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ABSTRACT

All nations that can be characterized as developed have undergone the demographic transition from high to low levels of fertility and mortality. Most presently developed nations began their fertility transitions in the late nineteenth or early twentieth centuries. The United States was an exception. Evidence using census-based child-woman ratios suggests that the fertility of the white population of the United States was declining from at least the year 1800. By the end of the antebellum period in 1860, child-woman ratios had declined 33 percent. There is also indication that the free black population was experiencing a fertility transition. This transition was well in advance of significant urbanization, industrialization, and mortality decline and well in advance of every other presently developed nation with the exception of France. This paper uses census data on county-level child-woman ratios to test a variety of explanations on the antebellum American fertility transition. It also uses micro data from the IPUMS files for 1850 and 1860. A number of the explanations, including the land availability hypothesis, the local labor market-child default hypothesis, and the life cycle saving hypothesis, are consistent with the data, but nuptiality, not one of the usual explanations, emerges as likely very important.

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INTRODUCTION

All nations that can be characterized as developed have undergone the demographic transition from high to low levels of fertility and mortality. Most presently developed nations began their fertility transitions in the late nineteenth or early twentieth centuries [Coale and Watkins, 1986, ch. 1]. The United States was an exception. Evidence using census-based child-woman ratios suggests that the fertility of the white population of the United States was declining from at least the year 1800. By the end of the antebellum period in 1860, child-woman ratios had declined 33 percent. There is also indication that the free black population was experiencing a fertility transition. This transition was well in advance of significant urbanization, industrialization, and mortality decline and well in advance of every other presently developed nation with the exception of France. Therein lies the puzzle.

Unfortunately, attempts to solve the puzzle of early American fertility decline are hampered by a lack of reliable data. Our most comprehensive source of fertility data is census-based child-woman ratios. While having the virtue of being highly correlated with total fertility and being easily constructed at the state and county level for the white population between 1800 and 1860, child-woman ratios present significant liabilities for the study of fertility decline. One problem is their sensitivity to mortality. Two counties with identical levels of fertility and different levels of mortality will have different child-woman ratios, the county with the highest mortality having the lowest child-woman ratio. The bias can be severe. Indeed, new evidence suggests that a significant part of the national decline in child-woman ratios between 1800 and 1860 was due to increasing mortality [Hacker, 2003]. We know little about regional and urban/rural differentials in antebellum mortality, but it is likely that some of the observed geographic differentials in child-woman ratios reflect differential mortality. A second problem with child-woman ratios is their inability to distinguish the relative contribution of nuptiality (the timing and incidence of marriage) and marital fertility (fertility rates within marriage) to overall fertility. Despite these liabilities, however, economic historians have constructed elaborate theories of U.S. fertility decline that emphasize the importance of fertility control within marriage. Complex neo-Malthusian mechanisms are stressed when simple Malthusian explanations may do.[1]

This paper uses improved source data to test various theories of U.S. antebellum fertility decline. In the first part of the analysis, we rely on child-woman ratios and other county-level aggregate data from the population and economic censuses of 1800 to 1860 and the agricultural and manufacturing censuses of 1840-1860 to evaluate a number of hypotheses. Data on churches in 1850 and 1860 provide some indications of ideational differences across counties. We supplement these commonly-used data in a number of ways. We include, for example, new estimates of urbanization and the geographic areas of the counties in all census years. More critically, for the 1850 and 1860 analysis, we include aggregated estimates of nuptiality constructed from the 1850 and 1860 IPUMS samples. We are thus able to determine whether identified correlates of child-woman ratios in the antebellum period remain significant when nuptiality is included in the model—in other words, to suggest whether the correlates of child-woman ratios act as Malthusian or neo-Malthusian adjustments. We take this analysis one step further in the second part of the analysis, where we rely on the 1850 and 1860 IPUMS samples to model marital fertility at the individual level.

LITERATURE REVIEW

[1] The situation parallels that in England, where Robert Woods contends that the absence of reliable data has encouraged speculation and loose theory about the origins and causes of English fertility decline. "Hypothesis," he observes, "has run far ahead of description to the detriment of interpretation" [2000, p. 112].

Classic work on American fertility decline by Yasuba, Forster and Tucker, Easterlin, and Sundstrom and David has suggested a variety of explanations for antebellum fertility decline [Yasuba, 1962; Forster & Tucker, 1972; Easterlin, 1976; Sundstrom & David, 1988]. A leading candidate has been the land availability hypothesis, which grew out of the observed and consistent negative correlation of child-woman ratios with population density at the state level, originally proposed by Yasuba [1962]. The hypothesis was refined to a correlation with availability of agricultural land at the county level by Forster and Tucker [1972]. Implicit in the land availability hypothesis is the concept of intergenerational transfers of real property (that is, actual or potential farm sites) from parents to children in order to keep children near the parents. A further implication is that old age insurance was largely in the form of children to care for and protect aged parents. Easterlin [1976; Easterlin, Alter, and Condran, 1978] further refined the concept and used micro data from the 1860 Northern Farms Sample [Bateman and Foust, 1974] to show that the gradient of fertility from the longest settled areas to the frontier was not monotonic. Children were less valuable on the frontier in clearing land; but, once an area had been settled for a period, family sizes were large. Further confirmation of this was provided by Morton Schapiro [1986]. Marvin McInnis used small area data and micro data from the manuscripts of the Canadian censuses to demonstrate that the same phenomenon was true in mid-nineteenth century Ontario [McInnis, 1977]. A county-level study was undertaken for the state of Ohio by Don Leet [1976], who found results that supported the land availability hypothesis, although he also noted the importance of sex ratios, educational variables, and the regional composition of the population.

Another explanation, not necessarily exclusive of the first, is the proximity of other alternatives for children, notably non-agricultural employment, especially in growing urban centers. This also embodies the notion that parents were seeking to reduce the risk of child default (that is, children moving far enough away so as to be unable to provide old age care). This view was put forward by Sundstrom and David [1986] in the form of an intergenerational bargaining model, which they contrasted to the land availability model as a homeostatic theory of human fertility [Smith, 1977]. They argued that a more favorable ratio of non-agricultural to agricultural wages in a region would lead to a higher risk that children would leave the area close to the parents. An adaptation by the parents would be a larger "bribe" in terms of property, both real and financial, and smaller families would be necessary to achieve that result. Although Sundstrom and David pose this as an exclusive alternative to the land availability hypothesis, it does seem a complement rather than a substitute for the traditional theory. Recent work by Carter, Ransom, and Sutch [2004] generally agrees with this model, but also note that other life cycle factors such as increasing rates of school attendance made children economically costly for farm parents. They reject the target-bequest model implied by the land availability hypothesis. They also stress the growing importance of alternative forms of saving and wealth accumulation over the life cycle. Steven Ruggles notes, however, that a very high proportion of elderly persons were living with children in the latter half of the nineteenth century, indicating that there was no large child default. In 1850, for example, about 70% of elderly were residing with a child or children [Ruggles, 2003].

