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ABSTRACT

The U.S. fertility transition in the nineteenth century is unusual. Not only did it start from a very high fertility level and very early in the nation's development, but it also took place long before the nation's mortality transition, industrialization, and urbanization. This paper assembles new county-level, household-level, and individual-level data for census years 1800-1880 to evaluate different theories for the nineteenth-century American fertility transition. We construct county-level models of child-woman ratios in all census years and couple-level models of marital fertility in census years 1830-1880. We find evidence of marital fertility control consistent with hypotheses as early as 1835. The results indicate support for several different but complimentary theories of the early U.S. fertility decline, including the land availability, local labor market/child default, conventional structuralist, ideational, and life-cycle savings theories. We emphasize discussion of the life-cycle savings hypothesis, which has received limited empirical study to date.

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1. INTRODUCTION

The fertility transition in the nineteenth-century United States is unusual in a number of respects. The decline comes very early in the nation's development. Between 1800 and 1880, the white population's crude birth rate fell from about 55 to 35 and its total fertility rate fell from about 7.0 to 4.2. Only France had a comparably early onset of the transition. The fertility transition also began long before the sustained decline in mortality commenced in the 1870s (Haines 1989; Haines 2000). Finally, the transition occurred when the nation was still predominantly agrarian and rural, although the decline in birth rates happened in both rural and urban places. Even in 1880, only about 28 percent of the U. S. population lived in urban areas (defined by the Census as places with over 2,500 people) and 52 percent of the labor force derived its primary support from non-agricultural activity (Haines and Steckel, 2000, Table 8.1; Carter, et al. 2006, Series Ba829-830).

This paper sheds new light on the early U.S. fertility transition by examining its correlates across the period 1800-1880 using a combination of county-level, household-level, and individual-level data. We begin by supplementing existing county-level data for the period 1800-1860 with new information on population densities, railroads/canals, wealth, religious denominations, and financial institutions, extending the series to include census years 1870 and 1880, and conducting new cross-sectional analyses comparable with classic studies of the U.S. fertility transition conducted by an earlier generation of researchers.[1] Next, we merge the

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[1] Unfortunately, a fire destroyed the 1890 census manuscript returns in the early twentieth century, ending the series of consecutive censuses in 1880. Although the historical U.S. fertility

enhanced county-level data with new census microdata from the IPUMS complete-count 1830-1870 datasets and the 10-percent 1880 IPUMS sample (Ruggles et al. 2020), which allow us to model marital fertility at the couple level while reducing potential biases in ecological regressions. We examine a number of competing, but possibly complementary, explanations for the fertility decline, including the land availability, local labor market/child default, ideational, and life-cycle savings hypotheses, as well as the conventional structuralist explanation. Although we find support for all these hypotheses, we emphasize discussion of the life-cycle savings hypothesis, which has received limited prior empirical verification and which has the capacity to link many of the various economic views.

The cross-sectional census data used in this study—like the vast majority of historical data—have limitations. Good instrumental variables are unavailable, omitted variable bias is likely present, and there is some risk that coefficients are biased by endogeneity, especially in early census years. Given these data limitations, we do not attempt to estimate causal relationships. The datasets assembled here, nonetheless, represent a substantial improvement in quality, quantity, and temporal coverage relative to data used by earlier researchers. We employ area-fixed effects to control for unobserved spatial heterogeneity and control for a wide variety of economic, demographic, and cultural correlates to minimize potential biases. In-

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decline continued into the 1930s, we focus on the nineteenth-century decline because of its puzzling early onset, when the population was overwhelmingly rural and most households engaged in agricultural labor.

progress work linking individuals across multiple censuses at the Minnesota Population Center (Ruggles et al. 2018) will allow future researchers to create large panel datasets with the potential to confirm, modify or reject the conclusions drawn below.

2. BACKGROUND AND PRIOR STUDIES

The United States did not establish a birth registration system until 1908. Broad patterns of the fertility transition, however, are evident in the ratio of the number of children to the number of women of childbearing age reported by decennial censuses. As shown in figure 1, the nation's child-woman ratio (CWR) declined 33 percent between 1800 and 1880. CWRs in urban areas were much lower than CWRs in rural areas in all census years, but urban and rural places experienced similar declines from early in the century. New England was the region with the lowest CWRs in each census year and experienced a decline in its CWR of more than 50 percent over the 80-year interval. CWRs were lower in the eastern census regions and higher in western regions, and, to a lesser extent, lower in northern census regions than in southern census regions.[2]

[2] Child-woman ratios plotted in the chart were calculated from the complete-count 1790-1840 and 1850-1870 complete-count IPUMS census datasets and the 1880 ten-percent IPUMS sample (Ruggles et al. 2019). We adjusted the CWR to account for missing records in a few states in early census years using published results. We also adjusted for differences in reported age groups of children and women using the overall age distribution of the white population by

The child-woman ratios shown in figure 1 suggest that fertility rates in the United States at the start of the nineteenth century were high relative to fertility rates in other English-speaking countries. Ansley Coale and Melvin Zelnik estimated that white women surviving their childbearing years in 1800 gave birth to an average of 7.0 children, about 1.6 more children than estimated by historical demographers for women in England and Wales. By 1880, total fertility in the United States had fallen to 4.2, about 0.5 *fewer* children than in England and Wales (Coale and Zelnik 1963; Woods 2000). Thus, despite a delayed onset of the industrial revolution in the United States relative to England and Wales, the U. S. experienced an earlier onset of the fertility transition.

Explicitly or implicitly, most contemporary observers associated high fertility in the early United States with early and near universal marriage, which was in turn seen as a product of the nation's inexpensive land, abundant resources, and high standard of living. Benjamin Franklin was the first to point out the association of land availability, early marriage, high fertility, and rapid population growth:

> Land being thus plenty in America, and so cheap as that a labouring Man, that understands Husbandry, can in a short Time save Money enough to purchase a Piece of new Land sufficient for a Plantation, whereon he may subsist a Family; such are not afraid to marry; for if they even look far enough forward to consider how their Children when grown up are to be provided for, they see that more Land is to be had a Rates equally easy, all Circumstances considered…Hence Marriages in America are more general, and more generally early, than in Europe (quoted in McCusker and Menard 1985, p. 212).

With the Louisiana Purchase in 1803, the defeat of Indian confederations in the War of

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single years of age in the 1850 complete-count dataset.

1812, and the opening of the trans-Appalachian west, land availability may have been near an all-time high early in the nineteenth century. Thereafter, increasing population densities, declining land availability, and rising farm prices—especially in more densely-populated areas near the Atlantic coast and navigable waterways—resulted in a trend toward later marriage, higher proportions who never married, and lower fertility. Imbalanced sex ratios (men outnumbered women in western frontier regions, while women outnumbered men in eastern regions) contributed to regional differentials in fertility (Haines and Hacker 2011). In a statistical analysis of the 1790-1840 censuses, George Tucker, Professor of Moral Philosophy at the University of Virginia, confirmed a long-term decline in the ratio of children to women in every state between 1800 and 1840 and an inverse relationship between state child-woman ratios and population densities (Tucker 1855, pp. 104-106).

To the extent that the fertility decline was caused by changes in the timing and incidence of marriage, the "early" U.S. fertility decline was not the result of exceptional or innovative behaviors; American marriage patterns were simply converging toward European norms, which in turn caused fertility to decline (Smith 1987). Likewise, state and regional differentials observed by Tucker and analyzed by subsequent researchers may have reflected differentials in nuptiality (Hacker 2008). Beginning in early the nineteenth century, however, observers suggested that regional differentials in the "productivity" of marriages resulted from differentials in the practice of conscious family limitation strategies. In an earlier essay, Tucker (1827) mentioned a secret "long practised by many in the east" that allowed couples to control fertility without abstinence. Private secrets were made public in the early 1830s, when Charles

Knowlton and Robert Dale Owen separately published books describing different methods of contraception (Knowlton recommended douching with spermicides while Owen recommended the practice of *coitus interuptus*). Although Knowlton was arrested and found guilty of publishing an obscene work and sentenced to three months hard labor, public demand created a rapidly growing market for contraceptive advice and goods by the mid nineteenth century (Brodie 1994).

Unfortunately, early studies based of child-woman ratios could not distinguish between the effects of nuptiality and marital fertility control. Yasuba (1962), Forster, Tucker, and Bridge (1972), Easterlin (1976), and Sundstrom and David (1988) suggested a variety of explanations for the unique American fertility transition, some of which required the conscious practice of birth control by married couples and some of which likely operated through adjustments in nuptiality. Because the nation was overwhelmingly rural and dominated by the agricultural sector of the economy, explanations focused on the changing costs and benefits of farm children. A leading candidate has been the land availability hypothesis, which grew out of the observed and consistent negative correlation between child-woman ratios and population density. Originally proposed by Yasuba using state-level data, the conclusion was strengthened through the examination of agricultural land availability by county by Forster, Tucker, and Bridge.

The land availability hypothesis has three potential mechanisms. The first mechanism is a simple Malthusian check on marriage, which in turn affected fertility. Family formation in nineteenth-century American was “neolocal,” with young couples setting up a new household upon marriage rather than living as dependents in a parent's or sibling's household (Smith 1993). Increasing population densities lowered land availability, increased the price of viable farms, and caused young couples to delay marriage in order to acquire the necessary resources to purchase a viable farm and set up a new household (Yasuba 1962, 159; Haines 1996; Hacker 2008).

A second mechanism is old age insurance through the intergenerational bequest process. As farmers are almost completely dependent on their farm for income, they have little or no income to support themselves when they stop working due to old age or injury. Therefore, parents might decide to transfer real property (that is, actual or potential farm sites) to children in order to keep the children working the farm or another nearby farm and supporting them when they retire. Essentially having children was a form of old age support in the rural, agrarian environment. At the same time, parents might have adjusted fertility in an altruistic motive of wanting to provide adequate farmsteads for their children. Greater availability of land in an area would keep the price of land low and make it easier for a parent to obtain additional nearby farms for their surviving children, who could continue working the farm. Future-minded couples with a targeted bequest in mind could adjust their fertility in response to growing land scarcity and higher prices (Easterlin, Alter, and Condran 1978).

The third mechanism by which land availability affects fertility is through labor availability. Farm work is hard and requires tremendous numbers of labor hours. On the frontier where labor is scarce, farmers might have additional children in order to have more help in the fields (Craig 1993). Microdata from the 1860 Northern Farms Sample (Bateman and

Foust 1974; Easterlin 1976; Easterlin, Alter, and Condran 1978) show that the gradient of fertility from the longest settled areas to the frontier was positive but not monotonic. Children were less valuable on the frontier where adult labor was needed to clear land, but once an area had been settled, children were needed to work the farm. Thus, on the immediate frontier, households were small (often just a single male) but just inside the frontier they were large (Leet 1976).

