Declining Fertility and the Material Wellbeing of Children

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This paper explores the consequences of the decline in fertility rates for the material wellbeing of children and families. As fertility declined in the U.S. (and other developed economies) since the baby boom, the youth dependency ratio—the ratio of children to working-aged adults—plunged. Within families, the declining dependency ratio increased per-child income, human capital, and consumption, reduced poverty, improved housing arrangements, and offset increases in household-level income inequality. At the local, state, and possibly federal government levels, the decline in the dependency ratio resulted in higher per-child public spending in areas like education, college access, and other child-related initiatives. While the decline in fertility may have potential negative effects from aging, it has had other positive effects on children and families, suggesting important tradeoffs from fertility-related policies.

The decline in the fertility rate in the United States (and elsewhere around the world) led to a significant decrease in the youth dependency ratio, which represents the ratio of the population under 20 to the working-age population of 20-64. This decline resulted in an increase in income resources available per child within families and throughout the economy. The magnitude of this change is substantial, as evidenced by the decline in the youth dependency ratio from 0.76 to 0.43 between 1965 and 2020. In comparison, the aged dependency ratio (the ratio of those over 65 to those 20-64) increased from 0.18 to 0.28 over the same period (Figure 1). While concerns often arise regarding the cost of financing retiree consumption due to the falling ratio of workers to retirees (e.g., through Social Security), the declining youth dependency ratio has had a larger and opposite effect.

Within families, declining fertility, characterized by smaller family sizes and delayed age at first birth, resulted in increases in income per capita, average human capital accumulation, reduced poverty rates, and improved material wellbeing of children. While Becker's (1960) quantity-quality fertility tradeoff is often framed in terms of human capital investment (with limited empirical support) the experience of the United States and other countries reveals a tradeoff between the quantity of children and their quality of life. Measured in these terms, the tradeoff is significant, with the decline in fertility being one of the most important contributors to the reduction in poverty rates and the increase in material wellbeing of children since at least the 1960s and likely even further back to the late 1800s.

To illustrate the relationship between fertility and material wellbeing, this paper first examines broad trends in the youth dependency ratio before, during, and after the baby boom, as well as the effects of fertility changes on the family environment from the perspective of children. The analysis primarily draws on microdata from the Decennial Census or American Community Survey spanning the period from 1900 to 2020, and the Supplemental Poverty Measure public use microdata merged with the Annual Social and Economic Supplement to the Current Population Survey spanning the period from 1967 to 2021.

In broad terms, the decline in fertility had profound effects on the living arrangements and material wellbeing of children. At the turn of the last century, more than 70 percent of children had more than three siblings (i.e., were part of families with at least four children), and around half of children in 1960 had at least three siblings. By 1990, this percentage had dropped to about 20 percent. Consequently, the proportion of children who were first-born doubled. According to the literature on birth order effects (Black, Devereux, and Salvanes 2005 and 2011), these changes modestly boosted average IQ and average years of schooling, and compressed the distribution of these attributes. Moreover, it became increasingly common for each child to have their own bedroom (largely due to smaller family sizes, not larger houses)—a convenient indicator of increased material wellbeing—and for all siblings in a family to be of the same gender, resulting in a measurable (but unmeasured) decline in the cost of living due to greater resource sharing among siblings.

A direct result of these changing fertility choices, income resources per child increased and poverty rates declined. (And that is holding other things equal—including any effect of women's control over fertility choices on their own education and income). For instance, whereas median family income of households with children increased by 78 percent (adjusted for inflation) between 1967 and 2019, on a per-child basis it increased by 150 percent, almost twice as much.

Focusing on child poverty rates, other things equal, the decline in family size and rising age of mothers "explains" (in a decomposition sense) about 7 percentage points of the decline in child poverty between

1967 and 2019 (measured using the Supplemental Poverty Measure (SPM)), with most of that decline occurring before 1990. In a decomposition, the contribution of falling family size to the decline in poverty is larger in magnitude than was the increase in market incomes during the welfare-reform era and strong economy of the 1990s, and equal to (and opposite) the effect of declining marriage rates on poverty in the 1970s and 1980s.

I believe that the effects of fertility on poverty and per-capita income (as well as housing arrangements) are causal, based both on the literature that largely finds zero or small negative effects on parental labor supply from intensive-margin increases in fertility (e.g. Angrist and Evans 1998-style analyses) and direct implementation of Angrist and Evans (1998) style estimates of the effects of twin births on family income and poverty, which show large IV effects similar to the OLS estimates.