Still another hypothesis stresses the ideational view of fertility transition [e.g., Lestheaghe, 1980, 1983; D.S. Smith, 1987; Hacker, 1999]. Interest in ideational causes grew out of the finding that European nations at very different levels of socio-economic development (e.g. levels of urbanization, share of non-agricultural employment in the labor force, levels of literacy) commenced their irreversible fertility transitions within a short period of time in relation to one another (roughly 1870 to 1920) [Knodel and van de Walle, 1979]. This argues that the growing influence of secular values has changed people's willingness to control and plan family size. As an example, Lesthaeghe [1977] found that the best predictors of timing of fertility decline in Belgium were the percentages voting socialist, liberal, and communist in 1919 (positively related to early fertility decline) and the proportion of the population paying Easter dues in the Roman Catholic Church (negatively related to early fertility decline). William Leasure [1982] has proposed that greater adherence to religious denominations that encouraged greater individualism and a positive role for women in the nineteenth century (e.g., Congregationalist, Unitarians, Universalist, Presbyterians, Society of Friends) would result in earlier and more rapid fertility declines. Daniel Scott Smith [1987] found support for this argument with a study of child-woman ratios in 1860, and J. David Hacker [1999] has demonstrated similar results with the 1850 and 1880 IPUMS samples. Hacker further observed that parents' reliance on biblical names for their children—which he suggested as a possible proxy for parental religiosity—was positively correlated with marital fertility. Michael Haan [2005] has observed a similar positive relationship between biblical names and marital fertility in a sample of the Canadian census of 1881 Canada—which includes a direct question on religious affiliation—although he cautions that the use of biblical names does not correlate with "strict" and "liberal" denominations in expected ways.

While stressing various hypotheses, most historians contend that traditional structural variables from standard demographic transition theory (e.g., urbanization; industrialization; increased education, especially of women; increased women's work outside the home, etc.) played a supporting role in U.S. fertility decline [Notestein, 1953]. Vinovskis [1976] noted that interstate fertility differentials were well explained by urbanization and literacy in 1850 and 1860 and that the effects of these variables strengthened over the nineteenth century. An earlier, and often overlooked, paper by H. Yuan T'ien proposed that sex ratios (males per 100 females) could be useful in explaining differentials and changes over time [T'ien, 1958]. The logic here is that a surplus of males would create a more favorable marriage market for females with the effect that a marriage age would fall and the proportions married by age would rise. Since overall fertility was largely a function of marital fertility in the white population of the United States in the nineteenth century (and indeed much of the twentieth century), this would raise fertility, which is based on the female population. This is a conventional demographic explanation, which attempts to get at the problem of separating the effects of marriage and marital fertility.

DATA FOR THE COUNTY-LEVEL ANALYSIS

The data set used in the first part of the analysis is a compilation of (mostly) published county-level statistics for the United States from 1790 to the present. The starting point was the ICPSR data set 0003 "Historical, Demographic, Economic, and Social Data: The United States, 1790-1970." To this was added the urban population of each county. These were obtained from the original, unpublished worksheets prepared at the U.S. Bureau of the Census in the 1930s.[2] Also added were county-level areas. Before 1900, county areas only appeared in connection with the 1880 U.S. census. In order to obtain areas at earlier dates, two sources were used. The first is a collection of historical atlases of counties by state, being compiled by John Long at the Newberry Library [Long, 2001]. A total of 21 states and the District of Columbia have been completed in published form. Most of those states were older states east of the Mississippi. The only states not finished in that part of the country are New Jersey, Virginia, and Georgia. John Long kindly furnished the worksheets for New Jersey. West of the Mississippi, only Minnesota and Iowa have been published. For those states, the atlases were used. For all other states and territories, the "Historical United States County Boundary Files" (HUSCO) constructed by Carville Earle at

[2] These data are currently available as ICPSR Study Number 2896.

Louisiana State University [Earle, et al., 1999] were used. The areas were calculated by ArcView from the HUSCO files.

Other modifications were made to the ICPSR data. All territories were included, as was the District of Columbia. Checks were performed for errors in the data. All the data from the Censuses of Agriculture of 1840-1860 have been added, as has some additional data from the Censuses of Manufactures. The data on churches was merged with all the other data. Finally, we supplemented these data with estimates of women's nuptiality aggregated from the 1850-1860 IPUMS samples.[3]

AN ANALYSIS OF THE ANTEBELLUM FERTILITY TRANSITION IN THE UNITED STATES USING COUNTY-LEVEL DATA

A brief overview of the demographic transition in the United States is given in Table 1. The data suggest that the fertility transition began from at least around 1800, while the mortality transition only commenced from about the 1870s [Haines, 2000]. Table 2 provides a view of child-woman ratios estimated from census data (children aged 0-4 years per 1,000 women aged 20-44 years) by race, rural-urban residence, and region for the period 1800 to 1860. These data are also depicted in Figures 1 and 2. While it is clear that these ratios suffer from shortcomings as measures of fertility, namely that they are net of child and adult female mortality and that they also reflect relative underenumeration of young children and adult women, they are the best we have for the early nineteenth century. A comprehensive Birth Registration Area (consisting of ten states and the District of Columbia) was not formed until 1915, and it did not cover the whole United States until

[3] At the present time, published census age structures which allow the calculation of child-woman ratios at the county level exist only for 1800 to 1860, and then for 1930 to 1990. There exists now, however, a 100% sample of the 1880 Census of the United States which will allow special tabulations for that date and a similar analysis.

1933. We are forced to rely on census-based measures, even for the national estimates made by own-children methods [Haines, 1989; Hacker, 2003]. Further, it is not clear what portion of the decline in child-woman ratios between 1800 and 1860 originated in changes in marital fertility, in rising mortality, or in the rising age at marriage and proportions married [Haines, 1996]. New evidence on antebellum adult life expectancies [Pope, 1992] suggests that a significant portion of the national decline in child-woman ratios before 1860 was probably due to changes in mortality [Hacker, 2003]. Large regional differentials in child-woman ratios suggest that marital fertility decline probably began in some parts of the nation (New England and the Mid-Atlantic) earlier, however, and evidence from community-based studies and genealogies supports this inference [Smith, 1973; Wells, 1971; Main, 2006]. But the early nineteenth century census data do not permit these causes to be disentangled. Only the micro data from the IPUMS (Integrated Public Use Microdata Series) permit this, and they do not begin until 1850.

Several major conclusions arise from looking at Table 2 and Figures 1 and 2. First, there was a fairly consistent overall decline in child-woman ratios from 1810 onwards, and the decline was consistent from 1800 onwards in most of the regions (see Figure 1). Second, there was a decline in both rural and urban areas (see Figure 2). This, of course, casts some doubt on the comprehensiveness of the land availability hypothesis. Third, there were substantial differences across regions. As expected, the oldest settled regions (New England, Middle Atlantic, and South Atlantic) had child-woman ratios which were the lowest, while areas further west, the East North and South Central regions, had considerably higher fertility ratios. But they too decline with time. Compositional effects (i.e., the mix of frontier and longer settle populations, and rural and urban populations) clearly influenced this, but convergence was taking place.

