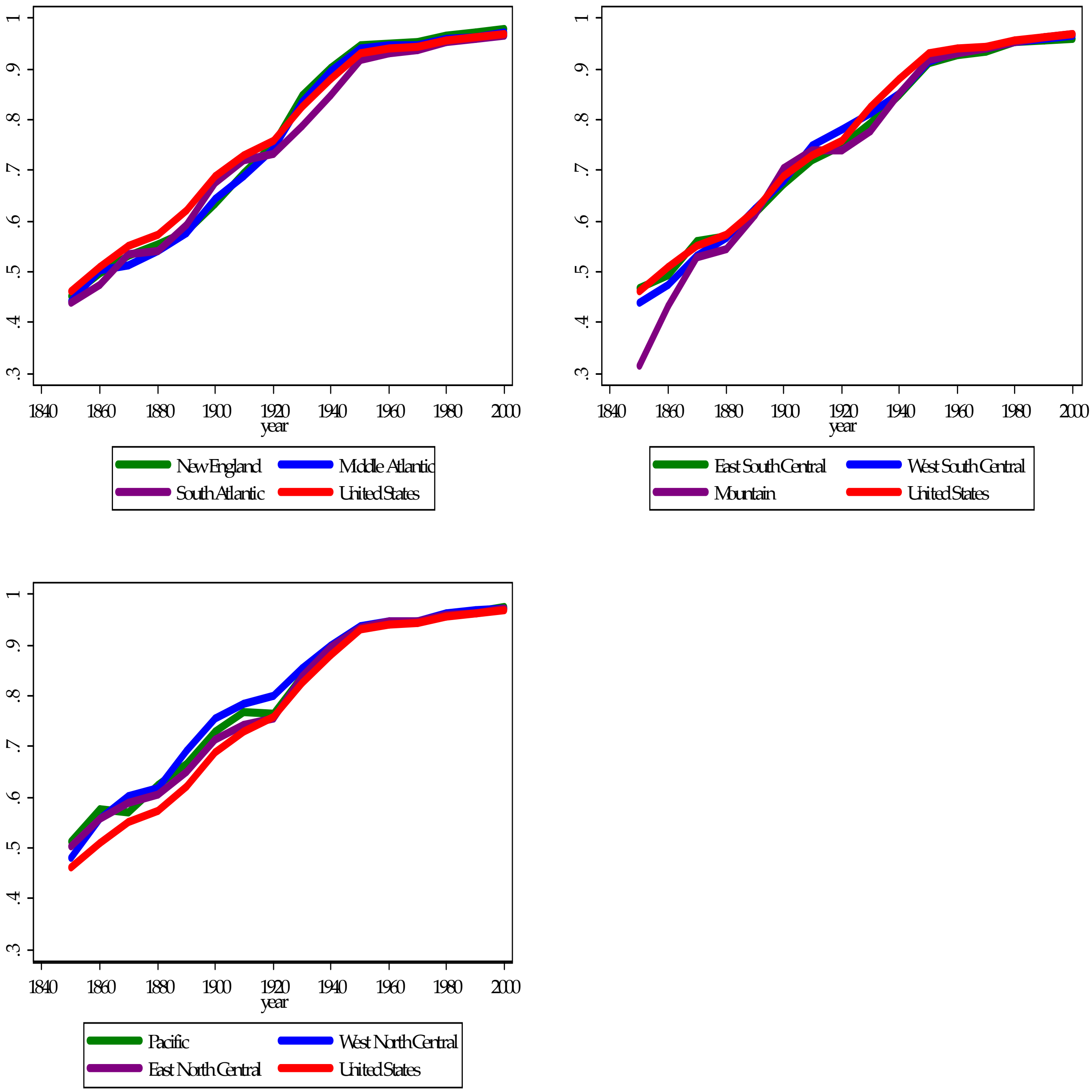

Figure 9: Probability of Surviving to Age 35

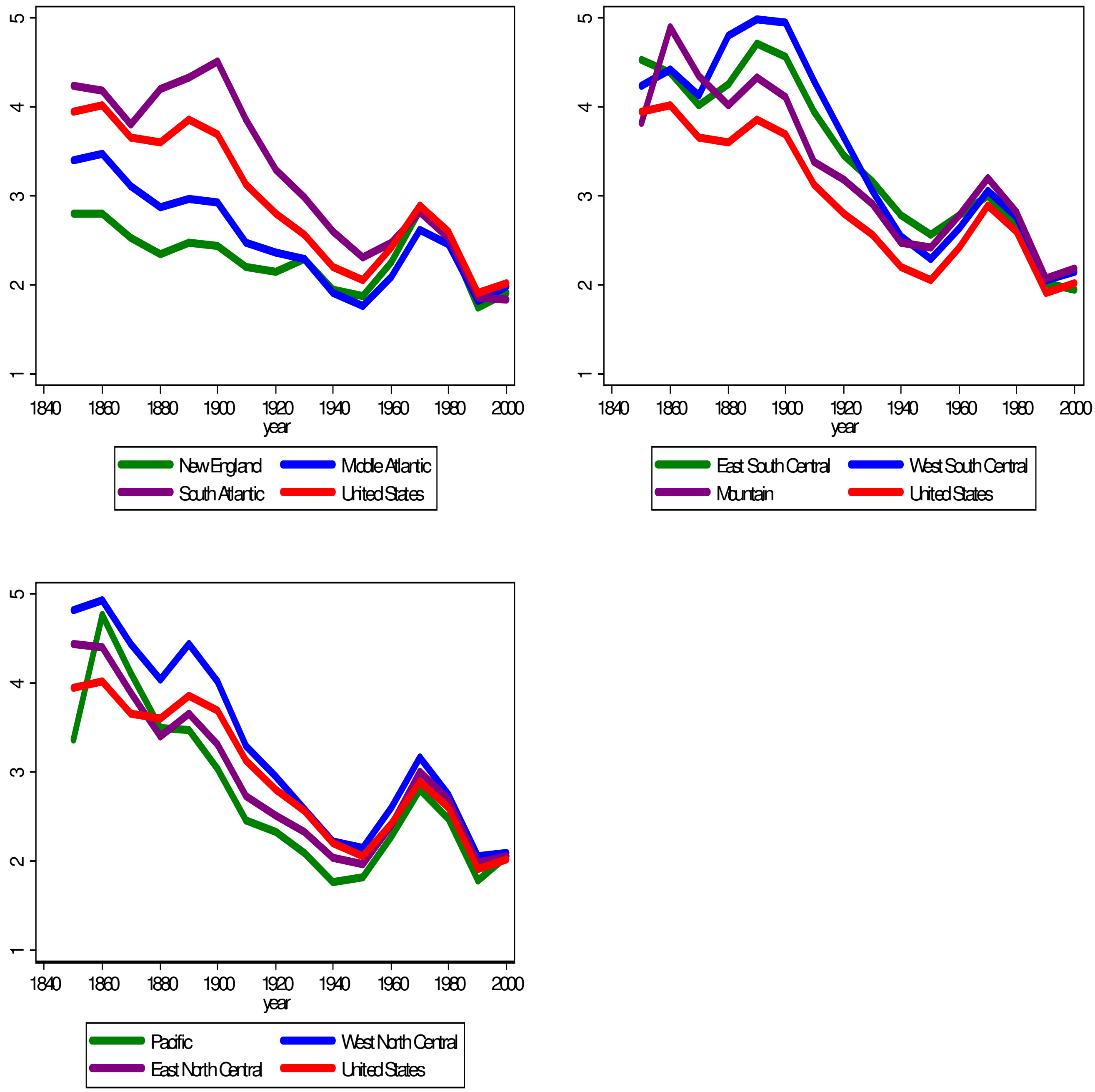

Figure 10: Children Surviving to Age 5

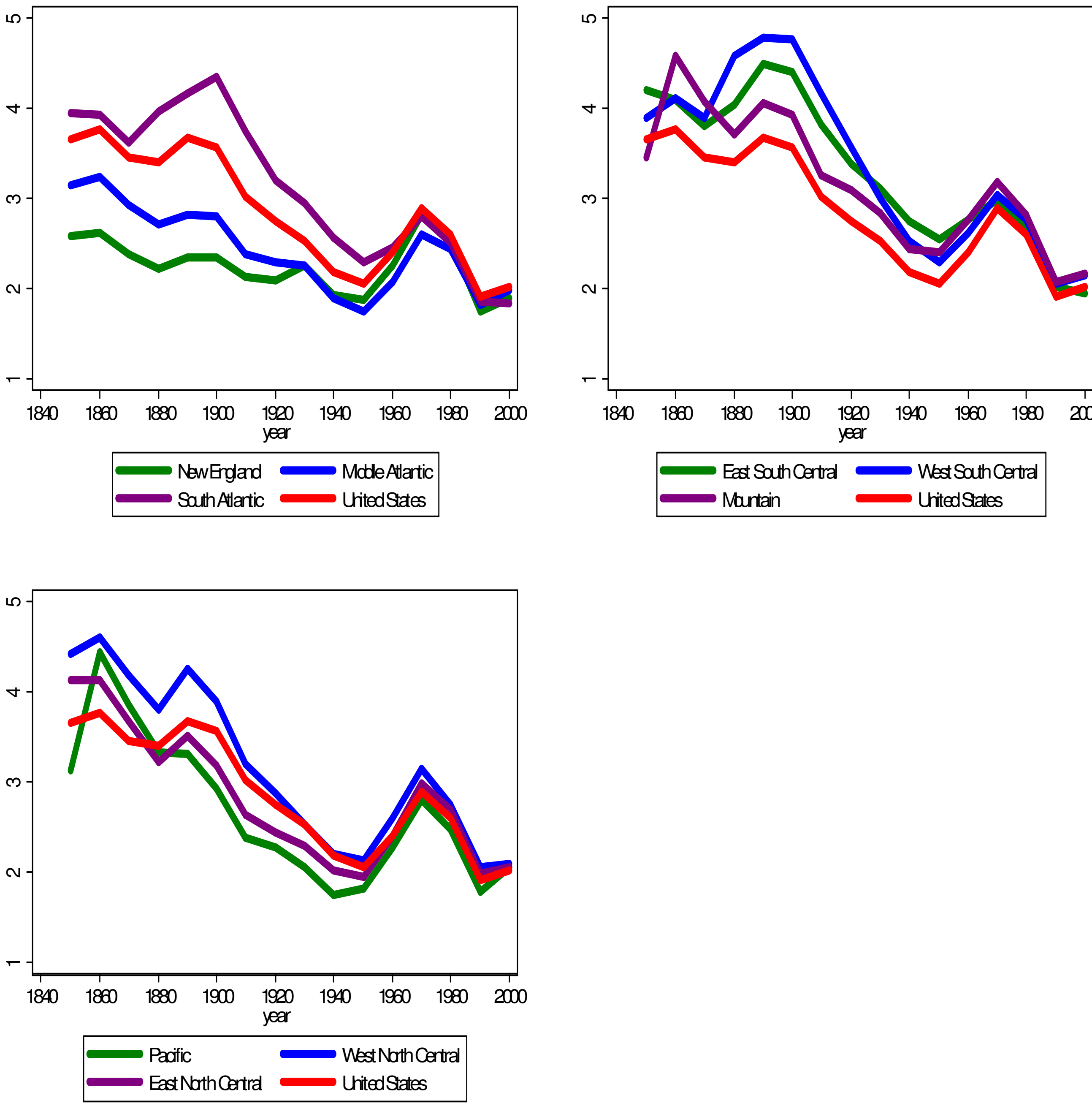

Figure 11: Children Surviving to Age 15