Another explanation of the decline in fertility is the rise in other alternatives for children, notably non-agricultural employment in growing urban centers. Put forward in the form of an inter-generational bargaining model by Sundstrom and David (1988), this hypothesis embodies the notion that parents were seeking to reduce the risk of child default (i.e., children moving far enough away so as to be unable to provide old age care). The authors argued that a more favorable ratio of non-agricultural to agricultural wages in a region led to a higher risk that children would leave the area and not take care of their parents. Parents thus would have to adapt by paying a larger "bribe" in terms of property, both real and financial. Given that farmers had scarce resources and could not easily grow the total value of the inheritance, a larger share would likely have been created by reducing the number of recipients (i.e., smaller families). Although Sundstrom and David pose this as an alternative to the land availability hypothesis, it seems a complement rather than a substitute for the traditional theory.

In addition to stressing the importance of land availability, research on American fertility decline has emphasized traditional structural variables from standard demographic transition theory (e.g., urbanization, industrialization, education, women's work outside the home, etc.), especially in the period after the Civil War (1861-65), when urbanization, industrialization and school attendance accelerated (Guest 1981; Guest and Tolnay 1983; Wanamaker 2012). Notestein's classic 1953 article concisely summarizes many potential causes:

> The new ideal of the small family arose typically in the urban industrial society. It is impossible to be precise about the various causal factors, but apparently many were important. Urban life stripped the family of many functions in production, consumption, recreation, and education. In factory employment the individual stood on his own accomplishments. The new mobility of young people and the anonymity of city life reduced the pressure toward traditional behavior exerted by the family and community. In a period of rapidly developing technology, new skills were needed, and new opportunities for individual advancement arose. Education and a rational point of view became increasingly important. As a consequence the cost of child-rearing grew and the possibilities for economic contributions by children declined. Falling death-rates at once increased the size of the family to be supported and lowered the inducements to have many births. Women, moreover, found new independence from household obligations and new economic roles less compatible with childbearing.

More recent economic theory has emphasized changing demand for children in the context of rising family incomes and the cost of children relative to other goods (Easterlin and Crimmins 1985). Most evidence suggests that fertility and income were positively correlated prior to the fertility transition. Economic changes related to industrialization and urbanization, however, led to an increase in the demand for child "quality"—which required greater parental investments in education and associated declines in child labor—at the expense of child "quantity," helping to explain why fertility declined during a period or rising incomes and why fertility was inversely correlated with income from the latter half of the nineteenth century (Becker 1981; Jones and Tertilt 2008; Becker et al. 2010, 2012; Dribe, Oris, and Pozzi 2014).

There has also been interest in the ideational view of fertility transition (e.g., Lesthaeghe 1980, 1983; Smith 1987). This view—which grew out of the finding that European nations at different levels of socio-economic development (e.g. levels of urbanization, share of non-agricultural employment in the labor force, and levels of literacy) commenced their irreversible fertility transitions within a short period of time in relation to one another (Knodel and van de Walle 1979)—argues that the growing influence and diffusion of secular values has changed people's willingness to control and plan family size. Smith (1987) proposed that greater adherence to religious denominations that encouraged greater individualism in the nineteenth century (Unitarian, Universalist, Congregational and some Presbyterians) resulted in earlier and more rapid fertility declines, which has received confirmation in recent county-level analyses (Haines and Hacker 2011). In addition, Hacker (1999, 2016) and Hacker and Roberts (2017, 2019) have documented a positive correlation between couples' choices of biblical versus secular names for their children and marital fertility, and large differentials in fertility between the native-born and foreign born populations, suggesting that religion and culture played significant roles in the U. S. fertility transition.

Another perspective looks at the life-cycle savings hypothesis (Carter, Ransom, and Sutch 2004). Building on the original work of Modigliani (e.g., 1966), the hypothesis argues that individuals have to provide for their old age whether that be through children, real assets, or financial assets. When there are limited financial options and in a largely rural, agrarian setting, such as the United States in the early nineteenth century, couples will choose children and, if possible, real assets such as land, structures, and livestock. As the financial network broadens and deepens, however, financial saving becomes more feasible and attractive, reducing the incentives for having children as insurance for old age. Knodel (1974, pp. 232-36), for example, found fertility in nineteenth-century Germany's administrative districts was inversely correlated with the number of bank accounts per capita. Financial savings also are largely independent of the risk of child default and increases in land prices. For instance, as land becomes more expensive, the best land is taken up, and local non-agricultural labor markets develop in towns and cities, child default becomes a greater risk and other alternatives must be sought.[3]

Three studies have discussed the effects of banks on fertility differentials in historical American counties. Steckel (1992) found a robust inverse relationship between net marital fertility and the number of banks per 100,000 people in the state of residence in a sample of 638 rural families linked between the 1850 and 1860 censuses, supporting the hypothesis that banks provided couples the option of accumulating financial assets as means of providing for their old-age support rather than investing in children. The second, by Carter, Ransom and Sutch (2004), looked at counties in the entire U.S. in 1840 and found support for the idea that life-cycle determinants were beginning to dominate over the traditional reliance on large numbers of children for old-age security. By out-migrating to the frontier, children were "defaulting" on their obligation to support their parents in old age and driving prospective parents to increase savings and investments in banks, financial markets and insurance. The authors, however, included no measures of banks or financial markets in their regressions to test the hypothesis directly. A third study by Basso and Cuberes (2013) found a robust and

[3] It is important to note that bank default was also a risk during the period, suggesting that a combination of investments might be optimal for families.

consistent inverse relationship between the white child-woman ratio and the presence of one or more banks for a limited set of 270 mostly Northeastern counties in 1840.

3. DATA AND RESULTS

We conduct our analysis in two parts. In a preliminary analysis, we follow the lead of previous researchers and model child-woman ratios (CWRs) at the county level. To provide more robust results, we supplement existing county-level databases with new data on banking institutions, population density, urbanization, farm value, manufacturing activity, literacy, transportation, religious denominations, nuptiality, and other variables. For our county-level analysis, we include dummy variables for census region, which allows us to estimate the impact of region on CWRs and control for unobserved heterogeneity at the region level. In the main analysis, we model couples' recent net marital fertility, defined as the number of surviving children age 0-4 in the household at the time of the census, using complete count census microdata. Although we rely on individual-level variables when possible, we include a few variables from the enhanced county-level dataset (e.g., the existence of transportation options and the number of banks in couples' county of residence) as contextual variables. We employ state-level fixed effects in our couple-level analysis for better control of unobserved spatial heterogeneity. We conclude with a discussion of how the empirical results support theories of U. S. fertility decline.

We limit our analysis to the nation's white population, which comprised approximately 85 percent of the total population of the United States in the nineteenth century.

Unfortunately, minimal data are available for the nation's black population until the 1870 census, preventing its inclusion in most census years. Other studies have shown little indication of fertility decline in the black population until after circa 1880, when the total fertility rate for the black population was 7.26 (Tolnay 1981), suggesting that fertility decline in the period 1800-1880 was limited to the white population.

3.1. County-level analyses

For our preliminary county-level analyses, we rely on child woman ratios (CWRs) as the dependent variable. Although based on the number of surviving children and women of childbearing ages enumerated by the census, not the number of live births per woman, child-woman ratios are a good proxy of fertility. Bogue and Palmore (1964) reported a linear correlation coefficient of 0.964 between the child-woman ratio and total fertility rate in fifty nations with reliable statistics in the period 1955 to 1960. Nonetheless, they warn that if "one area has higher child mortality rates than another, even though their fertility rates are the same, the area with the higher death rates will have a lower ratio." Differences in nuptiality between areas will also lead to differences in CWRs if both areas have equal marital fertility rates. Despite these drawbacks, child-woman ratios are a useful indicator of differential fertility across space and time and is the only consistent measure of fertility for the entire period.

The foundation of our county-level analysis is a compilation of county statistics for the United States from 1790 to the present (ICPSR 2010 and 2014). Although the publication of detailed county-level census population tabulations by age, sex, and race was discontinued by the Census Office after 1860 (and not resumed by the Census Bureau until 1930), we were able to use the new IPUMS complete-count 1870 census dataset and the 10-percent density 1880 IPUMS sample (Ruggles et al. 2020) to calculate the average child woman ratios for each county for 1870 and 1880.[4] We further supplemented the existing county-level datasets with measures of each county's urban population (from the original Census Bureau worksheets), area (allowing density calculations)[5], agricultural and manufacturing data (1840–1880), the availability of water and/or railroad connections (1840-1860)6, and data on churches (1850-1870). We also added county-level data on the number of banks from 1790 to 1880 using data from Warren Weber's antebellum bank census database (2005, 2008) and the *Merchants and Bankers' Directory*. Finally, we used IPUMS datasets to calculate the proportion of women age 15-49 currently married in each county in census years 1850-1880—thereby including a control for

[4] At the time of our analysis, the 1880 complete-count dataset lacked the variables literacy and schooling, forcing us to rely on the 10 percent sample. The IPUMS project is expected to release an enhanced version of the 1880 complete-count dataset in the near future.

[5] Before 1900, county areas only appeared in connection with the 1880 U.S. census. Updated areas were taken from data in the National Historical GIS (NHGIS) at IPUMS.org (Minnesota Population Center, 2016).

[6] The data on water and rail connections from 1840 to 1860 were originally made by Craig, Palmquist, and Weiss (1998).

nuptiality for those census years—and a few variables missing from the 1860 county-level dataset that were present in other census years.

We first estimate regression models using only variables available at the county level for all nine censuses 1800-1880. The parsimonious specification allows us to determine whether the factors are important before controlling for other variables, and gives a better view of how their effects changed over time. Second, we estimate the regressions using all the variables that are available for a given year. The augmented specification effectively controls for many other factors that could have been driving fertility and should present an effective lower bound on the coefficients, but at some cost to comparability across time.

Table 1 shows the results of the parsimonious model specification and Table 2 the results of the full specifications. To increase comparability of each variable's substantive impact, we divided coefficients in each census year by the mean CWR (shown at the bottom of the table) and multiplied by 100. For categorical and dummy variables, such as region, transportation, and the number of banks, the results in Tables 1 and 2 indicate the percentage difference in CWR relative to the reference category. For other independent variables the results indicate the percentage change in the CWR to a one-unit change in the variable. Results, of course, will depend on the choice of reference category and the scale used to measure real variables, which we have chosen to allow the precision of the results to show. Means of variables in the model are shown in appendix Table A-1.

Despite the limited number of independent variables, the parsimonious regressions explain between 45 and 67 percent of the variation in white CWRs across counties. However, much of this is driven by the region fixed-effects, as New England (the omitted dummy variable in the regression) experienced the decline in fertility much earlier than other regions. In most years, CWRs in New England counties were 10-15 percent lower than in the Middle Atlantic census region, 20-30 percent lower than in the East North Central, and 30-40 percent lower than in other regions even after controlling for other variables. Regional differentials were temporarily reduced in 1870 because of the disparate impact of the American Civil War (1861-1865) on the South, which lost approximately 1-in-5 of its white military age male population in the conflict (Hacker 2011).