A list of the variables to be used in the analysis is provided in Table 3. All variables were drawn from the Censuses of Population, Agriculture, and Manufacturing. The earliest censuses lacked economic data. Only in 1820 is there some information about the distribution of occupations by sector (broken down only by agriculture, commerce, and manufacturing). In 1840, a greater abundance of economic and social data becomes available. It should be noted that the child-woman ratio we use is children aged 0-9 years per 1,000 women aged 16-44 years for the censuses of 1800 to 1820, and children aged 0-9 years per 1,000 women aged 15-49 years for the censuses of 1830 to 1860. No effort was made to interpolate the age structures, which varied across the censuses. In neither case are they the same as those given in Table 2, which were estimated by Grabill, Kiser, and Whelpton [1958] and the U.S. Bureau of the Census [1975].

The distribution of variables may be seen in Table 4, which presents the zero order correlations between the county child-woman ratios and the various explanatory variables. For all the censuses, the white sex ratio, urbanization, density, the percent of the county population which was nonwhite, and the location (region or whether in the South) are available. The other variables, as mentioned, are present only in the later censuses. The table has two panels, one for all counties and one for rural counties only. The latter are defined as having no population in an incorporated place of 2,500 and over.[4] As shown in the table, density and urbanization are consistently negatively correlated with child-woman ratios. This supports several of the hypotheses (land availability, urban labor markets, the conventional structural explanation), but may also reflect differentials in infant and child mortality. The sex ratio had a large and positive effect on fertility ratios early on, but the effect weakened over time.[5] This is quite consistent with a view that

[4] It is the case that some of these counties had population in minor civil divisions of smaller size that might be considered "urban." It was decided to use the official census definition.

[5] Experiments were done with more refined sex ratios, e.g., males per 100 females in the childbearing years. The results

adjustment in marriage was important earlier in the nineteenth century, but diminished as marriage ages continued to rise and as sex imbalances in marriage markets became less common through migration. Residence in the South had generally a very small positive effect on fertility, although the presence of larger non-white populations (mostly slaves) seemed to have a damping effect on white fertility. This was more true in rural than in all counties. The explanation is unclear, but it is likely influenced by the large number of slaves in the older, longer settled parts of the South, where fertility was lower. Although this should be taken care of by region dummy variables (in the regression analysis in Table 5), the effect remains.

In terms of the land availability hypothesis, it receives support from the negative correlations between white child-woman ratios and population density, as well as negative correlations with farm value per acre (higher land prices meaning more expensive endowments for children) and a higher percentage of farmland improved (also implying higher land values) in 1850 and 1860. The density variable weakens over time for all counties but remains strong in rural counties. The urban labor market view of Sundstrom and David receives support from the consistently large effect of the two urban variables (PCTURB and PCTURB25) and a bit of weak support from the relative wage variable (RELWAGE), which is an effort to replicate a variable used by Sundstrom and David. The variable RELWAGE is available, however, only at the state level, since those data on customary wages and board were not published at the county level, and were only available in 1850 and 1860 in any event.[6]

The conventional structural view is supported also by the urbanization variables and also by the illiteracy variable (PCTWHILL) in 1840 and 1850 and by the percent of the labor force in non-

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were the same as with the simpler sex ratios.

[6] County level wage data from the 1850 and 1860 Censuses of Social Statistics are available, but only for selected states via transcriptions from the original manuscripts.

agricultural activity (PCTNONAG) in 1820 and 1840. The signs were in the expected direction and the correlations were modest. The variable for the estimated percent of the labor force in manufacturing (PCTMFGLB) is consistent with the structural view, but the correlation is only moderate in 1850. Wealth per free person (WEALTHPC) also has reasonable and expected negative signs in 1850 and 1860, although the negative correlation in rural counties could suggest a problem with the land availability/target bequest hypothesis. The variable for transport connections (TRANSPOR) for 1840-1860 is reasonably large and negative, reflecting a modernization of the local area–bringing it to closer contact with outside markets and society in general. The influence of a higher proportion of foreign-born population in the county (for 1850 and 1860) had a significant negative effect in 1850 but no effect in 1860.

Finally, the ideational hypothesis about fertility transition and differentials does get some validation from the variable PRELNEW, which is the proportion of total church accommodations which were Congregationalist, Society of Friends (Quaker), Presbyterian, Unitarian, and Universalist. We must make do with data on churches, since the U.S. Census has never asked a question of individuals on religion because of issues of separation of church and state. In any event, counties with a greater proportion of these religious groups (albeit imperfectly measured) also had lower fertility. If this proxy does, in some way, gauge the spread of individualism and greater willingness to assume control of one's own life decisions, then there is room to support this particular approach to the issues of differential fertility and fertility decline.

In terms of regional results, there are no surprises. The older areas, the New England, South Atlantic, and Middle Atlantic regions had a negative relationship to child-woman ratios, while western areas, the Midwest (East and West North central regions) and the western South (East and West South Central regions) generally had a positive relationship. This is in accord with the general west to east gradient in fertility ratios. Being in the South had a weak positive relationship for all counties, but an ambiguous one for rural counties. Those coefficients were statistically insignificant, in any event. Higher rural white Southern fertility did not appear to be as large an effect before the Civil War as it was later [U.S. Bureau of the Census, 1975, Series B 67-98].

These variables were placed in a set of straightforward OLS multivariate regressions to account for differences in child-woman ratios across counties from 1800 to 1860. These results are reported in Table 5. The regressions do well in explaining the variation in fertility ratios across counties, accounting for more than 50 percent of variation in all but one case (rural counties in 1860). The results observed in the correlations are generally confirmed with some interesting differences. Urbanization was consistently and negatively related to fertility ratios. When density was in the same equation (first panel of Table 5), density was not significant. It was if the urbanization variable was omitted from the equation. In the equations for rural counties, the density coefficient remained negative and significant throughout. These results tend to give greater support to the labor market view of Sundstrom and David rather than the land availability hypothesis (although lower child-woman ratios in urban areas may also reflect higher infant and child mortality and lower nuptiality). They also support the Carter, Ransom and Sutch hypothesis of the growing importance of life cycle saving. Other variables in the regressions, however, provide some support for the land availability view. Average farm values per acre and the percent of farmland which was improved both had negative and significant coefficients in 1850 and 1860 for all counties, consistent with higher land values and more settled agriculture creating incentives to reduce family size. In 1850, however, the coefficient on value per acre was positive in rural counties, and the same coefficient was statistically insignificant in 1860. These results run counter to the findings of poor performance of the land availability hypothesis by Carter, Ransom and Sutch in their study. On the other hand, the labor market hypothesis, as well as the conventional structural view, receive some backing from the negative and significant coefficients on the percent of the labor force in nonagricultural activities (1820 and 1840) and the strong effect of the transportation variable (1840, 1850, and 1860). The positive and significant coefficients on adult white illiteracy (1840 and 1850) are also supportive of the structuralist perspective. The relative wage variable provides no confirmation of the labor force theory, and indeed is even positive (the opposite to expected sign) and significant in 1860. It is, however, a state-level variable.