As fertility rates (and number of children per family) converged across groups, reductions in fertility acted to reduce disparities in family resources across groups. For example, while the 90/10 ratio of family income (among families with children) increased between 1967 and 2019 (on an after-tax, after transfer basis) by 38 percent, on a per-child basis the increase was 8 percent.

In short, at the family level, declining fertility increased the per-child resources. I suspect that extending a similar analysis to measures of consumption and consumption per child, time use and parental time per child, and children's health and safety (such as likelihood of injury) would show similar gains from reduced family size. Moreover, the above analysis likely understates the effects of falling fertility on material wellbeing because it excludes the analysis of the extensive margin of childbearing (not having children at all), which a substantial literature imposes a substantial "child penalty" (Kleven, Landais, and Søgaard 2019) and treats maternal education, employment, and income as exogenous, when increases in women's economic opportunities are closely related to control over fertility choices (e.g. Goldin and Katz 2002). (Of course, there are surely other social, economic, and nonpecuniary implications of having more siblings or parents having more kids, both positive and negative, which this analysis excludes.)

Within families, declining fertility increased per-child resources mostly because changes in the numerator (e.g. in family income or housing) were smaller in magnitude than changes in the denominator (family size). Beyond families, I suspect the same empirical pattern applies to a broader range of public investments in children. One well-known illustration of this is Bound and Turner's (2007) analysis of "cohort crowding", which showed that large birth cohorts receive lower public subsidies in higher education. I show the same is true in per-pupil spending at the K-12 level. I suspect it is also true for per-child public spending on children's health, early childhood education, and other services for children. Indeed, I speculate that the substantial increases in child-related federal spending enacted starting in the late 1980s and 1990s, like the Earned Income Tax Credit, Medicaid expansions, the Child Tax Credit, among programs, were predicated on a low youth dependency ratio. Hence, it seems likely that the decline in fertility not only helped finance increased the quality of life within families, but also increases in public investments in children.

Data

This paper draws on microdata from the decennial census and the American Community Survey (covering the period from 1900 to 2020) from IPUMS-USA (Ruggles et al 2023) and the Supplemental

Poverty Measure public use microdata files merged to the Current Population Survey's Annual Social and Economic Supplement (ASEC) from IPUMS-CPS (Waldfogel et al 2017; Flood et al 2022). The advantage of the census data is that it provides very large samples over a long period with detailed information on family composition and living arrangements. The advantage of the SPM-ASEC match is that it provides a more comprehensive and consistently-measured definition of total income, poverty, and family composition from 1967 to the present.

In general, the analysis focuses on individuals aged 17 and under and describes their immediate family environment using IPUMS-supplied characteristics of their parents (e.g. mother's age, marital status, eldest child's age, and mother's and father's income), and calculated sibling characteristics like number and gender of siblings based on those living in the same household and with the same mother.

For certain analyses, I focus on families whose eldest child in the household is 16 or 17 in an attempt to provide better estimates of completed family size characteristics, such as total completed family size, fraction of children who are first born, or gender composition. While this method may underestimate family size to the extent that there are older children who have left the household, it at least excludes families whose fertility is only beginning or incomplete (e.g. families with young children).

Trends in Childhood Living Arrangements

As broad indicators of how changes in fertility have improved within-family living arrangements and the family environment, Figure 2 shows the fraction of children who (1) have three or more siblings (2) are first born (3) have their own room and (4) have siblings all of the same gender.

While number of siblings does not appear to have a direct negative effect on certain outcomes, like educational attainment, it has indirect effects through birth order (Black, Devereaux, and Salvanes 2005 and 2011) and, as I show in the next section, on family poverty and family per-capita resources. Hence, the substantial decline in the fraction of children with more than three siblings from 70 percent of children circa 1900, to 50 percent in 1960 to about 20 percent today represents a large change in resource sharing within the household.

As a result of this trend, the share of children who were first born doubled. Using coefficient estimates from the literature on birth order effects, these changes boosted average IQ by a small amount (because higher-order births no longer occur) and average years of schooling by about a year.