Our measure of women's nuptiality is only available beginning with the 1850 census. As an additional proxy for the marriage market in all census years, we included the proportion of the white childbearing age population in each county that was male. We assume that women in counties with a high proportion of the childbearing age population male would have less competition in the marriage market, and therefore marry earlier in life and in greater proportions, than women in counties with a low proportion male and, consequently, proportion male would be positively correlated with CWRs. The results show the expected positive effects early in the nineteenth century (up through 1830). That effect gradually diminishes, however, and becomes negative by 1840, suggesting that adjustments in nuptiality had a role in the fertility transition in the early stages of the decline (T'ien 1959; Hacker 2008). Population density and urbanization were negatively correlated to CWRs in all census years except 1870, when density was not statistically significant.[7] The coefficient for proportion nonwhite is negative and significant for every year, suggesting that slaves, who represented the large majority of the non-white population through 1860, and children were substitutes. Slaves were a form of real wealth and could furnish support in old age. They also performed tasks on farms and plantations (and elsewhere) that children might have been doing in free states. As for the lower values after the abolition of slavery in 1865, reduced fertility could have been a natural response of former slaveholders to the loss of slave capital. They likely increased savings in other forms. The other possibility is that non-slave holding whites residing in areas with high proportions of slaves found it difficult to compete with slave labor, depressing fertility rates.

The presence of one or more banks in a county was negatively correlated with CWRs in most census years.[8] The coefficients were negative but insignificant in 1800, when there were only 27 banks in 19 of the 410 counties. The dummy variable approach provides a view of both the extensive margin (i.e., the entry of any banks) versus the intensive margin (i.e., the entry of

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[7] Because the density and farm values per acre variables were skewed by a few counties with very high values, we logged those variables to reduce the influence of outliers. Unsurprisingly, urbanization and density were inter-correlated. When urbanization is dropped from the models in 1870 and 1880 the coefficient for density becomes significant.

[8] We tested and obtained similar results when we included either the logarithm of bank capital (using data from Weber 2008) or the logarithm of the number of banks instead of the bank dummies (not shown).

an additional bank). Just getting a bank at all leads to a large negative decline in fertility whether that is the entry of one bank or multiple banks. However, while the coefficients generally show a monotonic decline in the child-woman ratios as the number of banks increased, the marginal effect of each extra bank decreases as compared to the county's first bank in most years. These results provide strong support of the life-cycle saving model. Our cross-sectional approach, however, is subject to endogeneity and omitted variable bias. Although we have no reason to believe that fertility decline caused banking to increase, omitted variables in the models potentially associated with bank entry and fertility decline (e.g., industrialization, transportation, and other measures of structural development) may bias the results. Although the inclusion of population density, urbanization, and region in the parsimonious models adds some confidence to the results (all of which were major determinants of bank location), we proceed with the augmented specifications, which include additional measures of economic development.[9]

Table 2 adds all available county variables in each census year to the regressions. The most significant addition was the proportion of women of childbearing age who were currently

[9] Banks were unlikely to start in an extremely rural community without significant economic activity (Atack, Jaremski, and Rousseau 2015). The decision to start a bank, however, was not entirely economic. During the period before the Civil War, banks had to receive a unique charter from their state legislature. As discussed by Hammond (1957) and Bodenhorn (2003), these charters were often related to political interests rather than economic ones.

married in the county, which was included in the 1850-1880 models. Remarkably, the results indicate that the proportion of women currently married accounts for more than 100 percent of county differentials in CWRs in census years 1850, 1860 and 1870. The decline in the magnitude of the coefficient after 1850, however, remains consistent with the interpretation on a shift from a demographic regime in which fertility was regulated by the timing and incidence of marriage early the century to a regime in which fertility was regulated by couples practicing marital fertility control in the latter part of the century. In 1880, all else being equal, the proportion of women currently married accounted for just 44 percent of the variation in CWRs.[10]

In the years in which additional variables are included, the magnitudes of the coefficients on the region and bank dummies fall in value. In the parsimonious model for 1850, for example, child-woman ratios in the West North Central region were 32.0 percent higher than in New England. In the full model for 1850, which includes county measures of proportion of women married, proportion farmers, transportation, foreign-born population, literacy, manufacturing, wealth, average farm values, farm acreage improved, liberal/individualistic church accommodations, and relative wages, the differential was just 13.7 percent. The

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[10] We did not attempt to weight the marriage variable by age-specific fertility rates, which is a possible explanation for the greater than one-to-one relationship between marriage and CWRs. These robust results also suggest that the proportion male in a county is a poor proxy for nuptiality in later census years.

magnitude for the coefficients on banks were approximately one-half the size in the parsimonious models, but in nearly all cases, remain negative, substantively significant, and statistically significant.[11] Therefore, the regression results indicate that while the growth of financial markets goes along with other aspects of development, such as improved transport connections, urbanization, wealth, and growth of the non-agricultural sector, there is still a persistent effect of bank availability on fertility after including the additional variables.

In addition to serving as controls, the additional variables in the full models provide various levels of support for different theories of the U. S. fertility decline, including the land availability, labor market, life-cycle savings, traditional demographic transition, and ideational theories. In all census years, for example, the proportion of the population engaged in farming was positively correlated with CWRs, providing support for the land availability, labor market, life-cycle savings, and traditional demographic transition theories. The proportion foreign born by county has a negative and significant relation to child-woman ratios in 1850 and a negative but insignificant relation in 1860, but is positive and significant for 1870 and 1880, even holding urbanization constant, supporting ideational theories. The 1850 result is puzzling, given the finding that the foreign born often had higher birth rates than the native-born population (Spengler, 1930), but the early stages of the mass migrations from Europe in the 1840s

[11] Fitting the connection between manufacturing and bank entry found in the literature (Jaremski and Rousseau 2013; Jaremski 2014), the largest declines occur when estimates of the non-agricultural workforce are included.

undoubtedly had some disruptive effects. Irish migration to the United States in response to the Great Famine (1845-49), in particular, was no doubt associated with lower numbers of surviving children age 0-9 among Irish born women enumerated by the 1850 census. As expected, the proportion of farm acreage improved and average farm values per acre were inversely correlated with CWRs in most census years, providing some support for the land availability thesis.[12] Since most of these additional variables are only present after 1850, however, when we have individual-level full count census microdata, we postpone our discussion of the results for later, with one additional exception. The coefficient for the relative wage of laborers and farm hands, while negative and statistically significant in 1850, was positive (the opposite of the expected sign) and significant in 1860. The county-level results therefore provide inconsistent support for Sundstrom and David's hypothesis that a more favorable ratio of non-agricultural to agricultural wages led to greater "default" by farm children to provide old age care of their parents, and a resulting adaptation to this default by parents to limit fertility and provide larger "bribes" to keep children on the farm. Unfortunately, the relative wage variable is a state-level variable and must be dropped from our couple-level analyses below, which employ state fixed effects models. Alternate couple-level regression models without state fixed effects (not shown), however, also show inconsistent results for the relative wage variable in 1850 and 1860.

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[12] We have tried other measures of improved acres similar to the approach of Easterlin (1976) with similar results.

3.2. Couple-level analysis

Relationships inferred from aggregate data for groups do not necessarily hold for individuals. Robinson's classic work on ecological inference (1950) using the 1930 census, for example, demonstrated that the positive correlation between the percentage of a state's population that was foreign born and the percentage that was literate did not apply to individuals, where foreign birth was negatively correlated with literacy. Sevlin (1958) later described the "invalid transfer to aggregate results to individuals" as an "ecological fallacy." Although we find a positive correlation between the proportion of men employed in farming and CWRs at the county level, for example, it would be a similar "ecological fallacy" to assume that farm couples had higher fertility than non-farm couples based solely on our county-level results. It is, of course, possible that a similar relationship exists at the individual level, but that relationship is not assured statistically. Where possible, researchers should rely on individual-level data to make inferences about individual behaviors.

In the following section, we rely on new complete-count IPUMS databases of the 1830-1880 censuses to shift our analysis from counties to currently-married couples. By focusing on married couples, we effectively control for the impact of nuptiality on general fertility rates. Our dependent variable is the number of couples' own children age 0-4 at the time of the census. It is therefore a measure of recent "net" marital fertility (the number of live births in the previous five years less the number of those children who died before the census). We also measure as many covariates as possible at the individual or couple level. Unfortunately, not all suspected covariates of marital fertility are available at the couple level. We have no data on the value and acreage of couples' own farms, for example, and must rely on the proportion of all farm acreage improved and the average dollar value per acre of farms in a couple's county of residence as a proxy for their ability to bequeath farms to their children. To some extent, however, these contextual data remain theoretically sound. If forward-looking couples adjusted their childbearing to achieve the goal of purchasing nearby farms for all of their surviving children, we need contextual information on the costs and availability of new farms. That information is especially relevant with the addition of couple-level real and personal estate wealth data, which we have in the 1850-1870 censuses.

In all models, we limit our universe to currently-married women age 15-49 with spouses present in the household. For the 1850-1880 census datasets, defining married-couple households and determining the number of their own children less than age 5 in the household is a straightforward task. We relied on the IPUMS variables *AGE*, *SEX*, and *SPLOC*, the latter of which indicates the location of each individual's spouse in the household, to define the analytical universe, and *NCHLT5*, which indicates the number of own children less than age 5 in the household, for the dependent variable.[13] The 1830 and 1840 censuses, however, were conducted at the household level, making it more difficult to identify married couples and the number of their children. Census enumerators recorded information for all individuals in the

[13] The IPUMS project imputed *SPLOC* and *NCHLT5* using each individual's recorded surname, age, sex, race, and order of enumeration in the household. Tests of the accuracy of the imputed variables with the 1880 census indicate that the imputed variables matched those reported in the census 99 percent of the time (Ruggles 1995).

household on a single line of a two-sided schedule with 80 summary columns (e.g., the number of white males age 0-4 in the household, the number of white females age 15-19, the number of household members engaged in agriculture, etc.). As a result, the IPUMS project did not attempt to impute whether households contained married couples or the number of own children each couple had in the household.

Our approach to using the 1830 and 1840 census microdata was to limit the analytical dataset to households that contained one (and only one) white female age 15-49 and one (and only one) white male age 15-59 in either the same age group as the woman or in the next older age group (e.g., a household with one white female age 30-39 and one white male age 40-49). If a household contained more than one woman or more than one man of childbearing ages or if the two age groups were not compatible with a probable married couple (e.g., a household with one white female age 30-39 and one white male age 20-29), we dropped the household from the analysis. We also dropped all households with one or more females age 50 and above and males age 60 and above to avoid ambiguity with other measured variables (foreign birth, occupation, and literacy). With these selection criteria, we can be reasonably confident that selected households contain a currently-married couple and that all co-resident children less than age 5 in the household are children of the couple. Hereafter we refer to these households as "imputed nuclear households," whether or not they contained any children.