The sex ratio, a proxy for the marriage market, showed the expected positive and significant effects early in the nineteenth century, but that effect gradually diminished and even became negative by 1840. Thus there is support for the view that adjustments in nuptiality played an important role in the fertility transition at least in the early stages, a more purely demographic perspective on the issue.

The ideational hypothesis also finds some confirmation. The religion variable (PRELGNEW) remains negative and significant in the multivariate framework. Counties with a higher proportion of the increasingly liberal and individualistic denominations were more likely to have lower fertility, holding region and economic and demographic structure constant. Finally, the level of wealth per free person seemed to have little impact on fertility ratios. But the percent of foreign born by county did have a negative and significant relation to fertility ratios, even holding urbanization constant. This is puzzling, given the finding that the foreign born often had higher birth rates [Spengler, 1930], but the early stages of the mass migrations from Europe in the 1840s and 1850s undoubtedly had some disruptive effects.

Tables 4 and 5 also presents two variables, WCURRMAR and WLABFORC, using data aggregated from the 1850 and 1860 IPUMS samples [Ruggles and Sobek, 1997]. These individual-level, one-percent samples of the original manuscript census records allow us to estimate women's current marital status and labor force participation at the county level or higher level of aggregation. For each county, we calculated the percentage of women age 20-49 who were imputed as having a spouse present in the household [see Ruggles, 1995 for details of the imputation procedure]. We repeated the aggregation procedure for each state economic area (SEA)—an aggregation of contiguous counties identified by the 1950 census sharing similar economic characteristics—and state. If there were enough women in the county age 20-49 to obtain a reasonably accurate estimate (using an arbitrary cut-off of at least 30 cases), we attached the estimate to the county-level dataset. If there were not enough cases, we relied on the SEA- or state-level estimates.[7] We also constructed a variable on women's economic opportunity by aggregating the percentage of single women age 20-49 currently in the paid labor force. The "independence" and "gains to marriage" theories contend that men and women will increasingly postpone marriage or disrupt current marriages as educational attainment and job opportunities for women improve. The relative lack of economic opportunity for young southern white women outside the home, for example, may have increased the cultural incentive for marriage in the antebellum South and helped to boost the region's fertility [Hacker, 2006].

Women's nuptiality (WCURRMAR) was included in 1850 and 1860. The variable was consistently significant and the effect was large. It modestly improved the performance of the models; the adjusted r-square for all counties in 1850, for example, increased from 0.561 to 0.575.

[7] Of the 1,589 counties in 1850, the percentage of women currently married (WCURRMAR) was aggregated at the county level in 665 counties (42%), at the SEA level in 815 counties (50%), and at the state level in 357 counties (9%). Of the 1,974 counties in 1860, WCURRMAR was calculated at the county level for 918 counties (44%), SEA level for

Its inclusion, however, resulted in only modest change to the coefficients of the existing variables. None of the coefficients changed sign and all but one of the coefficients significant at the .05 level in the earlier models remained significant with the addition of women's nuptiality. The one exception was the white sex ratio in the 1860 models, whose coefficient only remained significant at the 10% level when women's nuptiality was included, suggesting that the sex ratio was a reasonable proxy of marriage in the 1800-1840 models. Finally, women's economic opportunity, while having the expected negative sign, did not prove to be statistically significant.

DATA FOR THE INDIVIDUAL-LEVEL ANALYSIS

The data set used in the second part of the analysis is individual-level data in the 1850 and 1860 IPUMS samples [Ruggles and Sobek, 1997]. These samples, constructed at the University of Minnesota Population Center, were drawn from the original manuscript records of the census of the free population. Although neither census included questions on relationship to household head, marital status, or fertility, census marshals were instructed to record individuals in a specified order beginning with the head of household and followed by the spouse, children in order of age, relatives and non-relatives. When combined with surname, age, and sex, it is possible to impute the relationship of each individual to the household head and the position of each individual's spouse and children with a high degree of confidence. When tested against the 1880 IPUMS sample—the first census to record each individual's relationship to the household head—the imputation procedure correctly identified over 99% of spouses and 97% of children.

The imputed relationship and own children variables in 1850 and 1860 IPUMS samples allow us to attach directly model marital fertility (here defined as the number of own children under

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937 counties (44%), and at the state level for 251 counties (12%).

age 5 in the household). There are several advantages to this approach. Most importantly, it allows us to test hypotheses of U.S. fertility decline that emphasizes the importance to fertility decline within marriage. Moreover, measurement of some variables at the individual level—literacy and real estate wealth, for example—can reduce the possibility of spurious correlations inherent with ecological regression. Finally, we can include likely correlates of martial fertility, such as age, nativity, and spouse's occupation in the model.

Despite these advantages, there remain a few limitations to the IPUMS samples. Although manuscript records of the Census of Agriculture are available for some states and counties, individuals in the IPUMS samples have not been linked to their farm holdings. Thus, we are forced to link the individual-level data to the county-level dataset used in the first part of this analysis and treat the data as contextual variables. We also lack information on the duration of each woman's current marriage. As a result, a model of own children under age 5 will include many women who were married for only a portion of the five years preceding the census and identify correlates of nuptiality and marital fertility. To reduce this source of bias, we further restrict the sample to currently married women with at least one surviving child over age 5 in the household.[8] Thus, only fecund women are included. Finally, like child-woman ratios, the number of own children under age 5 in the household is net of mortality. Unavoidably, our model of marital fertility will include some unknown influence of differential mortality.

AN ANALYSIS OF THE ANTEBELLUM FERTILITY TRANSITION IN THE UNITED STATES USING THE 1850 AND 1860 IPUMS SAMPLES

8 Because our data do not allow us to identify stepchildren, it is still likely that come women in the model universe were not married the entire five-year period preceding the census.

Regression results are shown in Table 6. Because our dependent variable—the number of own children under age 5—is a count that is truncated at zero and skewed to the right, we chose to rely on Poisson regression. Two models were constructed for each census year. The first model includes all white women age 20-44 with at least one own child age 5 or above and a spouse present in the household. The second model is limited further to women whose spouse listed a farm occupation in the census (farmer, farm manager, tenant farmer, farm laborer, etc.).