One indication of how these changes affect quality of life is through the housing arrangements of children. Unsurprisingly, when most children lived with many siblings it was rare that a child had their own room. Indeed, it mostly occurred when children were singleton (or their younger siblings either had not yet been born or older siblings had left). For instance, looking at all children living in a household with only their parent or parents (to keep living arrangements simple) and comparing the number of bedrooms to the number of family members, in 2010 about 80 percent of children with exactly one sibling had their own room compared to 40 percent of children with two siblings, and 14 percent of children with three siblings. In other words, younger brothers and sisters have large negative externalities on your probability of having your own room. And that externality is greater if your sibling is of the same gender—the odds of having your own room fall by between 7 and 15 percent (depending on the year in question) for two child families.

Hence, the decline in family size (rather than increases in house size) is predominantly responsible for the increase in bedrooms per person and the odds of having ones own room. (In particular, between 1970 and 2020, the number of bedrooms per family increased from 3.3 to 3.4 whereas the average number of children fell from 3.8 to 2.7.)

According to Figure 2, the share of children whose siblings are all of the same gender more than doubled over the course of the 20th century. Other things equal, families whose children are of the same gender consumed about 4 percent fewer bedrooms in 1970 and 2 percent fewer today. Surely those efficiencies in hand-me-downs and sharing apply to other goods in the household, reducing cost of living in ways that are almost certainly unmeasured in income or by price indices. (And I'm also sure there are other social and economic implications of the decline in the likelihood of having opposite-gender siblings, which may be positive or negative.)

Income, Poverty, and Income Inequality

Just as falling family size has increased housing amenities, for similar reasons declining fertility has boosted per-capita family income, reduced poverty, and reduced inequality in per-capita family income. Figure 3 compares the cumulative growth in (PCE-deflator-adjusted) median family income since 1967 (using the SPM measure of total family resources after taxes and transfers) to median income per capita and median income per child. While median family income increased by 78 percent, on a per-capita basis it increased by 110 percent, and on a per-child basis by 150 percent.

Likewise, as Figure 4 shows, in the three-year period centered on 1968, the likelihood of a child living in poverty was strongly increasing in the number of children in his or her family. Whereas children who had only one or no siblings had less than a 20 percent poverty rate, more than half of children with six siblings lived in poverty. While poverty rates have declined across the board, even in 2018, the children in families with four children were 69 percent more likely to live in poverty than children in two-child families, and children in families with five children were 113 percent more likely to be in poverty. (And note that this chart presents conditional means by family size—there are five times as many children in each five-child household than in each one-child household.)

The arithmetic reason for why poverty rises with family size is that income resources per person falls as family size increases. Figure 5 shows real total SPM family resources divided by the NAS-equivalence-scale number of people.[1] Resources per capita within families declines with the number of children in the household, and even today children in five or more children household have essentially half as many resources as one- or two-children households.

Are these differences in poverty rates and income per capita caused by fertility choices? One reason to believe the answer is yes is the large literature examining the causal effect of marginal fertility choices on parent outcomes, which suggests the effect of having additional children on employment and earnings is small and negative (e.g. Angrist and Evans 1998; Angrist, Lavy, and Schlosser 2010; Kearney and Levine 2012; Aaronson et al 2020). For example, as Kearney and Levine (2010) write (speaking about the parents) "Teen birth itself does not appear to have much direct economic consequence." Of course,

[1] The equivalence scale is (Adults + 0.7*Children)^0.7.

the children of teen parents are very likely to live in poverty, to experience a host of negative health and educational outcomes, and become teen parents themselves (Aizer, Devereux, and Salvanes 2022).

Furthermore (but not shown here), an analysis of twin births using decennial Census data following Angrist and Evans (1998) shows that twin births increase family size and have no effect on family income, but reduce family income per child and increase poverty—and the magnitude of the IV effect are very close to the OLS.[2]

As a result, the decline in family size summarized in Figure 2's decline in families with four or more children and the cross-sectional relationships illustrated in Figures4 and 5 produced large declines in child poverty over the 20th century.

How much did fertility changes (and other factors) affect child poverty since 1967?

To illustrate the magnitude of the effect of fertility changes and other factors, Figure 6 illustrates how changes in fertility (number of children and age of the mother) would be predicted to affect child poverty holding fixed the relationship between SPM poverty and fertility in (the three years centered in) 1968.