Because of the different identification strategies and variables available at the household and couple levels, we present our results for the period 1830-1850 and 1850-1880 separately. We include results from the 1850 dataset in both sets of results for comparison.

When comparing the 1850 results to those for census years 1830 and 1840, we collapsed the individual-level 1850 dataset to a one record household summary and used the same logical rules to impute nuclear households that we used in the 1830 and 1840 datasets. We also replicated, as closely as possible, the household-level variables available in 1830 and 1840.

We rely on a standard OLS regression because of its ease of interpretation and for consistency with our county-level results. Although the dependent variable is a count with no negative values and many observations of zero children, suggesting the need of Poisson regression or other count-based regression approach to ensure unbiased standard errors, we have complete microdata with hundreds of thousands of couples in each census year. We compared results using both OLS and Poisson approaches and found the vast majority of variables were statistically significant at the 0.001 level in all models. Finally, because of the large spatial differentials in fertility indicated by our county-level analysis above, we employ state-level fixed effects in all models to control for unobserved heterogeneities.

Table 3 presents the results for the parsimonious models using only variables available in 1830, 1840 and 1850. Table 4 shows the full model results. Means for variables in the models are shown in appendix Table A-2. To increase comparability of each variable's substantive impact across time, we divided coefficients in each census year by the mean number of children age 0-4 in the household and multiplied by 100. The first three columns show the results for the imputed nuclear household models in 1830, 1840 and 1850, respectfully. The second 1850 model further limits the 1850 analytical universe to households identified as containing a currently-married couple by the IPUMS project, which used individual-level information only available in the 1850 and later censuses (e.g., age, sex, surname, position in household) to impute married couples. We also rely on the number of own children imputed by the IPUMS project as the dependent variable instead of the number of children in the household. Encouragingly for the 1830 and 1840 results, this restriction results in the loss of only 1.1 percent of the imputed nuclear household cases from the analysis and we obtain similar results in both 1850 models.

We include the age group of the childbearing woman in all models. Relative to the reference group of women age 20-29, imputed nuclear households containing a female age 30-39 had a modestly higher number of children age 0-4 in all census years (probably because proportionately more women in the age 20-29 reference group had not been married for the full five-year observation period prior to the census), while those age 40-49 had significantly fewer children (probably the result of lower fecundity at older ages and possibly the increasing practice of marital fertility control). Relative to 1830, the results in 1840 and 1850 indicate that women's childbearing was increasingly concentrated in their 20s, a pattern consistent with the practice of what demographers call parity-dependent fertility control or "stopping behavior"—the successful attempts by couples to curtail their childbearing after reaching a target number of children. This pattern is more evident in the results from the period 1850-1880 discussed further below.

With microdata, we are able to distinguish couples living in urban areas from couples living in rural areas, even if they resided in the same county. We further categorize urban couples by the population size of their city of residence. Similar to the results from our county-level analysis, however, which indicated that counties with greater proportions in urban areas had lower child-woman ratios, we find that couples living in urban areas had fewer children age 0-4 than couples living in rural areas in all three censuses. With only a few exceptions, we find the size of the urban area in which couples resided was negatively correlated with their number of children. This result was likely due in part to higher infant and child mortality in urban areas. Although available data do not allow the measurement of child mortality differentials by size of place in 1830 or 1840, mortality differentials were large at the end of the century when they can first be measured. Children in urban places suffered dramatically higher rates of mortality than children in rural areas, likely because greater crowding and poorer sanitation in cities facilitated the spread of infectious disease (Preston and Haines 1991).

The results for banks are very similar to the results in the county-level models. We again find that the availability and number of banks in a county was negatively associated with fertility. Across the various models shown in Table 3, couples living in a county with one or more banks had 4-11 percent fewer children age 0-4 than couples living in a county without banks, all else being equal. Coefficients are modestly larger in later censuses, suggesting an increase in the substantive impact of banks on marital fertility over time.

The full models, shown in Table 4, contain a few new insights. Although the county-level analysis indicates that agricultural work was associated with higher fertility, the 1840 census, which collected information on six occupational groups, provides more detail. Households with men in professional and commercial occupations had 10-23 percent fewer children under the age of five than the reference group of households with men in an agricultural occupation. The result likely reflects differences in the perceived costs and benefits of children. Farm couples had greater need for child labor, while professional and commercial couples increasingly invested more in their children's education and benefited less from their labor (Guest 1981; Dribe et al. 2014; Maloney et al. 2014). Providing further support for this theory, school attendance in 1850 was negatively correlated with couples' net marital fertility. Households with men in navigational and manufacturing occupations or with no occupation listed had 2-11 percent fewer children than households with an agricultural occupation listed. The fertility of couples in mining households, however, was only modestly lower in 1840 than the fertility couples in agricultural households and was modestly higher in 1850, consistent with other studies that have stressed the high-fertility of mining families (e.g., Haines 1977). Mining occupations were rare in the United States, however, and accounted for less than one percent of men's occupations in 1840 and 1850. Overall, these relatively large occupational differences in net marital fertility, consistent with hypothesis about the costs and benefits of childbearing, provides strong evidence of a significant level of marital fertility control among American couples circa 1835-1840.

Because spouses' place of birth and literacy were strongly inter-correlated, we coded nativity (native-born and foreign-born) and literacy as couple-level variables. If one spouse was native born and one foreign born, we coded the couple as being foreign born. We considered a couple as being literate only if both the husband and wife could read and write. In contrast to the county-level results, which show a strong negative association between the proportion of a county's population that was foreign born and its child-woman ratio in 1850, the couple-level results show a no significant association between households in which one or both members of the couple were foreign born and the number of children 0-4. A couples' literacy was negatively correlated with their fertility, all else being equal. The result, which is typical of other results across many populations across time and place, may reflect an orientation toward greater investments in education and child quality among literate parents, greater exposure to secular culture, or greater access to printed birth control information. The availability of water or railroad transportation was negatively correlated with fertility, as it was in the county level regressions. Banks remained negatively correlated with couples' marital fertility in the full models, despite the inclusion of additional variables associated with economic development, including transportation, school attendance rates, and couples' real estate wealth.

Of special interest to economic theories of fertility decline, including life-cycle savings theory, the 1830 and 1840 censuses include information on slave ownership and the 1850 census includes information on real estate wealth. The results indicate that slave ownership was negatively associated with couples' marital fertility. The coefficient was larger for couples with large slave holdings (more than 20 slaves).The results again provide support for hypotheses that slaves—who could provide both farm labor and old-age support for aging couples—represented a substitute for investments in child quantity for slaveholding couples (Carter, Ransom and Sutch 2004). We coded couples' real estate wealth in 1850 into three groups to allow for the possibility on a non-linear relationship with fertility. In all models, including the models for the 1850-1880 regressions below, approximately half of all couples reported no wealth. We chose the minimum dollar value for the high wealth group to yield 10 percent of all couples. Interestingly, we find an inverted U-shape relationship between real estate wealth in 1850 and fertility. Couples with no real estate wealth and couples with high real estate wealth had fewer children than the reference group of couples with a moderate level of real estate wealth. We discuss this relationship in more length below with the 1860 and 1870 results, which allow us to combine personal estate wealth and the value of local farms per acre for a more comprehensive investigation of the land availability/target bequest hypothesis.

Finally, Tables 5 and 6 shows the results for the parsimonious and full models for the couple-level analysis of the 1850-1880 censuses. Results for the parsimonious models confirm the trend away from higher childbearing rates at older ages discussed above in the 1830-1850 models. Relative to women in the age 20-24 reference group, women in all age groups above age 30 experienced lower fertility in each subsequent census from 1850 to 1880. In 1850, for example, women age 40-44 had 29% fewer children age 0-4 in the household than women age 20-24, all else being equal. Thirty years later, in 1880, they had 53% fewer children. The trend is consistent with the increasing practice of parity-dependent control and an associated decline in the mean age at childbearing (Hacker 2003, 2016).

Husbands' occupation group was a significant correlate of net marital fertility in all census years, again indicating that couples perceived different costs and benefits to childbearing depending on the type of labor the husband performed. Similar to the 1840 results, women married to farmers had more children age 0-4 in the household at the time of each census, while women married to men with professional, managerial, clerical and sales occupations had fewer children. The results suggest that occupational differentials widened slightly between 1850 and 1880. In 1850, for example, professional couples had 16 percent fewer children than farmers; in 1880, they had 23 percent fewer. Literacy was negatively correlated with fertility at the couple level. Differentials between literate and non-literate couples remained consistent between 1850 and 1880, with literate couples having 10-11 percent fewer children than illiterate couples, all else being equal. School attendance was negatively correlated with couples' net marital fertility in all census years. Some of this result may reflect couples' adaptation to compulsory school attendance laws, which were first enacted in Massachusetts in 1852 and which increased costs and decreased the benefits of childbearing. Compulsory attendance laws were rare before 1870, however, and were typically passed in states that had already obtained high attendance rates (Goldin 1999).

Beginning in 1850, the census recorded foreign-born individuals' country of birth. We coded nativity as a couple-level variable with couples either native born (born in the United States) or born in Germany, Ireland, Great Britain, or other foreign countries. If one partner was native born and the other foreign born, we took the foreign-born birthplace. If both partners were foreign born but born in different countries, we took the birthplace of the wife. In 1850, the dummy variables for couples' nativity had a relatively modest impact on marital fertility. Couples born in Ireland, for example, had 3 percent more children under age five than native-born couples, all else being equal. In the next three censuses, however, a couple's nativity had a greater impact on their childbearing rates than all other variables in the model. In 1860, couples born in Germany had 21 percent more children than native-born white couples, while those born in Ireland at 23 percent more children. Couples born in Great Britain, Canada and other foreign countries also had more children than native-born couples, although the difference was more modest (9-16 percent). By 1880, nativity differentials had widened further, with couples born in Germany having 35 percent more children than native-born couples, couples born in Ireland having 29 percent more children, while those born in Great Britain and Canada had 14-26 percent more. Recent work by Hacker and Roberts (2019) confirms that nativity continued to be one of the most substantively important correlates of marital fertility well into the twentieth century, with second generation couples (native born of foreign-born parents) typically having marital fertility rates approximately midway between those of native-born whites of native parentage and foreign- born populations. Nativity differences—all else being equal—are strong evidence of the importance of culture and ideational factors in determining fertility behaviors. Foreign-born populations clearly lagged behind in the transition to smaller families that accelerated among native-born couples after 1850, although changes in immigrant selection factors over time may have also played a role in widening fertility differentials.

The 1850-1880 results again confirm that urban places and banks were negatively correlated with marital fertility. Once again, however, lower marital fertility rates among couples in the urban areas (approximately 6-13 percent lower than among rural couples across the models and various size of place dummy variables) likely reflects differences in infant and child mortality rates, which were likely higher in urban areas. In most models, there was a consistent gradient in marital fertility among couples living in counties with zero, one, two, three, or four or more banks. The relationships in each census year were remarkably consistent. Increasingly more couples, however, were living in counties with banks or in counties with multiple banks over time, increasing the overall impact of banks over time. In 1850, 46.8 percent of couples lived in a county without a bank. In 1880, the percentage had fallen to 32.1 percent.