For the most part, the 1860 results present no surprises. All else being equal, white women in 1860 who were literate, native born, lived in New England, lived in counties with large percentages of the population living in urban areas, or had husbands with non-agricultural occupations achieved lower marital fertility, supporting many of the structuralist theories. A high percentage of "liberal" churches in the county also was correlated with lower marital fertility. Relative to the age 25-29 reference group, older married women had lower birth rates, corresponding with the known age profile of marital fertility. One surprise is the lower birth rates evident in the age 20-24 group. Assuming that women in this age group had been married for the entire 5 years preceding the census, we would expect them to have the higher marital fertility than the age 25-29 reference group. In all likelihood, however, many were recently married. To have been married for the entire duration of the 5 years preceding the census and to have a child age 5 or above, for example, all the women age 20 in the sample would have had to been married before the age of 15, which seems unlikely. It may be that we have incorrectly imputed some older step children to these women as own children (and women of all other ages). This assumption is supported by the contextual variable WCURRMAR, which measures the percentage of women in the area currently married. It remains positive and significant in both the 1850 and 1860 models, suggesting the strong possibility that we are including some recently married women in the model universe.

In 1860, nativity proved to be a significant at both the individual and county levels. The marital fertility of foreign born women, all else being equal, was over 20% higher than native born women. Interestingly, the percentage of the population in a county that was foreign born was negatively correlated with marital fertility. It is unclear what mechanisms were at work; modern researchers have not followed the lead of nineteenth-century nativist observers such as Francis A. Walker who blamed immigrants for falling native born fertility. Still the relationship holds. The percentage of the population that was non-white also was negatively correlated with white marital fertility in 1860.

There is mixed support for the various economic theories. Although the sign is in the expected direction, the availability of transportation (TRANSPOR) is not significant in the individual-level regressions. Although women living in counties with large urban populations had lower marital fertility in both census years, the relative wage variable RELWAGE provides contradictory evidence of the labor force theory. Contrary to expectations, it has a positive sign and is statistically significant in 1860. It is, however, negatively correlated with marital fertility in 1850. The individual-level regressions also provide mixed support for the land availability and target-bequest hypotheses. Although average farm values per acre remains insignificant in both census years, the percentage of farmland improved was negatively correlated with marital fertility in 1850 and had a negative sign in 1860. More impressive, despite the negative correlations between per capita wealth and child-woman ratios at the county level, couples' real estate wealth (natural logged) was positively correlated with marital fertility in both 1850 and 1860. Taken together, these variables suggest that couples with limited real estate holdings to bequest or who lived in areas with limited farmland to purchase as endowments for children were more likely to limit their number of births. Another interpretation is possible, however. Since socio-economic status and wealth have been shown to be negatively correlated with mortality in the mid nineteenth-century United States [Ferrie 2003], it may be that children of couples with greater real estate wealth simply experienced lower rates of infant mortality.

A few results for the 1850 census do not correspond with the 1860 results. While having the expected positive sign, foreign birth was not significantly correlated with marital fertility in 1850. The percentage of church accommodations with a positive role for women, while having the expected negative sign, also was not significantly correlated with marital fertility. Regional differentials in marital fertility are not nearly as pronounced as they were in 1860 and, in the case of some of the most recently settled regions, were not significantly different from that of the reference group of New England. And as mentioned earlier, the relative wage variable returned different results.

There are several possible explanations for the inconsistent results. First, differential mortality likely played a greater role in 1850 than it did in 1860. The year preceding the 1850 census corresponded with an epidemic of cholera, which hit infants and urban areas especially hard [Rosenberg 1962; Vinovskis, 1978]. Second, it is likely that true marital fertility differentials were less pronounced in 1850 than in 1860. Evidence of parity-dependent fertility control in the United States is only first detectable in the years preceding the 1860 census, and then only in the Northeast [Hacker, 2003]. Evidence of parity-dependent control in other regions comes much later. Although there is some evidence that New England couples were effectively “spacing” their children before 1850 [Main 2006], it is nonetheless probable that majority of the population did not practice conscious marital fertility control and that the small differentials in marital fertility that did exist in 1850 are difficult to detect amidst larger differentials in marriage and mortality.

CONCLUDING COMMENTS

This paper is a first pass at a new analysis of the early fertility transition for the white population of the United States in the nineteenth century. It uses aggregate county-level data, some of which have not been much exploited for this purpose, and the recently constructed 1850 and 1860 IPUMS samples. New variables have been created from other data sources to supplement the county-level data, namely the urban populations of the counties from 1790 onwards as well as county areas, which allow calculations of density. More will need to be done, including analysis of changes over decades and fixed effects models.

While analysis of change over time using a time series of cross sections is not perfect, some useful results have appeared. The major competing hypotheses concerning the early American fertility transition are: the land availability hypothesis, the local labor market/child default hypothesis, the conventional structuralist view, and the ideational hypothesis. All receive some support from the data here. Using the county-level dataset, we noted that support for the land availability view is weakened by the finding that, when population density and percent urban are both in the regression models, urbanization dominates. This lends more credence to the local labor market/child default hypothesis. But structural variables (illiteracy, urbanization, transport) also demonstrate some power in explaining cross sectional variation. The ideational view also finds support, using a variable on religion in 1850 and 1860. But these different perspectives are not necessarily mutually exclusive. More likely, a number of processes were underway, all of which contributed to the unusual early fertility transition in the United States.

Many theories of U.S. fertility decline emphasize the importance of fertility decline within marriage. Although many of the proposed mechanisms may act as simple Malthusian adjustments to marriage—decreased land availability, for example, may reduce fertility by reducing nuptiality rather than causing couples to engage in conscious fertility control—our individual-level models of marital fertility suggest that the emphasis on neo-Malthusian adjustments in not entirely misplaced. In particular, we note that the individual-level data, in addition to providing support for traditional structural explanations, provide support for land availability/target-bequest theories. We caution, however, that differential mortality may still bias the results. Counter-intuitively, we may need to focus on nineteenth-century mortality differentials to learn more about U.S. fertility decline.

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TABLE 1. FERTILITY AND MORTALITY IN THE UNITED STATES. 1800-1998.