Using Dinardo, Fortin, and Lemieux's (1996) method, I reweight the 1968 microdata sample to match the family size and maternal age distribution of each subsequent year from 1969-2019 as well as the historical census data from 1900 to 1960. The red line in Figure 6 presents the average SPM poverty rate calculated on the re-weighted sample (which I call the contribution of fertility); the blue line is the actual SPM poverty rate. The analysis suggests that changes in fertility reduced the poverty rate by about 7 percentage points (off a starting level of about 25.5 percent). Hence, the magnitude of the predicted change is large—matching the entire decline in poverty experienced between 1968 and the late 1990s. Looking backwards, the analysis also suggests that declining family size was also an important contributor to declining poverty over the first half of the 20th century as well.

To examine in greater detail why poverty fell since 1960, figure 7 presents the result of a decomposition of the cumulative change in the child poverty rate between 1968 and 2019. The analysis decomposes the change in the poverty rate between a target year *t* and the base year 1967 into a component 'explained' by (1) fertility: reductions in the number of children and the delay in childbearing (age of mother) (2) changes in marital status and cohabitation (3) changes in the market income earned by families and (4) changes in taxes and transfers.

The first two components of the decomposition are estimated first by DFL-reweighting the 1967 SPM microdata sample of children by the family size and maternal age of the target year population and, second, by both family size, mother's age, mother's marital status, and presence of a cohabitating adult among non-married mothers. The third component (the role of market income) are measured as the difference in poverty rates in the target year calculated only based on pre-tax market income minus the

[2] The IV estimated effect of intensive-margin increases in fertility from having twins is somewhat less than the OLS estimate, and I suspect that this is because the likelihood of having twins is not random but related to the age of the mother and (since the 1980s) IVF. As a result, mothers of twins are older, better educated, more likely to be married, and have higher income, and thus are less likely to be close to an income threshold where additional children would put them below the poverty line.

pre-tax market income poverty rate calculated using the reweighted 1967 sample. The final component (taxes and transfers) is measured as the incremental effect of taxes and transfers on poverty relative to the market-income-based measure of poverty in the target year minus the incremental effect of taxes and transfers on poverty relative to the market-income-based measure of poverty in the reweighted base (1967) year. In short, the first two steps of the decomposition incrementally re-weight the base-year microdata sample to match (1) the fertility characteristics of the target year and (2) the marital characteristics of the target year. The third step then compares the actual market-income-only based poverty rate in the target year to that calculated in the reweighted sample. The final step compares the incremental effects of taxes and transfers in each year relative to the market-income-based measure.

Figure 7 suggests that the decline in fertility is among the largest contributors to reductions in child poverty over the last 50 years. Cumulatively, the 7-percentage-points reduction in poverty from the decline in fertility explains somewhat more than increases in market incomes over this period (which reduced poverty by 5 percentage points) and had about the same effect on poverty as the increases in employment associated with welfare reform and the strong economy in the 1990s. Cumulative tax and transfer policy changes had somewhat larger cumulative effects (10.6 ppts) and the reductions in poverty from rising pre- and post-transfer incomes and declining fertility were offset to some extent by falling marriage rates (which other things equal increased poverty by almost 8 percentage points).

The decline in poverty is one indicator that declining fertility reduced inequality in family economic circumstances. Figure 8 provides a more direct indication that declining family size reduced such inequities. The figure compares the 10^{th}, median, and 90^{th} percentiles of family income (the top panel) to the same percentiles of the per-child distribution of income. Whereas the top panel shows that income growth was higher among richer households, and thus inequality increased, the bottom panel shows that on a per-child basis, high- and low-income families' resources grew at similar amounts.

Beyond the family: Public Spending on Children

The basic evidence above suggests that quality of life and material wellbeing of children increased largely because family resources are supplied inelastically relative to changing family size. The same is likely true for public resources at different levels of government.

Bound and Turner's (2007) analysis of "cohort crowding" provides a specific example of this phenomenon, in which the large and growing birth cohorts generated by the baby boom increased demand college, whereas public support for colleges increased inelastically, which resulted in fewer individuals finding seats or graduating from college. Based on their evidence, the subsequent decline in fertility should have increased per-student resources and boosted college attendance.

Figure 9 provides some suggestive evidence that this occurs at the K-12 level. The graph plots the log of per-pupil spending by state (from the National Center for Education Statistics) against the log of the youth dependency ratio (calculated as in figure 1, the number of children under 20 in a state to the population 20-64 from the Census and ACS). The figure shows that the relationship is downward sloping—states with a high dependency ratio (and where spending on kids is "expensive" in the sense that it requires a higher tax rate on workers to spend a fixed dollar amount per child) have lower per-pupil spending than states with low dependency ratios.