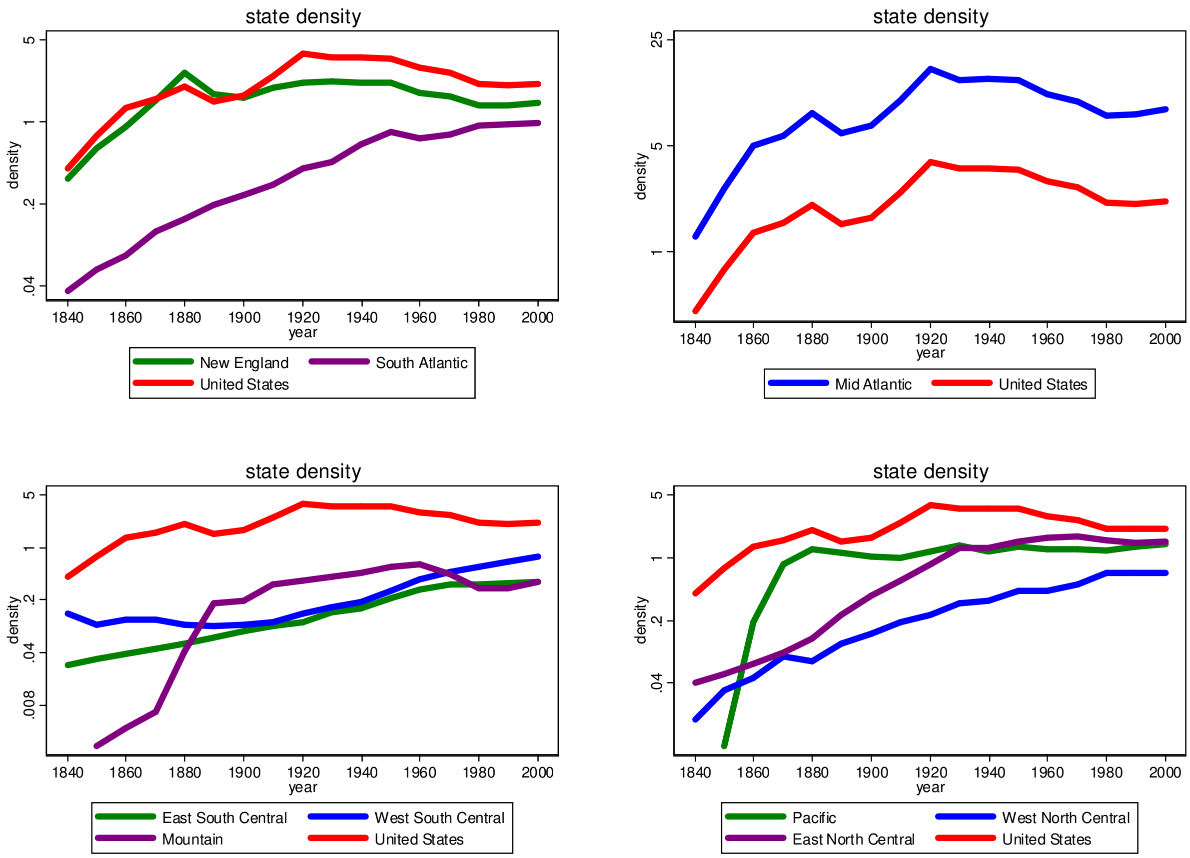

Figure 12: Average Population Density

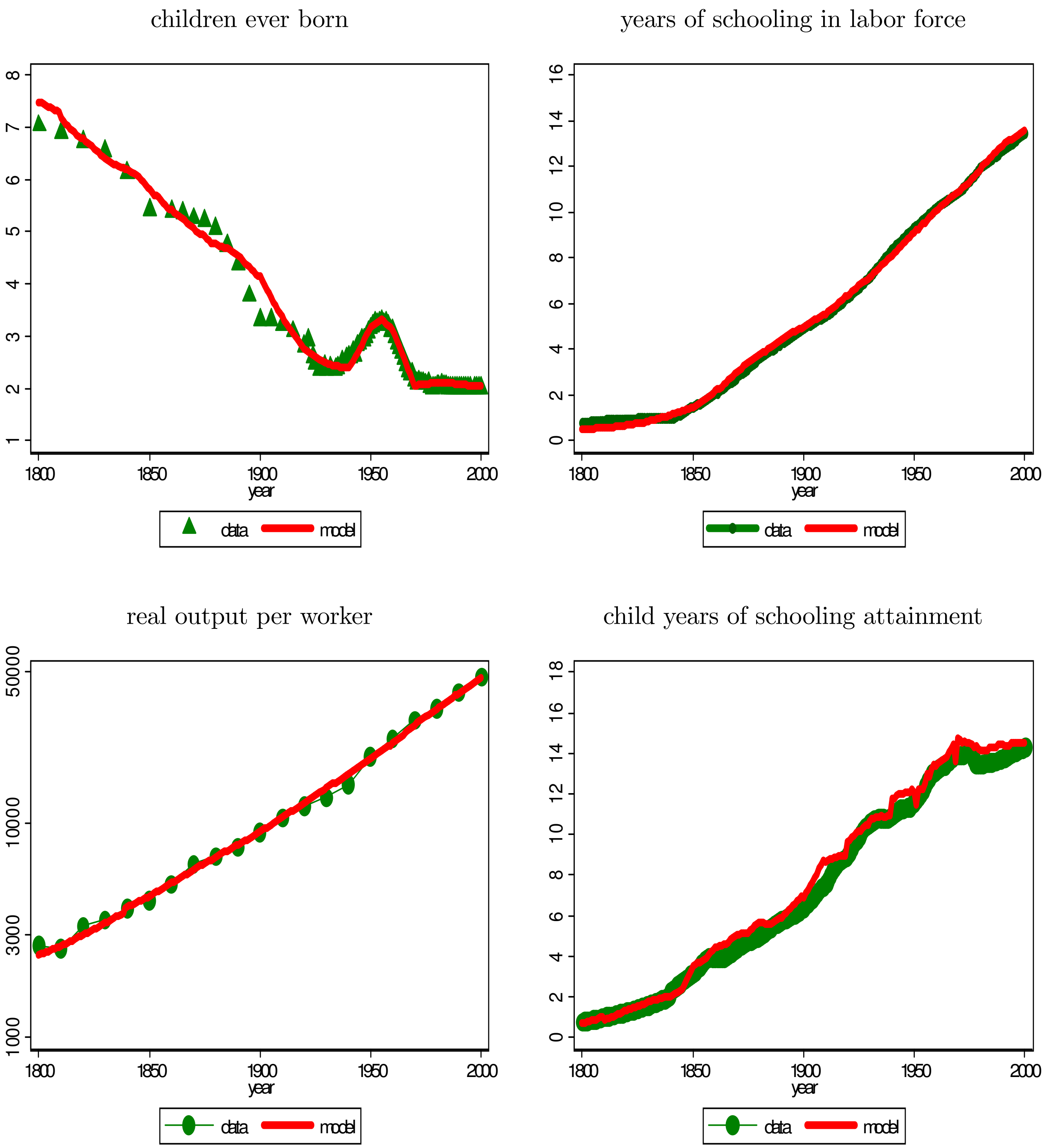

Figure 13: Model fit

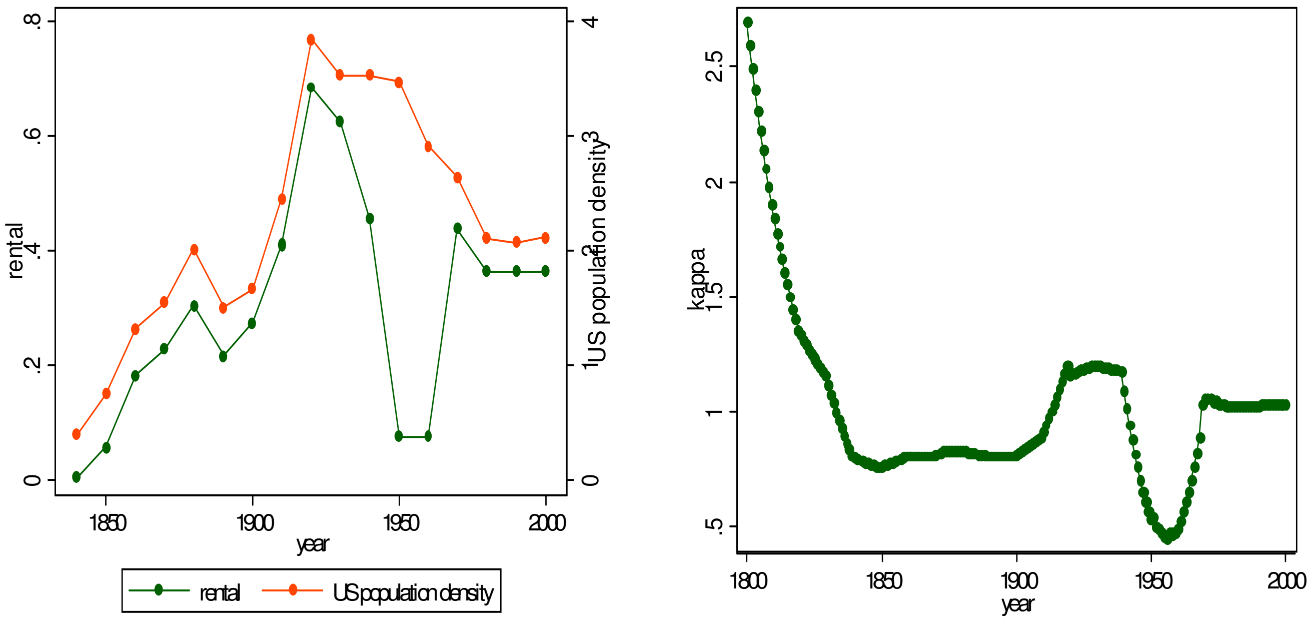

Figure 14: Model rental series, US population density data, κ