The full models add several variables of interest to fertility decline hypotheses while reducing the potential impact of omitted variable bias. For the most part, the results are consistent with results from the county-level analysis. Residence in a county with a high proportion of Congregational, Unitarian, Universalist and Presbyterian churches was negatively correlated with marital fertility, supporting hypotheses that members of liberal/individualistic churches were more willing to practice marital fertility control, all else being equal, than members of more conservative churches. As expected, variables typically associated with traditional demographic theory—urbanization, industrialization, education, literacy—were negatively correlated with couples' marital fertility. Married women's participation in the paid labor force was negatively correlated with their fertility, although participation rates were very low (less than 2 percent of married white women in 1870 and 1880 had occupations in paid labor force). The availability of transportation, which was negatively correlated with CWRs at the county level, was also negatively correlated with couples' net marital fertility, suggesting that residence in a county more connected to the national economy and the movement of goods, people and information was associated with reduced childbearing.

The availability of real estate wealth data in 1850 and real estate and personal estate wealth data in 1860 and 1870 provides a rare opportunity to examine the impact of occupation and wealth simultaneously during the demographic transition (Guinnane 2011). When combined with local farm prices and banking availability, wealth data allow a more comprehensive test of the land availability/target-bequest and life-cycle savings hypotheses than previously possible.

We find inconsistent support for the land availability hypothesis. All else being equal, the theory suggests that couples with low wealth living in counties with high farm prices and high proportions of farm acreage improved would anticipate the greatest difficulty providing nearby farms for their surviving children and would adapt by reducing their fertility relative to couples with high levels of wealth living in counties with low farm prices and low proportions of farm acreage improved. As expected, farm prices and acreage improved was negatively correlated with marital fertility in all census years. Couples' real estate and personal estate wealth, however, had an inverted u-shaped correlation with fertility. As expected, couples with moderate levels of wealth had higher fertility than couples with no real estate or personal estate wealth, all else being equal. Couples with higher levels of real and personal estate wealth, however, had lower fertility than couples with moderate wealth, despite their greater ability to provide adequate farmsteads for more children. Wealthier couples, of course, may have sought to provide their children with better or more extensive farm bequests more reflective of the family's higher standard of living. Even with higher targeted bequests levels, however, there is little or no reason to expect a negative relationship between wealth and fertility based solely on the land availability thesis. Instead, the results are more consistent with the household economics literature on the quantity-quality tradeoff, which predicts a negative relationship between wealth/income and fertility after income exceeds a threshold where parents’ investments in child quality depresses the number of children demanded (Becker 1981; Wahl 1992; Winegarden and Wheeler 1992).

Results remain consistent with the life-cycle savings hypothesis, which contends that individuals must provide for their old age support by investing in children, real assets, financial assets or slaves. The presence and number of banks were negatively correlated with net marital fertility in each census year. Although the cross-sectional approach does not allow us to make causal estimates, the use of state-level fixed effects and large number of variables in the model—especially in census years 1860 and 1870, which included measures of occupation, literacy, urbanization, transportation, school attendance, farm values, farm acreage improved, and level of manufacturing—increases confidence in findings. Given the agrarian setting and limited financial options in the early nineteenth century, couples invested in children and real estate. In southern census regions prior to 1870, couples also invested in slaves. The expansion of banking and financial networks in the nineteenth-century United States made financial savings more feasible and attractive, reducing the need for couples to rely on surviving children as a source of old-age support. This was especially true of wealthier couples, whose greater real and personal estate wealth reduced the need to invest in child quantity, and for urban couples. But it was also true of the declining proportion of couples engaged in farming.

4. CONCLUSION

This paper began by analyzing the geographic dispersion patterns of U. S. white child-woman ratios at the county level using an enhanced and expanded county-level dataset for census years 1800-1880. We included new data on population densities, urbanization, farm values, manufacturing activity, literacy, transportation, religious denominations, nuptiality, and banking institutions. The land availability, local labor market/child default, conventional structuralist, ideational, and life-cycle savings hypotheses all receive some support from the data. The results confirmed that nuptiality had a strong impact on fertility in all census years in which it can be measured, but suggest that the relative contribution of nuptiality to fertility differentials declined over time while the contribution of marital fertility control increased (Hacker 2003).

We also found support for multiple theories of fertility decline in our household-level and couple-level analyses using new complete-count census IPUMS microdata databases for the 1830-1870 censuses and a 10-percent IPUMS sample of the 1880 census. These datasets allowed us to model couples' recent net marital fertility, thereby avoiding the inherent ambiguity in county-level CWR models as to whether the mechanism linking fertility and independent variables was via adjustments to the timing and incidence of marriage or via couples' conscious practice of marital fertility control. Our couple-level models, which employed state-level fixed effects to control for unobserved spatial heterogeneity, also allowed us to construct more comprehensive tests of hypotheses while minimizing ecological biases.

Despite the strong influence of nuptiality on fertility differentials in early census years, we found evidence of marital fertility control consistent with hypotheses as early as the period 1835-40. Farm couples, for example, had more children under the age of five in the 1840 census than non-farm couples, all else being equal, suggesting that couples adjusted their childbearing in response to differentials in the perceived costs and benefits of children by husbands' occupation. We note, however, that lower childbearing rates among wealthier couples in years with individual-level wealth data (1850-1870) is inconsistent with the land availability hypothesis. Banks proved to be a significant correlate of marital fertility in all census years, even in state-fixed effects models with controls for urbanization and a wide range of demographic and economic variables, providing strong and consistent support for the life-cycle savings hypothesis. Although the cross-sectional models used in this study do not allow us to make causal estimates, we conclude that the evidence is consistent with the hypothesis that banks facilitated financial savings, lowering couples' incentives for having a large number of children as an alternative way to save for old age.

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Figure 1. White woman-child ratios in the United States, 1800-1880

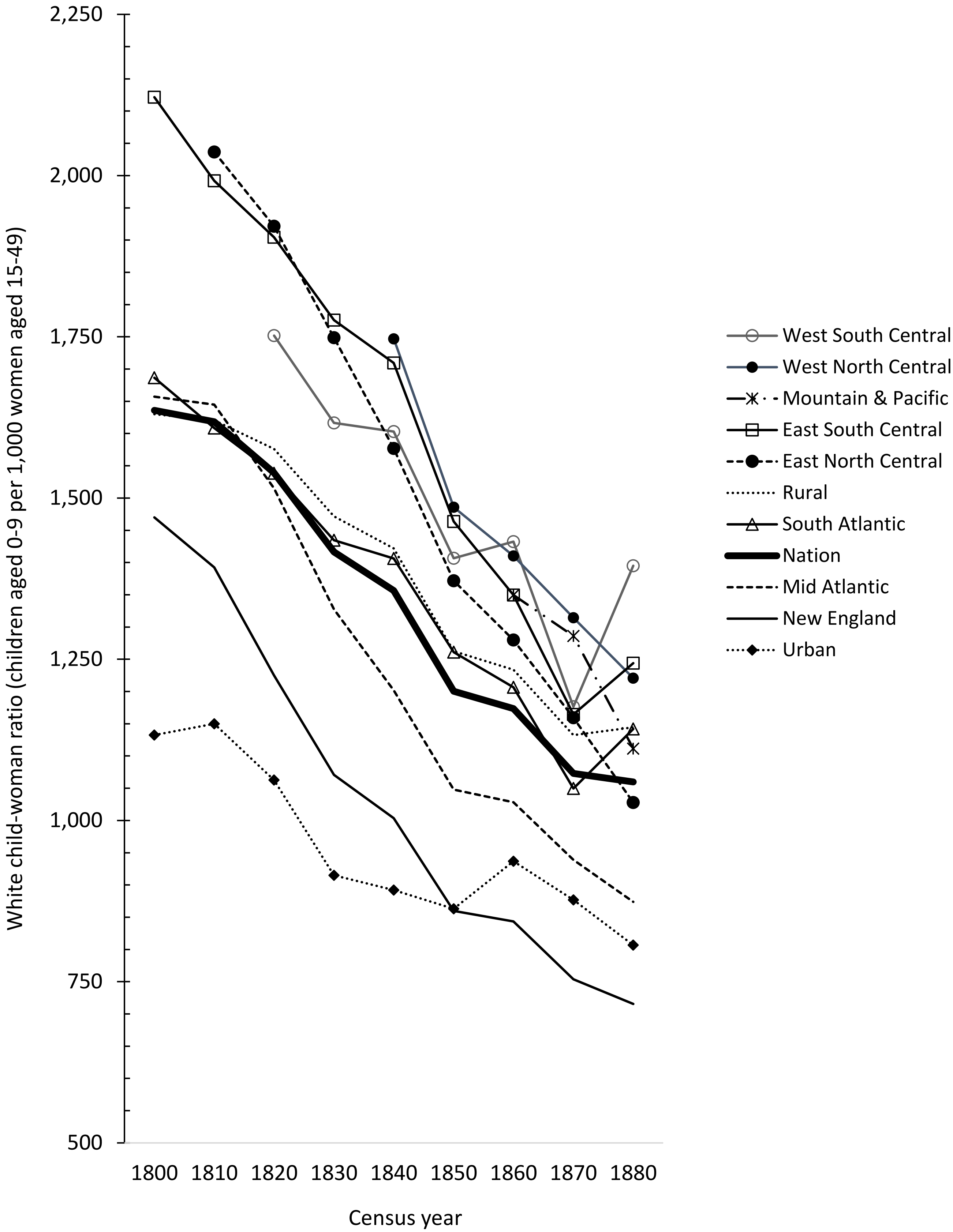

Table 1. Parsimonious OLS county-level regressions of white child-woman ratio (CWR), 1800-1880