APPROX. DATE	BIRTHRATE(a)		CHILD-WOMAN RATIO(b)		TOTAL FERTILITY RATE(c)		EXPECTATION OF LIFE(d)		INFANT MORTALITY RATE(e)	
	WHITE	BLACK(f)	WHITE	BLACK	WHITE	BLACK(f)	WHITE	BLACK(f)	WHITE	BLACK(f)
1800	55.0		1342		7.04					
1810	54.3		1358		6.92					
1820	52.8		1295	1191	6.73					
1830	51.4		1145	1220	6.55					
1840	48.3		1085	1154	6.14					
1850	43.3		892	1087	5.42		39.5	23.0	216.8	340.0
		58.6 (g)				7.90 (g)				
1860	41.4		905	1072	5.21		43.6		181.3	
		55.0 (h)				7.58 (h)				
1870	38.3		814	997	4.55		45.2		175.5	
		55.4 (i)				7.69 (i)				
1880	35.2		780	1090	4.24		40.5		214.8	
		51.9 (j)				7.26 (j)				
1890	31.5	48.1	685	930	3.87	6.56	46.8		150.7	
1900	30.1	44.4	666	845	3.56	5.61	51.8 (k)	41.8 (k)	110.8 (k)	170.3 (k)
1910	29.2	38.5	631	736	3.42	4.61	54.6 (l)	46.8 (l)	96.5 (l)	142.6 (l)
1920	26.9	35.0	604	608	3.17	3.64	57.4	47.0	82.1	131.7
1930	20.6	27.5	506	554	2.45	2.98	60.9	48.5	60.1	99.9
1940	18.6	26.7	419	513	2.22	2.87	64.9	53.9	43.2	73.8
1950	23.0	33.3	580	663	2.98	3.93	69.0	60.7	26.8	44.5
1960	22.7	32.1	717	895	3.53	4.52	70.7	63.9	22.9	43.2
1970	17.4	25.1	507	689	2.39	3.07	71.6	64.1	17.8	30.9
1980	15.1	21.3	300	367	1.77	2.18	74.5	68.5	10.9	22.2
1990	15.8	22.4	298	359	2.00	2.48	76.1	69.1	7.6	18.0
1998	14.0	17.7			2.04	2.17	77.3	71.2	6.0	14.3

TABLE 1 (cont.)

(a) Births per 1000 population per annum.
(b) Children aged 0-4 per 1000 women aged 20-44. Taken from U.S. Bureau of the Census [1975], Series 67-68 for 1800-1970. For the black population 1820-1840, Thompson and Whelpton [1933], Table 74, adjusted upward 47% for relative under-enumeration of black children aged 0-4 for the censuses of 1820-1840.
(c) Total number of births per woman if she experienced the current period age-specific fertility rates throughout her life.
(d) Expectation of life at birth for both sexes combined.
(e) Infant deaths per 1000 live births per annum.
(f) Black and other population for CBR (1920-1970), TFR (1940-1990), e(0) (1950-1960), IMR (1920-
(g) Average for 1850-59.
(h) Average for 1860-69.
(i) Average for 1870-79.
(j) Average for 1880-84.
(k) Approximately 1895.
(l) Approximately 1904.

Source: U.S. Bureau of the Census [1975, 1985, 1997, 2001]. Coale and Zelnik [1960]. Coale and Rives [1973]. Haines [1998]. Preston and Haines [1991]. Steckel [1986].

TABLE 2. Number of Children Under 5 Years Old per 1,000 Women Aged 20-44 Years, by Race, Residence, and Region. United States, 1800-1860.

	Year						
Region, Residence, Race	1800	1810	1820	1830	1840	1850	1860
United States, white population, adjusted	1342	1358	1295	1145	1085	892	905
United States, black population, adjusted	-----	-----	-----	-----	-----	1087	1072
United States, white population	1281	1290	1236	1134	1070	877	886
United States, urban white population	845	900	831	708	701	-----	-----
United States, rural white population	1319	1329	1276	1189	1134	-----	-----
New England, white population	1098	1052	930	812	752	621	622
New England, urban white population	827	845	764	614	592	-----	-----
New England, rural white population	1126	1079	952	851	800	-----	-----
Middle Atlantic, white population	1279	1289	1183	1036	940	763	767
Middle Atlantic, urban white population	852	924	842	722	711	-----	-----
Middle Atlantic, rural white population	1339	1344	1235	1100	1006	-----	-----
East North Central, white population	1840	1702	1608	1467	1270	1022	999
East North Central, urban white population	-----	1256	1059	910	841	-----	-----
East North Central, rural white population	1840	1706	1616	1484	1291	-----	-----
West North Central, white population	-----	1810	1685	1678	1445	1114	1105
West North Central, urban white population	-----	-----	-----	1181	705	-----	-----
West North Central, rural white population	-----	1810	1685	1703	1481	-----	-----
South Atlantic, white population	1345	1325	1280	1174	1140	937	918
South Atlantic, urban white population	861	936	881	767	770	-----	-----
South Atlantic, rural white population	1365	1347	1310	1209	1185	-----	-----
East South Central, white population	1799	1700	1631	1519	1408	1099	1039
East South Central, urban white population	-----	1348	1089	863	859	-----	-----
East South Central, rural white population	1799	1701	1635	1529	1424	-----	-----

Table 2 (cont.)

Region, Residence, Race	Year 1800	1810	1820	1830	1840	1850	1860
West South Central, white population	-----	1383	1418	1359	1297	1046	1084
West South Central, urban white population	-----	727	866	877	846	-----	-----
Mountain, white population	-----	-----	-----	-----	-----	886	1051
Mountain, urban white population	-----	-----	-----	-----	-----	-----	-----
Mountain, rural white population	-----	-----	-----	-----	-----	-----	-----
Pacific, white population	-----	-----	-----	-----	-----	901	1026
Pacific, urban white population	-----	-----	-----	-----	-----	-----	-----
Pacific, rural white population	-----	-----	-----	-----	-----	-----	-----

Source: U.S. Bureau of the Census [1975], Series B 67-98.

(a) Adjusted data standardized for age of women, and allowance made for undercount in censuses; see text.

TABLE 3. Variable Names and Descriptions.

VARIABLE	DESCRIPTION
WHCWRAT	Child-woman ratio, white population: 1800-1820: children aged 0-9 years per 1,000 women aged 16-44 years. 1830-1860: children aged 0-9 years per 1,000 women aged 15-49 years.
WHSEXRAT	Sex ratio, white population: White males per 100 white females (all ages).
DENSITY	Population density: Persons per square mile.
PCTURB	Percent urban (in places 2,500 and over).
PCTURB25	Percent of population in places 25,000 and over.
PCTNW	Percent of total population non-white.
SOUTH	=1 if the county was in the South, =0 otherwise.
PCTNONAG	Estimated percent of the labor force in non-agricultural activity.
PCTWHILL	Percent of white population aged 20 and over who were unable to read and write.
PCTFOR	Percent of the total population foreign born.
PCTMFGLB	Estimated percent of the white population aged 15-69 employed in manufacturing.
PRELGNEW	Percent of all church accommodations Congregationalist, Presbyterian, Unitarian, and Universalist.
RELWAGE	Ratio of estimated monthly wages of a common laborer with board to the monthly wages of a farmhand with board. (States only).
TRANSPOR	Variable=1 if the county was on a canal, river, or other navigable waterway in 1840. Otherwise=0. For 1850 and 1860, variable =1 if county on a railroad or navigable waterway. Otherwise=0.
WEALTHPC	1850: Value of real estate per free person. 1860: Value of real and personal estate per free person.
FARVALAC	Average value of farm per acre (improved and unimproved).
PCTACIMP	Percent of farm acres improved.
WCURRMARR	Proportion of women aged 20-49 currently married.
WLABFORCE	Proportion of single women aged 20-49 in the labor force.

Source: See text.

Table 4. Zero-Order Correlations with White Child-Woman Ratios. Counties, 1800-1860.