While this figure pools all states and all years, the downward sloping relationship holds in the cross section, within state over time (i.e. taking out state fixed effects), and across counties within states.

I suspect it is also true for per-child public spending on children's health, early childhood education, and other services for children. As a share of GDP, federal spending on children has been relatively flat since the mid-1970s (Lou et al. 2022). Hence, the decline in the youth dependency ratio (and ratio of children/GDP) has meant more federal spending per child. I speculate that the substantial increases in per-child federal spending enacted starting in the late 1980s and 1990s, like the Earned Income Tax Credit, Medicaid expansions, the Child Tax Credit, among other programs, were predicated on a low youth dependency ratio. It's certainly not clear that aggregate public spending should be so inelastic with respect to the number of children, but it seems plausible that it turned out that way. In any case, it seems likely that the decline in fertility not only helped finance increased the quality of life within families but also increases in public investments in children.

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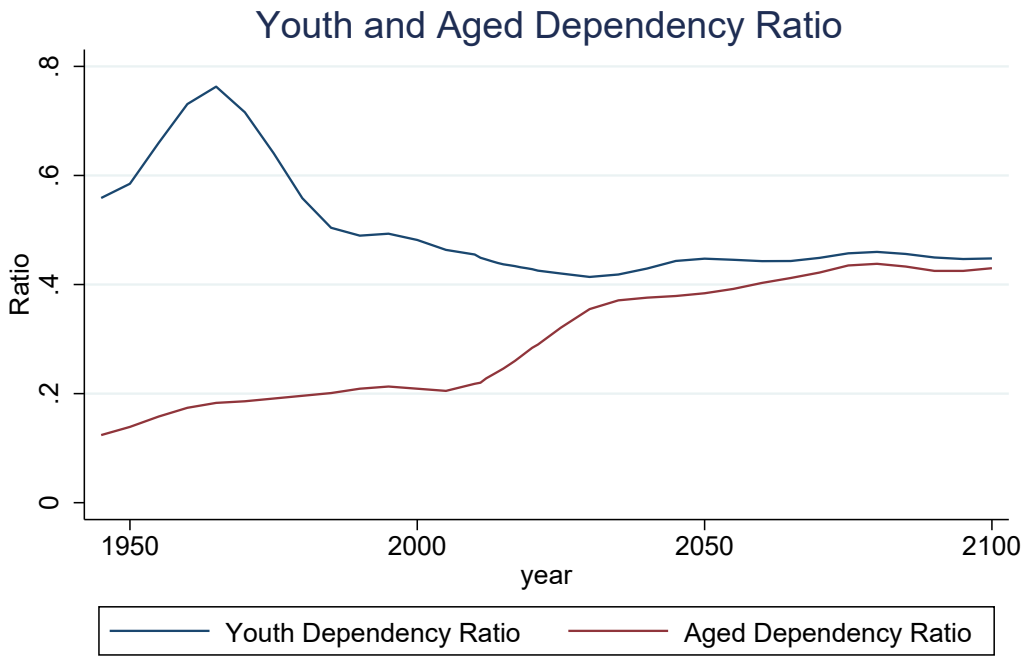
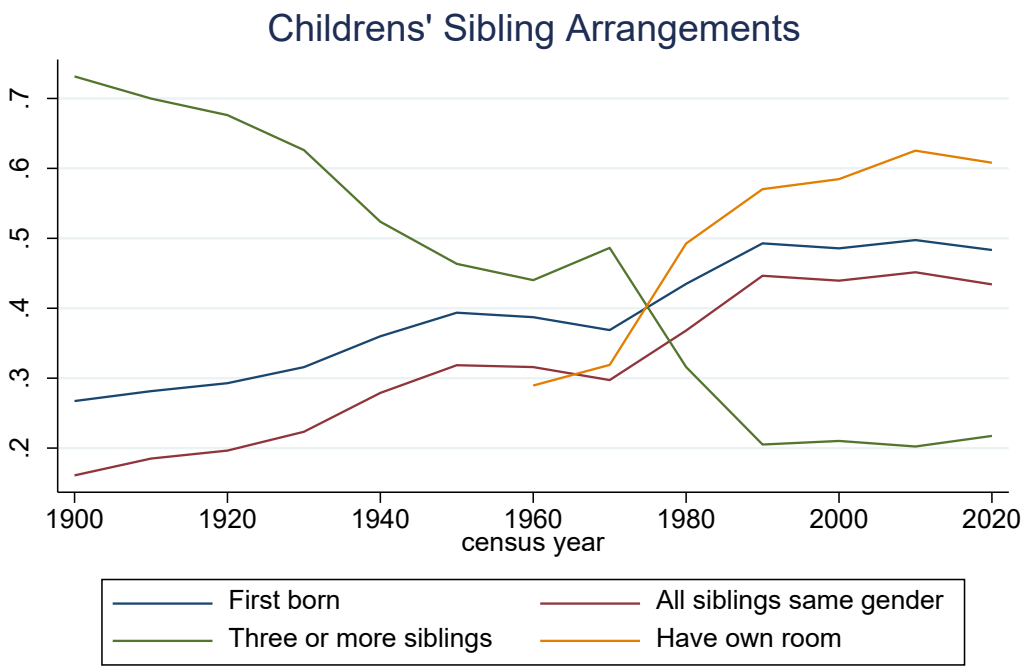
Figure 1