APPENDIX A: STATES BY CENSUS REGION AND YEAR OF DEATH REGISTRATION

New England	year	*Middle Atlantic*	year	*South Atlantic*	year
Connecticut	1890	New Jersey	1880	Delaware	1890
Maine	1900	New York	1890	D.C.	1880
Massachusetts	1880	Pennsylvania	1906	Florida	1919
New Hampshire	1890			Georgia	1922
Rhode Island	1890			Maryland	1906
Vermont	1890			North Carolina	1917
				South Carolina	1916
				Virginia	1913
				West Virginia	1925
E. South Central	year	*W. South Central*	year	*Mountain*	
Alabama	1925	Arkansas	1927	Arizona	1926
Kentucky	1911	Louisiana	1918	Colorado	1906
Mississippi	1919	Oklahoma	1928	Idaho	1922
Tennessee	1917	Texas	1933	Montana	1910
				Nevada	1929
				New Mexico	1929
				Utah	1910
				Wyoming	1922
Pacific		*W. North Central*		*E. North Central*	
Alaska	1960	Iowa	1923	Illinois	1918
California	1906	Kansas	1914	Indiana	1900
Hawaii	1917	Minnesota	1910	Michigan	1900
Oregon	1918	Missouri	1911	Ohio	1909
Washington	1908	Nebraska	1920	Wisconsin	1908
		North Dakota	1924		
		South Dakota	1906		