VARIABLE	YEAR: 1800	1810	1820	1830	1840	1850	1860
ALL COUNTIES							
WHSEXRAT	0.495	0.285	0.190	0.227	0.022	-0.160	0.126
DENSITY	-0.202	-0.168	-0.164	-0.150	-0.122	-0.100	-0.080
PCTURB	-0.288	-0.296	-0.320	-0.328	-0.381	-0.364	-0.363
PCTURB25	-0.147	-0.163	-0.169	-0.157	-0.169	-0.189	-0.182
PCTNW	-0.426	-0.404	-0.288	-0.284	-0.100	-0.111	-0.169
SOUTH	0.097	0.015	0.066	0.005	0.172	0.109	0.065
TRANSPOR					-0.363	-0.401	-0.410
PCTFOR						-0.269	0.012
PCTNONAG			-0.387		-0.499		
PCTWHILL					0.382	0.245	
PCTMFGLB						-0.427	-0.290
WEALTHPC						-0.261	-0.200
FARVALAC						-0.178	-0.106
PCTACIMP						-0.400	-0.487
PRELGNEW						-0.283	-0.379
RELWAGE						-0.222	-0.058
WCURRMAR						0.382	0.172
WLABFORC							0.146
REGIONS:							
New England	-0.237	-0.312	-0.410	-0.398	-0.384	-0.348	-0.342
Middle Atlantic	0.027	-0.004	-0.140	-0.228	-0.310	-0.275	-0.277
East North Central	0.127	0.270	0.295	0.321	0.114	0.068	-0.059
West North Central		0.100	0.121	0.207	0.184	0.256	0.216
South Atlantic	-0.268	-0.334	-0.272	-0.311	-0.193	-0.141	-0.144
East South Central	0.503	0.420	0.368	0.300	0.317	0.136	0.031
West South Central		0.053	0.060	0.108	0.181	0.201	0.260
Mountain						-0.046	0.137
Pacific						-0.058	0.153
N	417	571	753	982	1235	1611	2012

Table 4 (cont.)

RURAL COUNTIES

WHSEXRAT	0.496	0.284	0.171	0.200	-0.004	-0.187	0.102
DENSITY	-0.559	-0.564	-0.556	-0.614	-0.526	-0.471	-0.495
PCTNW	-0.495	-0.470	-0.349	-0.350	-0.152	-0.180	-0.261
SOUTH	0.029	-0.061	0.004	-0.064	0.126	0.042	-0.024
TRANSPOR					-0.314	-0.344	-0.349
PCTFOR						-0.205	0.120
PCTNONAG			-0.264		-0.379		
PCTWHILL					0.336	0.196	
PCTMFGLB						-0.288	-0.133
WEALTHPC						-0.253	-0.230
FARVALAC						-0.368	-0.404
PCTACIMP						-0.326	-0.409
PRELGNEW						-0.216	-0.286
RELWAGE						-0.208	0.037
WCURRMAR						0.357	0.157
WLABFORC							0.216
REGIONS:							
New England	-0.160	-0.239	-0.347	-0.321	-0.289	-0.239	-0.240
Middle Atlantic	0.035	0.015	-0.129	-0.221	-0.311	-0.262	-0.235
East North Central	0.123	0.267	0.284	0.310	0.075	0.050	-0.072
West North Central		0.099	0.118	0.213	0.180	0.248	0.190
South Atlantic	-0.343	-0.413	-0.333	-0.375	-0.246	-0.194	-0.214
East South Central	0.505	0.424	0.359	0.290	0.310	0.110	-0.009
West South Central		0.067	0.059	0.102	0.180	0.192	0.252
Mountain						-0.054	0.141
Pacific						-0.075	0.153
N	396	540	709	919	1137	1434	1721

Table 5. Regression Results. White Child-Woman Ratios as the Dependent Variable. Counties. United States, 1800-1860.

YEAR:							ALL COUNTIES							
VARIABLE	1800		1810		1820		1830		1840		1850		1860	
	(coef)	(signi	(coef)	(signi)	(coef)	(signi)	(coef)	(signi)	(coef)	(signi)	(coef)	(signi)	(coef)	(signi)
CONSTANT	448.665	***	1472.231	***	1502.751	***	1094.992	***	1310.230	***	1039.793	***	491.895	***
WHSEXRAT	13.186	***	2.243	***	1.371	***	0.979	**	-0.028	---	-0.204	***	-0.048	---
DENSITY	-0.072	---	-0.018	---	0.017	---	-0.009	---	0.006	---	0.041	---	0.069	***
PCTURB	-5.997	***	-6.219	***	-2.322	**	-5.748	***	-2.703	***	-2.354	***	-3.304	***
PCTNW	-11.794	***	-10.433	***	-9.104	***	-7.890	***	-4.378	***	-2.799	***	-2.685	***
PCTNONAG					-6.568	***			-4.283	***				
TRANSPOR									-84.107	***	-73.457	***	-42.938	***
PCTFOR											-6.142	***	-0.354	---
PCTWHILL									2.788	***	1.144	---		
PCTMFGLB											-0.456	---	0.642	---
WEALTHPC											-0.167	***	-0.005	---
FARVALAC											-0.498	---	-0.449	**
PCTACIMP											-2.213	***	-2.478	***
PRELGNEW											-1.899	***	-2.245	***
RELWAGE											1469.313	---	287.878	***
WCURRMAR											411.257	***	498.504	***
WLABFORC													27.411	---
REGIONS:														
New England	NI		NI		NI		NI		NI		NI		NI	
Middle Atlantic	171.475	***	320.719	***	358.403	***	295.984	***	215.754	***	193.926	***	173.863	***
East North Cent.	165.523	*	576.659	***	606.578	***	665.590	***	416.531	***	334.414	***	325.132	***
West North Central			753.566	***	767.102	***	962.821	***	592.177	***	426.945	***	379.783	***
South Atlantic	464.658	***	547.060	***	576.073	***	621.370	***	376.142	***	246.043	***	338.738	***
East South Cent.	727.827	***	782.528	***	779.338	***	841.779	***	588.406	***	351.642	***	406.174	***
West South Central			73.471	---	791.707	***	904.731	***	704.285	***	432.111	***	502.085	***
Mountain											79.635	---	694.100	***
Pacific											596.241	***	662.734	***
Adj. R-squared	0.6542		0.6129		0.6134		0.6147		0.6160		0.5746		0.5649	
F-ratio	99.39	***	91.25	***	109.48	***	157.48	***	153.29	***	99.86	***	119.68	***
N	417		571		753		982		1235		1611		2012	

Table 5 (cont.)