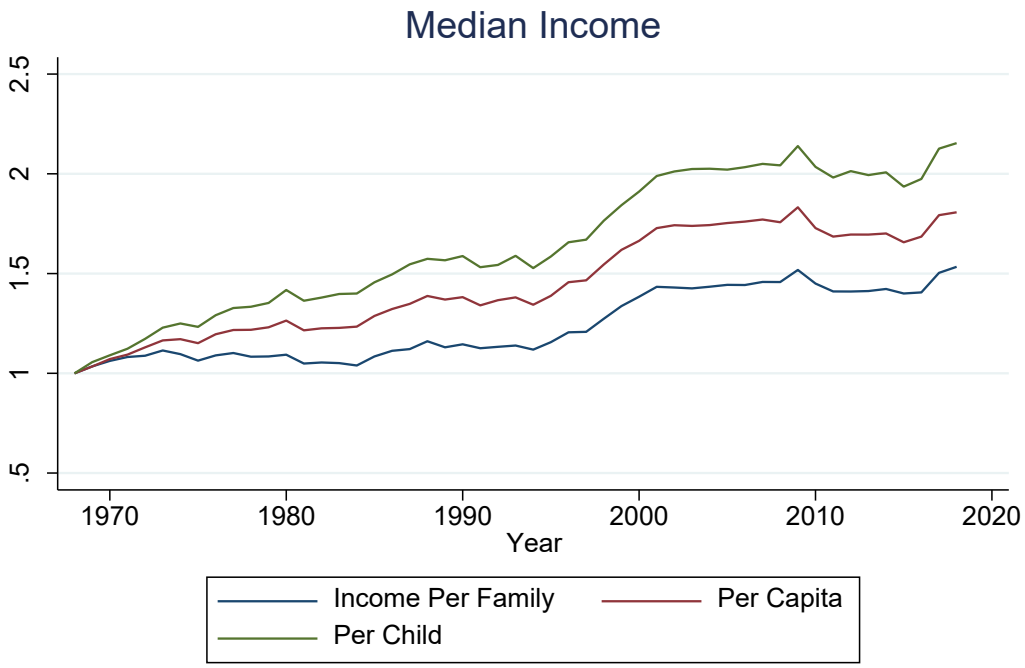
Source: SSA Trustee's Report 2021.
Youth and Total Dependency Ratio Under the Intermediate Projection.

Figure 2



Source: IPUMS USA.
Note: Children living in families whose oldest child is aged 16 to 18.

Figure 3



Source: Historical Supplemental Poverty Measure Data of total resources.
Center on Poverty and Social Policy at Columbia University.