	Census year								
	1800	1810	1820	1830	1840	1850	1860	1870	1880
Proportion male	160.9 ***	125.3 ***	34.6 *	15.9	-87.4 ***	-64.5 ***	-90.6 ***	-2.6	-36.1 *
Population density	-1.64 **	-1.84 ***	-2.61 ***	-3.94 ***	-4.01 ***	-3.45 ***	-3.32 ***	-1.04	-1.74
Proportion urban	-29.7 ***	-23.7 ***	-22.9 ***	-14.1 ***	-14.1 ***	-10.2 **	-16.9 ***	-14.4 ***	-16.3 ***
Proportion non-white	-58.7 ***	-49.5 ***	-40.6 ***	-38.4 ***	-23.6 ***	-24.0 ***	-27.1 ***	-40.9 ***	-30.1 ***
Census division									
New England	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Middle Atlantic	7.9 ***	10.6 ***	17.1 ***	14.7 ***	12.5 ***	12.4 ***	14.5 ***	15.9 ***	13.6 ***
East North Central	7.5	20.8 ***	29.5 ***	30.3 ***	26.3 ***	23.8 ***	27.6 ***	27.5 ***	20.3 ***
West North Central		23.8 ***	32.4 ***	42.5 ***	36.2 ***	32.0 ***	33.0 ***	33.9 ***	30.7 ***
South Atlantic	22.0 ***	22.3 ***	29.6 ***	27.1 ***	23.6 ***	22.8 ***	28.5 ***	25.7 ***	33.9 ***
East South Central	33.8 ***	31.6 ***	39.8 ***	40.3 ***	39.3 ***	31.7 ***	34.5 ***	30.7 ***	36.4 ***
West South Central		26.6 ***	34.4 ***	36.2 ***	43.3 ***	35.2 ***	45.5 ***	34.5 ***	49.3 ***
Mountain						-5.5	32.8 ***	27.3 ***	29.8 ***
Pacific						12.7	54.2 ***	53.5 ***	33.1 ***
Banking availability									
No banks in county	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
1 bank	-3.8	-3.9 ***	-1.9	-5.5 ***	-4.5 ***	-8.9 ***	-4.0 ***	-5.0 ***	-7.6 ***
2 banks	-3.2	-4.4	-6.2 ***	-9.3 ***	-8.2 ***	-10.2 ***	-6.0 ***	-7.8 ***	-12.6 ***
3 banks	-5.8	-6.3 *	-5.5 *	-9.2 ***	-11.4 ***	-14.8 ***	-6.5 ***	-11.4 ***	-14.4 ***
4 or more banks		-5.2	-1.8	-8.0 ***	-9.8 ***	-15.7 ***	-7.3 ***	-11.4 ***	-16.2 ***
Mean Child-Woman ratio	1,963	1,978	1,932	1,651	1,574	1,393	1,367	1,197	1,252
Number of counties	410	563	753	976	1,276	1,614	2,042	2,241	2,528
R-square	0.689	0.691	0.637	0.697	0.582	0.499	0.486	0.455	0.462

Notes: Child-woman ratio is the number of white children aged 0-9 per thousand white women aged 16-44 in census years 1800-1820 and the number of white children aged 0-9 per thousand white women aged 15-49 in census years 1830-1880. The proportion male is the proportion of white population age 15-49 in the county that was male. Population density is the natural log of the total population per thousand square miles. Proportion urban is the proportion of the population in the county living in places with 2,500 or more inhabitants. Proportion nonwhite population is the proportion of the population black, Indian or Chinese. Census divisions include the following states: New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont); Middle Atlantic (New Jersey, New York, Pennsylvania); East North Central (Illinois, Indiana, Michigan, Ohio, Wisconsin); West North Central (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota); South Atlantic (Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia, and the District of Columbia); East South Central (Alabama, Kentucky, Mississippi, Tennessee); West South Central (Arkansas, Louisiana, Oklahoma/Indian Territory, Texas); Mountain (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming); Pacific (California, Oregon, Washington).

Table 2. Full county-level OLS regressions of white child-woman ratio (CWR), 1800-1880

	Census year								
	1800	1810	1820	1830	1840	1850	1860	1870	1880
Proportion male	160.86 ***	125.30 ***	62.85 ***	15.91	-12.83	-39.39 **	-80.05 ***	-52.05 ***	-49.66 ***
Population density	-1.64 **	-1.84 ***	-1.73 ***	-3.94 ***	-2.23 ***	-0.72	-0.07	-1.22	-0.44
Proportion urban	-29.7 ***	-23.7 ***	-7.2	-14.1 ***	-1.8	2.0	-8.7 ***	-7.8 ***	-7.3 ***
Proportion non-white	-58.7 ***	-49.5 ***	-44.7 ***	-38.4 ***	-24.6 ***	-9.7 ***	-10.9 ***	-24.6 ***	-22.1 ***
Proportion non-agricultural			-30.4 ***		-25.6 ***				
Proportion farmers						5.4 ***	6.3 **	8.8 ***	25.1 ***
Transportation					-4.6 ***	-2.8 ***	-1.0 *		
Proportion foreign born						-40.0 ***	-6.4	25.6 ***	26.5 ***
Proportion literate					-14.4 ***	-8.2 ***	-11.2 ***	0.6	-6.9 *
Proportion in manufacturing						-2.2	1.5	16.3 **	17.6
Wealth per capita						0.107	0.198	-0.551	
Average farm value per acre						0.29	-2.60 ***	-0.80	-2.21 ***
Proportion of farm acres improved						-12.4 ***	-6.0 **	-1.0	-9.3 ***
Proportion liberal/individualistic churches						-6.7 ***	-9.9 ***	-12.7 ***	
Relative wage laborer to farmhand						-5.8 **	13.9 ***		
Proportion attending school						-10.9 ***	-2.3	0.0	1.8
Proportion women currently married						128.9 ***	116.9 ***	103.0 ***	44.1 ***
Single women's labor force participation							-4.7 ***	-15.2 ***	-11.2 ***
Census division									
New England	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Middle Atlantic	7.9 ***	10.6 ***	16.6 ***	14.7 ***	13.0 ***	9.1 ***	11.7 ***	13.3 ***	16.0 ***
East North Central	7.5	20.8 ***	26.7 ***	30.3 ***	21.7 ***	11.4 ***	17.9 ***	19.1 ***	18.5 ***
West North Central		23.8 ***	30.0 ***	42.5 ***	30.9 ***	13.7 ***	17.1 ***	24.5 ***	25.0 ***
South Atlantic	22.0 ***	22.3 ***	27.3 ***	27.1 ***	18.8 ***	11.8 ***	18.7 ***	22.8 ***	29.2 ***
East South Central	33.8 ***	31.6 ***	36.4 ***	40.3 ***	32.4 ***	14.6 ***	22.5 ***	26.1 ***	30.3 ***
West South Central		26.6 ***	30.8 ***	36.2 ***	36.6 ***	14.2 ***	27.3 ***	23.5 ***	39.3 ***
Mountain						-3.2	39.6 ***	20.3 ***	33.7 ***
Pacific						17.3 ***	36.3 ***	35.5 ***	31.2 ***
Banking availability									
No banks in county	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
1 bank in county	-3.8	-3.9 ***	-1.6	-5.5 ***	-2.9 ***	-2.7 ***	-0.8	-2.1 ***	-3.9 ***
2 banks in county	-3.2	-4.4	-5.1 ***	-9.3 ***	-7.3 ***	-4.3 ***	-3.1 ***	-4.0 ***	-7.1 ***
3 banks in county	-5.8	-6.3 *	-4.9 *	-9.2 ***	-8.5 ***	-6.7 ***	-4.2 ***	-6.7 ***	-8.4 ***
4 or more banks in county		-5.2	0.0	-8.0 ***	-7.0 ***	-5.5 ***	-3.7 ***	-6.9 ***	-9.8 ***
Mean Child-Woman ratio	1,963	1,978	1,932	1,651	1,574	1,393	1,367	1,197	1,252
Number of counties	410	563	749	976	1,236	1,461	1,980	2,056	2,454
R-square	0.689	0.691	0.662	0.697	0.643	0.793	0.720	0.703	0.728

Notes: See table 1 for definition of child-woman ratio, proportion male, proportion non-white, proportion urban and census division. Proportion non-agricultural is the proportion of the white labor force engaged in non-agricultural occupations. Proportion farmers is the proportion of the white male population aged 20 & over engaged in farming. Transportation is a dummy variable indicating if the county was on a canal, river, or other navigable waterway in 1840 and if on a canal, river, or other navigable waterway or had a railroad in 1850 and 1860. Proportion foreign born in the proportion of the white population born in a foreign country. Proportion literate is percent of white population aged 20 and over who were able to read and write. Proportion manufacturing is the proportion of the white population age 15-69 employed in manufacturing. Wealth per capita is total real estate wealth per capita in 1850 and combined real and personal estate wealth in 1860 and 1870 in thousands of dollars. Average farm value per acre is the natural log of the value in hundreds of dollars and includes improved and unimproved acreage. Proportion "liberal/individualistic" churches is the proportion of all church accomodations Congregationalist, Presbyterian, Unitarian and Universalist. Relative wage is the ratio of the average wage of common laborers to the average for farmhands and is a state-level variable. Proportion attending school is the proportion of white children age 5-17 attending school. Proportion women currently married is the proportion of white women aged 20-49 with spouse present in household.

Table 3. Parsimonious couple-level OLS regressions of children less than five in household, 1830-1850

	Census year							
	1830		1840		1850		1850	
Analytical unit	imputed nuclear households		imputed nuclear households		imputed nuclear households		imputed couples	
Age group of imputed wife								
15-19	-66.1	***	-67.6	***	-67.8	***	-68.1	***
20-29	*ref.*		*ref.*		*ref.*		*ref.*	
30-39	11.7	***	10.5	***	2.4	***	2.1	***
40-49	-44.9	***	-47.5	***	-52.6	***	-53.5	***
Residence type								
Rural	*ref.*		*ref.*		*ref.*		*ref.*	
Urban, population less than 10,000	-12.8	***	-10.8	***	-13.2	***	-13.3	***
Urban, 10,000 - 24,999	-17.8	***	-13.8	***	-9.3	***	-9.3	***
Urban, 25,000 - 99,999	-16.7	***	-13.6	***	-13.7	***	-13.7	***
Urban, 100,00 or more	-16.6	***	-11.9	***	-14.5	***	-14.5	***
Bank availability								
No banks in county	*ref.*		*ref.*		*ref.*		*ref.*	
1 bank in county	-4.4	***	-5.3	***	-7.4	***	-7.4	***
2 banks in county	-6.8	***	-6.7	***	-8.5	***	-8.4	***
3 banks in county	-4.4	***	-8.8	***	-10.0	***	-9.9	***
4 or more banks in county	-7.2	***	-8.7	***	-10.5	***	-10.5	***
Mean number of children age 0-4	1.44		1.35		1.17		1.17	
Number of couples	609,158		891,204		1,124,656		1,112,421	
R-square	0.095		0.088		0.073		0.072	

Notes: All models employ state-level fixed effects. The analytical universe in all models was limited to imputed nuclear households with one white couple present. See text for definition and selection criteria. The dependent variable is the total number of white children ages 0-4 in household. The second 1850 model is futher limited to couples identified using the IPUMS SPLOC (spouse location) variable. The dependent varaible is the IPUMS variable NCHLT5, the number of women's own children less than age five in the household, constructed by the IPUMS project using individuals' surnames, ages, and positions in household.