							RURAL COUNTIES							
CONSTANT	964.166	***	1775.454	***	1728.668	***	1550.457	***	1450.343	***	1093.801	***	566.353	***
WHSEXRAT	9.822	***	1.597	***	0.392	---	-0.801	**	-0.329	**	-0.194	***	-0.078	---
DENSITY	-5.438	***	-6.516	***	-5.277	***	-7.202	***	-4.082	***	-4.957	***	-2.516	***
PCTNW	-9.973	***	-8.271	***	-7.439	***	-5.963	***	3.715	***	-2.770	***	-2.760	***
TRANSPOR									-71.712	***	-59.423	***	-30.951	***
PCTFOR											-7.470	***	-0.593	---
PCTNONAG					-4.058	***			-3.536	***				
PCTWHILL									2.136	***	0.284	---		
PCTMFGLB											-0.298	---	-0.004	---
WEALTHPC											-0.134	**	-0.004	---
FARVALAC											3.793	***	-0.261	---
PCTACIMP											-1.560	***	-1.528	***
PRELGNEW											-1.532	***	-2.053	***
RELWAGE											1316.368	---	273.665	***
WCURRMAR											379.561	***	479.481	***
WLABFORC													-37.624	---
REGIONS:														
New England	NI		NI		NI		NI		NI		NI		NI	
Middle Atlantic	137.887	***	234.900	***	330.997	***	281.106	***	241.849	***	209.394	***	198.077	***
East North Cent.	85.960	---	396.357	***	525.587	***	515.321	***	376.269	***	348.990	***	342.347	***
West North Central			497.595	***	626.466	***	717.227	***	508.558	***	400.720	***	379.437	***
South Atlantic	338.108	***	353.766	***	479.301	***	425.473	***	328.030	***	270.177	***	356.350	***
East South Cent.	609.344	***	595.117	***	680.179	***	647.410	***	539.973	***	369.748	***	422.093	***
West South Central			-23.765	---	633.979	***	632.418	***	594.604	***	394.016	***	512.818	***
Mountain											21.497	---	636.796	***
Pacific											518.619	***	669.294	***
Adj, R-squared	0.6578		0.6384		0.6054		0.6612		0.5826		0.5375		0.488	
F-ratio	109.46	***	106.74	***	109.62	***	200.09	***	133.15	***	78.14	***	79.21	***
N	396		540		709		919		1137		1434		1721	

Table 6. Poisson Regression, Number of Own Children Age 0-4 Living in Household, White Women 20-44 with Spouse Present and Eldest Child over Age 5 in Household, 1850 and 1860

	1850 All Households		1850 Farm Households		1860 All Households		1860 Farm Households	
Mother's characteristics								
Age 20-24	-0.229	***	-0.232	***	-0.183	***	-0.191	***
Age 25-29	NI		NI		NI		NI	
Age 30-34	-0.034	---	-0.034	---	-0.082	***	-0.065	***
Age 35-39	-0.156	***	-0.156	***	-0.278	***	-0.248	***
Age 40-44	-0.554	***	-0.550	***	-0.679	***	-0.640	***
Literate	-0.095	***	-0.078	***	-0.074	***	-0.067	***
Foreign born	0.028	---	0.004	---	0.234	***	0.211	***
Father's characteristics								
Professional Occupation	-0.189	***			-0.144	***		
Farm occupation	NI				NI			
Other occupation	-0.062	***			-0.064	***		
Value of real property (natural log)	0.008	***	0.007	**	0.012	***	0.011	***
County-level Characteristics								
		***						
White sex ratio (males per 100 females)	-0.004	***	-0.003	*	-0.001	---	-0.001	---
Percentage of women currently married	0.002	*	0.003	**	0.004	***	0.004	***
Percentage of population nonwhite	-0.001	---	-0.001	---	-0.002	**	-0.002	*
Percentage of free population foreign born	-0.001	---	0.001	---	-0.004	***	-0.004	***
Percentage of population urban	-0.002	**	-0.002	**	-0.001	**	-0.001	**
Average value of farms per acre	0.000	---	0.000	---	0.000	---	0.000	---
Percentage of farm acreage improved	-0.003	***	-0.003	***	-0.001	---	-0.001	---
Ratio of wage of common laborer to farm	-0.365	***	-0.296	***	0.186	*	0.282	*
Percentage of white labor force in manufacturing	0.000	---	-0.001	---	0.004	***	0.003	*
Rail or water transportation available	-0.019	---	-0.018	---	-0.016	---	-0.010	---
Percentage of single women in labor force					-0.083	---	-0.071	---
Percentage of church accommodations in denominations with positive roles for women	-0.001	---	-0.001	---	-0.002	***	-0.002	**

Table 6 (cont.)

Regions:								
New England	NI		NI		NI		NI	
Middle Atlantic	0.127	***	0.081	*	0.118	***	0.104	**
East North Central	0.138	***	0.101	*	0.207	***	0.207	***
West North Central	0.106	*	0.108	---	0.197	***	0.194	***
South Atlantic	0.219	***	0.178	***	0.262	***	0.248	***
East South Central	0.199	***	0.164	**	0.286	***	0.280	***
West South Central	0.125	*	0.061	---	0.249	***	0.248	***
Mountain	-0.003	---	0.039	---	0.143	---	0.144	---
Pacific	0.240	---	0.084	---	0.368	***	0.400	***
Constant	1.185	***	0.931	***	-0.142	---	-0.282	---
N	22,216		14,030		32,347		19,710	
Adjusted R-squared	0.025		0.023		0.028		0.024	
Log likelihood	(28,146)		(18,178)		(41,169)		(25,636)	

Source: 1850 and 1860 IPUMS samples (Ruggles and Sobek 1997)

Notes: *** p<.001, ** p<.01, * p<.05, --- = not significant at least at a 10% level

Fig. 1. Child-Woman Ratios.
By Rural-Urban. U.S. 1800-1840.

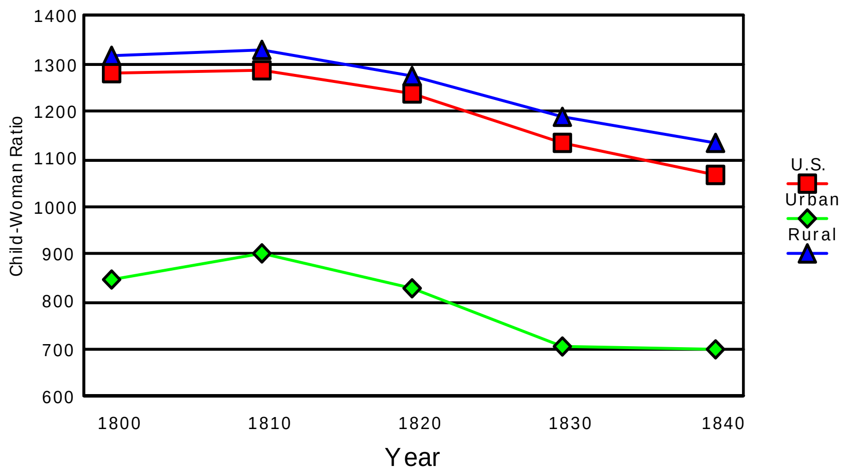

Fig. 2. Child-Woman Ratios.
By Region. U.S. 1800-1860.