Figure 4

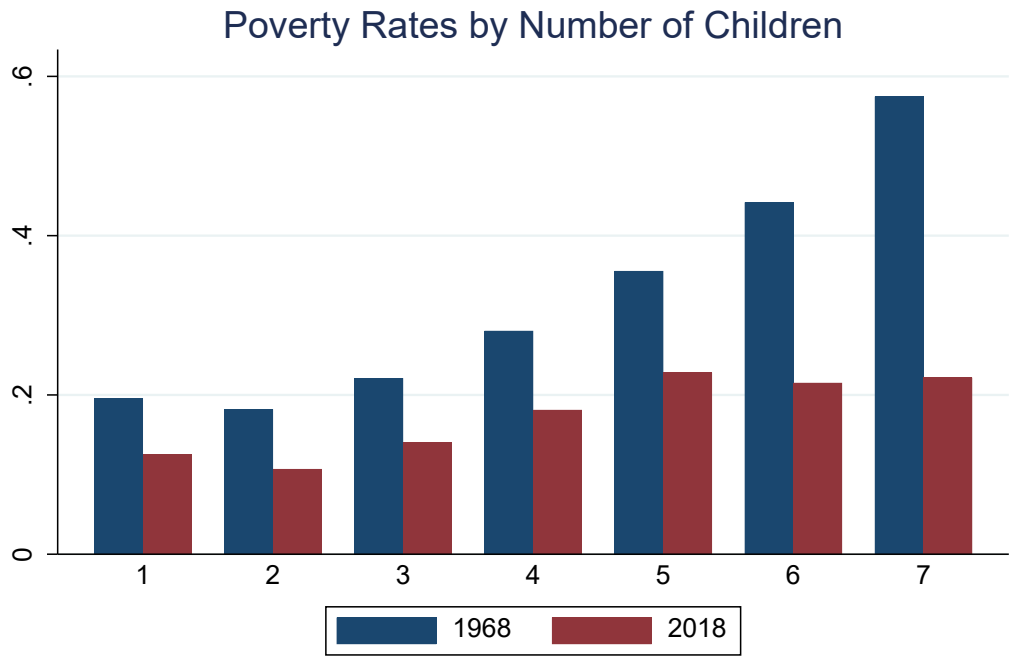


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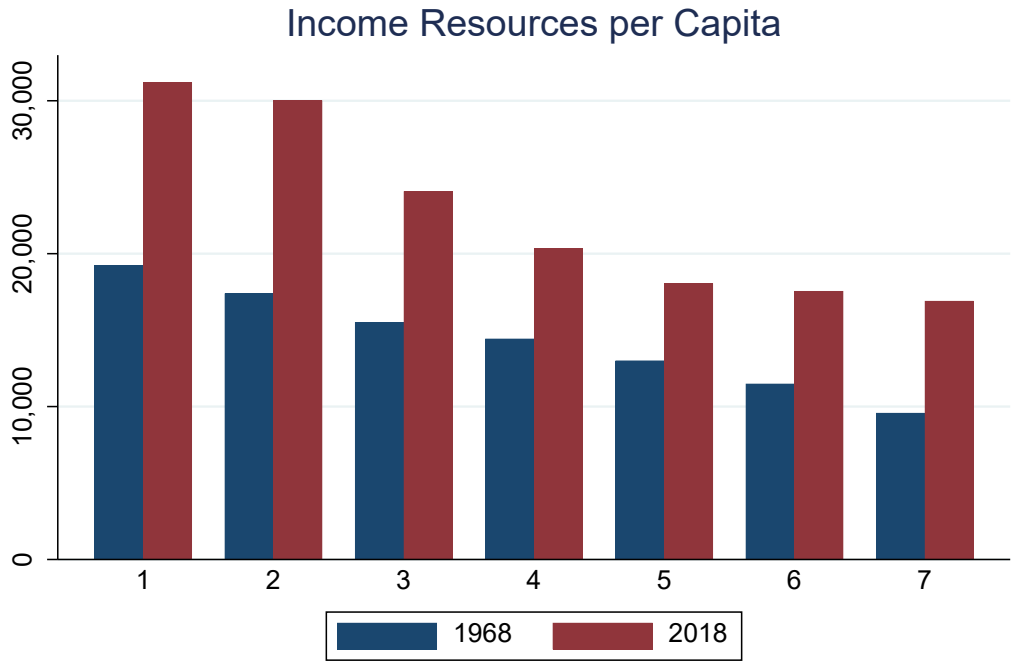
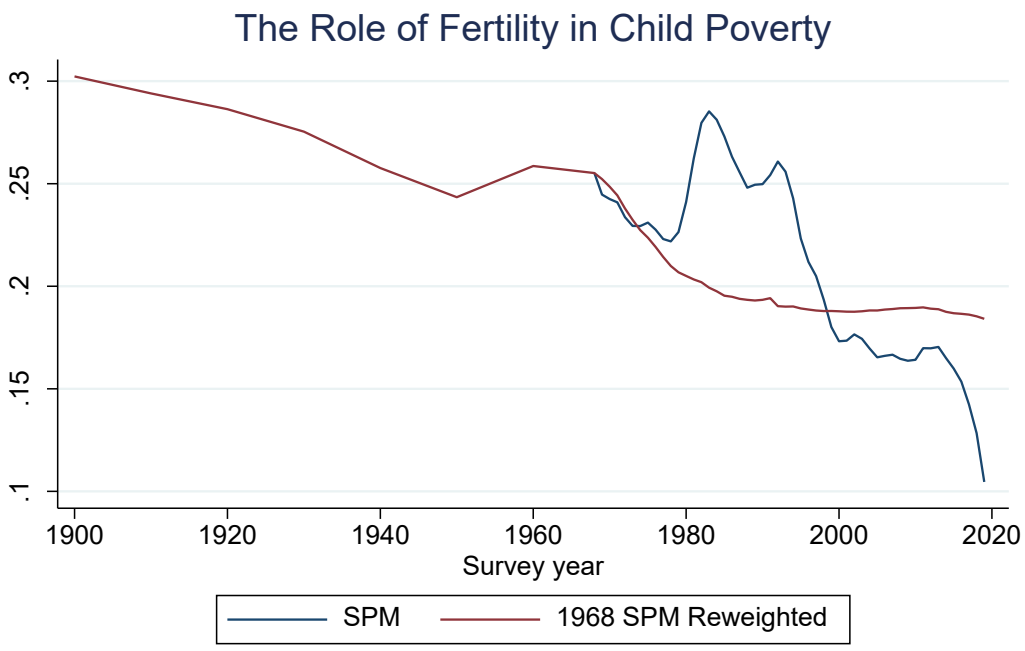
Figure 5