Table 4. Full couple-level OLS regressions of children less than five in household, 1830-1850

	Census year			
Year	1830	1840	1850	1850
Analytical unit	imputed nuclear households	imputed nuclear households	imputed nuclear households	IPUMS imputed couples
Age group of imputed wife				
15-19	-66.1 ***	-67.6 ***	-66.5 ***	-76.4 ***
20-29	*ref.*	*ref.*	*ref.*	*ref.*
30-39	11.7 ***	10.2 ***	0.9 ***	1.4 ***
40-49	-44.8 ***	-47.8 ***	-54.1 ***	-54.8 ***
Occupation group of males in household				
Agricultural		*ref.*	*ref.*	*ref.*
Professional, engineering		-23.3 ***	-14.3 ***	-16.4 ***
Commercial		-16.8 ***	-10.2 ***	-14.5 ***
Manufacturing		-7.3 ***	-1.9 ***	-6.7 ***
Mining		-3.7 ***	8.1 ***	-0.3
Navigational		-11.0 ***	-5.4 ***	-8.6 ***
No occupation		-7.8 ***	27.6 ***	-14.2 ***
Mixed occupations		-1.8 ***	-4.7 ***	
Literacy of household members 20 & over				
One or more illiterate		*ref.*	*ref.*	*ref.*
Both literate		-7.6 ***	-2.7 ***	-11.2 ***
Nativity				
Native-born couple	*ref.*		*ref.*	*ref.*
Foreign-born couple	-0.8		-0.2	1.2
Slave holdings				
No slaves in household	*ref.*	*ref.*		
Less than 20 slaves	-4.6 ***	-1.9 ***		
20 or more slaves	-14.9 ***	-10.7 ***		
Real estate wealth				
None			-9.6 ***	-7.8 ***
Moderate ($100 - $2499)			*ref.*	*ref.*
High ($2500 or more)			-6.5 ***	-4.4 ***
Residence type				
Rural	*ref.*	*ref.*	*ref.*	*ref.*
Urban, population less than 10,000	-12.7 ***	-6.5 ***	-10.5 ***	-8.2 ***
Urban, 10,000 - 24,999	-17.7 ***	-9.2 ***	-7.3 ***	-5.8 ***
Urban, 25,000 - 99,999	-16.7 ***	-10.0 ***	-10.8 ***	-10.1 ***
Urban, 100,00 or more	-16.5 ***	-8.2 ***	-11.7 ***	-11.2 ***
Transportation		-3.9 ***	-6.7 ***	-5.1 ***
School attendance, whites age 5-17			-19.2 ***	-18.7 ***

Bank availability				
No banks in county	*ref.*	*ref.*	*ref.*	*ref.*
1 bank in county	-4.3 ***	-3.7 ***	-5.7 ***	-4.0 ***
2 banks in county	-6.6 ***	-4.0 ***	-6.1 ***	-4.5 ***
3 banks in county	-4.3 ***	-5.7 ***	-8.2 ***	-6.4 ***
4 or more banks in county	-7.1 ***	-5.3 ***	-8.4 ***	-6.8 ***
Mean number of children age 0-4	1.44	1.35	1.17	1.17
Number of couples	609,158	891,204	1,122,548	1,110,374
R-square	0.096	0.093	0.090	0.082

Notes: All models employ state-level fixed effects. See table 3 for universe selection criteria. For the IPUMS imputed couple model for 1850, occupation, nativity, and literacy values were taken from the wives and spouses' individual records, rather than based on the values for aggegated household members. Foreign-born couples include couples with one or both partners foreign born. Literate couples include only couples in which both partners could read and write. Population density and transportation were taken from the county-level datasets. The dollar figure to define the cutoff between moderate and high wealth couples was chosen to classify approximately 10 percent of all couples as high wealth. In 1850, high real estate wealth couples reported $2500 or more in real estate wealth.

Table 5. Parsimonious couple-level OLS regressions of own children less than five in household, 1850-1880

	Census year							
	1850		1860		1870		1880	
Age group of imputed wife								
15-19	-71.0	***	-72.3	***	-61.0	***	-61.4	***
20-24	*ref.*		*ref.*		*ref.*		*ref.*	
25-29	27.5	***	22.3	***	23.2	***	22.5	***
30-34	20.2	***	12.4	***	11.8	***	7.9	***
35-39	4.0	***	-7.5	***	-8.3	***	-15.7	***
40-44	-29.4	***	-41.7	***	-43.8	***	-53.4	***
45-49	-74.7	***	-84.5	***	-86.8	***	-96.0	***
Age differential from spouse	-0.1	***	-0.2	***	-0.2	***	-0.6	***
Occupation group of spouse (1950 classification)								
Professional	-17.5	***	-18.4	***	-22.3	***	-23.2	***
Farmer	*ref.*		*ref.*		*ref.*		*ref.*	
Manager-Official-Proprietor	-14.9	***	-16.1	***	-20.1	***	-22.6	***
Clerial & Sales	-20.1	***	-19.6	***	-24.0	***	-25.6	***
Craftsmen	-8.9	***	-8.6	***	-12.6	***	-12.6	***
Operatives & Apprentices	-9.7	***	-9.9	***	-12.2	***	-11.5	***
Service Worker	-15.1	***	-16.3	***	-20.1	***	-19.7	***
Farm Laborer	-49.8	***	-8.3	***	-9.8	***	-12.3	***
Laborers	-7.0	***	-7.1	***	-10.4	***	-6.5	***
Miners	-2.2	**	-3.8	***	-2.2	***	3.1	**
Non-Occupational Response	-31.6	***	-13.3	***	-22.3	***	-26.7	***
Literacy of couple								
One or both spouses cannot read or write	*ref.*		*ref.*		*ref.*		*ref.*	
Both spouses can read and write	-11.3	***	-11.7	***	-9.3	***	-10.2	***
Nativity of couple								
Both spouses native born								
One or both spouses born Germany	0.4		21.3	***	30.1	***	34.7	***
One or both spouses born Ireland	2.5	***	22.2	***	29.2	***	28.7	***
One or both spouses born Great Britain	1.5	***	8.3	***	9.7	***	13.1	***
One or both spouses born Canada	13.1	***	15.5	***	17.4	***	18.1	***
One or both spouses other foreign born	-4.0	***	15.5	***	18.4	***	26.1	***

Residence type								
Rural	*ref.*		*ref.*		*ref.*		*ref.*	
Urban, population less than 10,000	-8.2	***	-8.9	***	-8.5	***	-8.0	***
Urban, 10,000 - 24,999	-6.5	***	-9.0	***	-8.2	***	-7.1	***
Urban, 25,000 - 99,999	-8.2	***	-7.8	***	-7.6	***	-7.0	***
Urban, 100,00 or more	-6.4	***	-12.7	***	-7.5	***	-5.8	***
Additional county-level control variables								
School attendance, whites age 5-17	-17.9	***	-9.8	***	-7.7	***	-11.3	***
Proportion of labor force in manufacturing	-17.5	***	-10.4	***	-41.2	***	-23.9	***
Average farm value per acre (ln)	-1.2	***	-0.2	**	-0.7	***	-1.3	***
Proportion of farm acres improved	-9.0	***	-10.4	***	-10.1	***	-8.8	***
Bank availability								
No banks in county	*ref.*		*ref.*		*ref.*		*ref.*	
1 bank in county	-4.4	***	-3.1	***	-2.4	***	-3.1	***
2 banks in county	-5.3	***	-5.0	***	-3.9	***	-3.9	***
3 banks in county	-6.6	***	-4.9	***	-5.4	***	-6.1	***
4 or more banks in county	-5.8	***	-6.2	***	-5.6	***	-6.2	***
Mean number of children age 0-4	0.994		0.991		0.907		0.875	
Number of couples	2,590,117		3,679,139		4,578,768		630,420	
R-square	0.135		0.145		0.141		0.151	

Notes: All models employ state-level fixed effects. See Tables 1 and 2 for definitions of county-level variables. See www.ipums.org for dicussion of occupation (OCC1950) and size of place (SIZEPL).

Table 6. Full couple-level OLS regressions of own children less than five in household, 1850-1880

	Census year							
	1850		1860		1870		1880	
Age group of imputed wife								
15-19	-70.3	***	-70.5	***	-59.4	***	-61.3	***
20-24	*ref.*		*ref.*		*ref.*		*ref.*	
25-29	27.1	***	21.7	***	22.4	***	22.4	***
30-34	19.5	***	11.4	***	10.6	***	7.8	***
35-39	3.2	***	-8.6	***	-9.6	***	-15.7	***
40-44	-30.2	***	-42.8	***	-45.3	***	-53.4	***
45-49	-75.6	***	-85.7	***	-88.4	***	-96.0	***
Age differential from spouse	-0.1	***	-0.2	***	-0.2	***	-0.6	***
Labor force participation of mother			-9.7	***	-35.2	***	-37.8	***
Occupation group of spouse (1950 classification)								
Professional	-16.4	***	-17.1	***	-20.4	***	-22.5	***
Farmer	*ref.*		*ref.*		*ref.*		*ref.*	
Manager-Official-Proprietor	-13.9	***	-15.4	***	-18.0	***	-22.2	***
Clerial & Sales	-18.6	***	-18.1	***	-21.8	***	-25.0	***
Craftsmen	-8.1	***	-7.5	***	-11.0	***	-12.0	***
Operatives & Apprentices	-8.7	***	-8.4	***	-9.7	***	-10.6	***
Service Worker	-13.8	***	-14.3	***	-16.6	***	-18.3	***
Farm Laborer	-46.6	***	-4.6	***	-5.2	***	-11.4	***
Laborers	-4.6	***	-3.8	***	-6.8	***	-5.9	***
Miners	0.0		-1.6	**	1.4	***	3.2	**
Non-Occupational Response	-29.9	***	-9.9	***	-17.2	***	-25.7	***
Literacy of couple								
One or both spouses cannot read or write	*ref.*		*ref.*		*ref.*		*ref.*	
Both spouses can read and write	-11.2	***	-11.3	***	-9.6	***	-10.3	***
Nativity of couple								
Both spouses native born	*ref.*		*ref.*		*ref.*		*ref.*	
One or both spouses born Germany	0.4		21.3	***	29.5	***	34.6	***
One or both spouses born Ireland	2.8	***	23.4	***	29.6	***	28.7	***
One or both spouses born Great Britain	1.9	***	8.9	***	10.2	***	13.5	***
One or both spouses born Canada	13.9	***	16.3	***	18.1	***	18.4	***

One or both spouses other foreign born	-3.2	***	16.0	***	19.2	***	26.2	***
Couples' combined real estate wealth								
None	-7.1	***	-3.8	***	-4.5	***		
Moderate	*ref.*		*ref.*		*ref.*			
High	-5.4	***	-3.1	***	-4.1	***		
Couples' combined personal estate wealth								
None			-10.5	***	-7.0	***		
Moderate			*ref.*		*ref.*			
High			-2.4	***	-5.0	***		
Residence type								
Rural	*ref.*		*ref.*		*ref.*		*ref.*	
Urban, population less than 10,000	-7.6	***	-7.8	***	-7.9	***	-7.9	***
Urban, 10,000 - 24,999	-5.7	***	-8.4	***	-6.6	***	-7.0	***
Urban, 25,000 - 99,999	-7.8	***	-6.4	***	-6.5	***	-6.7	***
Urban, 100,00 or more	-7.5	***	-12.7	***	-6.4	***	-5.8	***
Additional county-level control variables								
Transportation	-5.1	***	-5.4	***				
School attendance, whites age 5-17	-16.9	***	-10.6	***	-10.5	***	-11.2	***
Proportion of labor force in manufacturing	-10.8	***	-4.6	***	-35.1	***	-20.2	***
Average farm value per acre (ln)	-0.4	***	0.4	***	-0.2	***	-1.3	***
Proportion of farm acres improved	-8.8	***	-6.8	***	-9.0	***	-8.7	***
Proportion liberal/pietistic churches	-8.4	***	-12.2	***	-4.4	***		
Bank availability								
No banks in county	*ref.*		*ref.*		*ref.*		*ref.*	
1 bank in county	-3.5	***	-2.2	***	-2.1	***	-3.1	***
2 banks in county	-4.4	***	-4.2	***	-3.6	***	-3.9	***
3 banks in county	-5.5	***	-3.9	***	-5.2	***	-6.2	***
4 or more banks in county	-5.1	***	-5.2	***	-5.3	***	-6.3	***
Mean number of children age 0-4	0.993		0.991		0.906		0.875	
Number of couples	2,554,825		3,647,177		4,551,750		630,420	
R-square	0.136		0.148		0.145		0.153	

Notes: Notes: All models employ state-level fixed effects. See Tables 1 and 2 for definitions of county-level variables. See www.ipums.org for dicussion of occupation (OCC1950) and size of place (SIZEPL). The dollar figure to define the cutoff between moderate and high wealth couples was chosen to classify approximately 10 percent of all couples as high wealth. In 1850, high real estate wealth couples reported $2500 or more in real estate wealth. In 1860, couples with high real estate wealth reported $3500 or more in real estate wealth, while couples with high personal estate wealth reported $2000 or more in personal estate. In 1870, couples with high real estate wealth reported $5000 or more in real estate, while couples with high personal estate wealth reported $2000 or more in personal estate.

Table A-1. Means of variables in county-level regression models

	Census year								
	1800	1810	1820	1830	1840	1850	1860	1870	1880
Child-Woman Ratio	1962.9	1978.2	1931.9	1650.8	1573.6	1392.5	1367.0	1196.8	1252.5
Proportion male	0.512	0.511	0.516	0.519	0.527	0.520	0.535	0.511	0.531
Population density	2.538	2.497	2.487	2.454	2.623	2.802	2.671	2.916	2.911
Proportion urban	0.022	0.023	0.020	0.023	0.026	0.040	0.048	0.074	0.084
Proportion non-white	0.226	0.228	0.209	0.210	0.195	0.194	0.175	0.169	0.161
Proportion non-agricultural			0.131		0.160				
Proportion farmers						0.530	0.368	0.386	0.414
Transportation					0.494	0.561	0.610		
Proportion foreign born						0.053	0.088	0.095	0.104
Proportion literate					0.850	0.832	0.875	0.925	0.900
Proportion in manufacturing						0.039	0.037	0.030	0.020
Wealth per capita						0.210	0.846	0.591	
Average farm value per acre ($100)						1.974	2.361	2.429	2.372
Proportion farm acres improved						0.382	0.381	0.430	0.490
Proportion liberal/individualistic churches						0.175	0.121	0.176	
Relative wage laborer to farmhand						1.356	1.354		
Proportion attending school						0.475	0.505	0.450	0.492
Proportion women currently married						0.582	0.600	0.569	0.609
Single women's labor force participation							0.318	0.258	0.259
Census division									
New England	0.115	0.091	0.073	0.059	0.050	0.044	0.034	0.033	0.027
Middle Atlantic	0.180	0.174	0.152	0.124	0.104	0.097	0.074	0.071	0.060
East North Central	0.020	0.075	0.156	0.201	0.245	0.222	0.197	0.194	0.171
West North Central		0.009	0.020	0.033	0.061	0.074	0.154	0.145	0.196
South Atlantic	0.537	0.437	0.346	0.317	0.272	0.259	0.229	0.226	0.196
East South Central	0.149	0.179	0.211	0.212	0.211	0.194	0.153	0.157	0.143
West South Central		0.036	0.041	0.054	0.057	0.093	0.112	0.107	0.122
Mountain						0.009	0.011	0.029	0.046
Pacific						0.008	0.037	0.037	0.040
Banking availability									
No banks in county	0.954	0.872	0.784	0.826	0.761	0.804	0.728	0.716	0.644
1 bank in county	0.029	0.092	0.144	0.109	0.129	0.100	0.134	0.116	0.131
2 banks in county	0.015	0.014	0.037	0.026	0.049	0.036	0.050	0.062	0.093
3 banks in county	0.002	0.009	0.013	0.013	0.022	0.018	0.029	0.041	0.040
4 or more banks in county		0.012	0.021	0.027	0.040	0.042	0.059	0.065	0.092
Number of counties	410	563	749	976	1,236	1,461	1,980	2,056	2,454

Notes: See notes Tables 1 & 2 for variable definitions.

Table A2. Means of variables in household-level regressions, 1830-1880

Analytical unit	1830 imputed nuclear households	1840 imputed nuclear households	1850 imputed nuclear households	1850 imputed couples
Dependent variable (number of children age 0-4)	1.441	1.348	1.172	1.165
Age group of imputed wife				
15-19	0.079	0.073	0.057	0.056
20-29	0.559	0.553	0.540	0.541
30-39	0.308	0.315	0.339	0.339
40-49	0.054	0.058	0.064	0.063
Occupation group of spouse (1950 classification)				
Professional		0.012	0.026	0.026
Farmer		0.592	0.549	0.637
Commercial		0.016	0.051	0.050
Manufacturing		0.181	0.254	0.259
Mining		0.004	0.006	0.006
Navigation		0.016	0.009	0.013
Mixed occupations		0.153	0.005	0.000
Non-Occupational Response		0.026	0.100	0.008
Foreign-born household	0.020		0.209	0.206
Illiterate household		0.858	0.785	0.780
Wealth				
Non slave-owning household	0.892	0.913		
Slave-owning household (1-19 slaves)	0.103	0.082		
Slave-owning household (20 or more slaves)	0.005	0.005		
No real estate wealth			0.541	0.547
Moderate real estate wealth			0.360	0.364
High real estate wealth			0.099	0.088
Residence type				
Rural	0.930	0.898	0.856	

Urban, population less than 10,000	0.023	0.029	0.027	0.027
Urban, 10,000 - 24,999	0.016	0.023	0.025	0.025
Urban, 25,000 - 99,999	0.015	0.024	0.041	0.041
Urban, 100,00 or more	0.016	0.026	0.051	0.050
Additional county-level control variables				
Transportation		0.644	0.735	0.734
School attendance, whites age 5-17			0.579	0.579
Bank availability				
No banks in county	0.599	0.470	0.510	0.511
1 bank in county	0.202	0.183	0.155	0.155
2 banks in county	0.055	0.108	0.068	0.068
3 banks in county	0.039	0.058	0.047	0.047
4 or more banks in county	0.106	0.182	0.219	0.219
Number of households/couples	609,158	891,204	1,124,656	1,112,421

Notes: See notes Tables 3 & 4.

Table A3. Means of variables in the couple-level regressions, 1850-1880

	Census year			
	1850	1860	1870	1880
Dependent variable (number of children age 0-	0.993	0.991	0.906	0.875
Age group of imputed wife				
15-19	0.047	0.045	0.040	0.037
20-24	0.182	0.174	0.165	0.164
25-29	0.210	0.211	0.199	0.199
30-34	0.186	0.193	0.185	0.185
35-39	0.156	0.158	0.169	0.169
40-44	0.126	0.126	0.137	0.137
45-49	0.093	0.093	0.106	0.110
Age differential from spouse	4.645	4.876	5.206	5.243
Labor force participation of mother		0.051	0.017	0.017
Occupation group of spouse (1950 classification)				
Professional	0.031	0.030	0.029	0.036
Farmer	0.494	0.391	0.398	0.413
Manager-Official-Proprietor	0.059	0.064	0.070	0.080
Clerial & Sales	0.013	0.019	0.029	0.041
Craftsmen	0.174	0.171	0.153	0.137
Operatives & Apprentices	0.085	0.068	0.095	0.104
Service Worker	0.005	0.010	0.012	0.013
Farm Laborer	0.004	0.034	0.068	0.036
Laborers	0.119	0.107	0.098	0.106
Miners	0.005	0.007	0.012	0.014
Non-Occupational Response	0.011	0.098	0.037	0.018
Literacy of couple				
One or both spouses cannot read or write				
Both spouses can read and write	0.829	0.858	0.853	0.898
Nativity of couple				
Both spouses native born	0.807	0.713	0.679	0.701
One or both spouses born Germany	0.055	0.084	0.102	0.096
One or both spouses born Ireland	0.076	0.113	0.108	0.079

One or both spouses born Great Britain	0.039	0.046	0.048	0.044
One or both spouses born Canada	0.013	0.018	0.027	0.033
One or both spouses other foreign born	0.010	0.026	0.035	0.048
Couples' combined real estate wealth				
None	0.491	0.468	0.482	
Moderate	0.395	0.413	0.407	
High	0.114	0.119	0.112	
Couples' combined personal estate wealth				
None		0.194	0.297	
Moderate		0.703	0.608	
High		0.102	0.094	
Residence type				
Rural	0.839	0.790	0.746	0.714
Urban, population less than 10,000	0.030	0.044	0.051	0.059
Urban, 10,000 - 24,999	0.028	0.030	0.042	0.041
Urban, 25,000 - 99,999	0.045	0.041	0.049	0.050
Urban, 100,00 or more	0.059	0.095	0.113	0.135
Additional county-level control variables				
Transportation	0.764	0.832		
School attendance, whites age 5-17	0.590	0.610	0.581	0.569
Proportion of labor force in manufacturing	0.081	0.076	0.058	0.059
Average farm value per acre (ln)	2.873	3.344	3.627	3.350
Proportion of farm acres improved	0.526	0.553	0.596	0.640
Proportion liberal/pietistic churches	0.262	0.192	0.236	
Relative wage laborer to farmhand	1.359	1.380		
Census division				
New England	0.143	0.118	0.105	0.089
Middle Atlantic	0.306	0.279	0.265	0.232
East North Central	0.241	0.267	0.281	0.251
West North Central	0.038	0.082	0.114	0.137
South Atlantic	0.132	0.105	0.091	0.109
East South Central	0.110	0.093	0.082	0.086
West South Central	0.026	0.040	0.037	0.057
Mountain	0.003	0.004	0.007	0.015

Pacific	0.001	0.012	0.017	0.023
Bank availability				
No banks in county	0.468	0.390	0.330	0.321
1 bank in county	0.158	0.163	0.136	0.121
2 banks in county	0.073	0.086	0.102	0.118
3 banks in county	0.051	0.050	0.084	0.068
4 or more banks in county	0.248	0.311	0.347	0.372
Number of couples	2,554,825	3,647,177	4,551,750	630,420

Notes: See notes Tables 5 & 6.