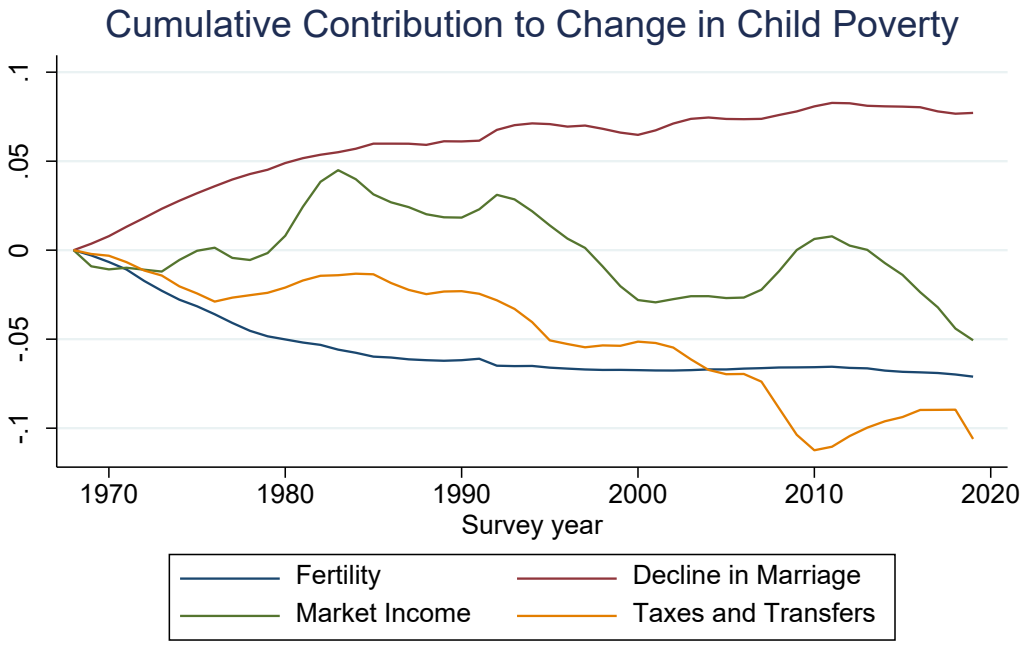
Note: Uses NAS equivalance scale. Source: Historical Supplemental Poverty Measure Data.
Center on Poverty and Social Policy at Columbia University.

Figure 6



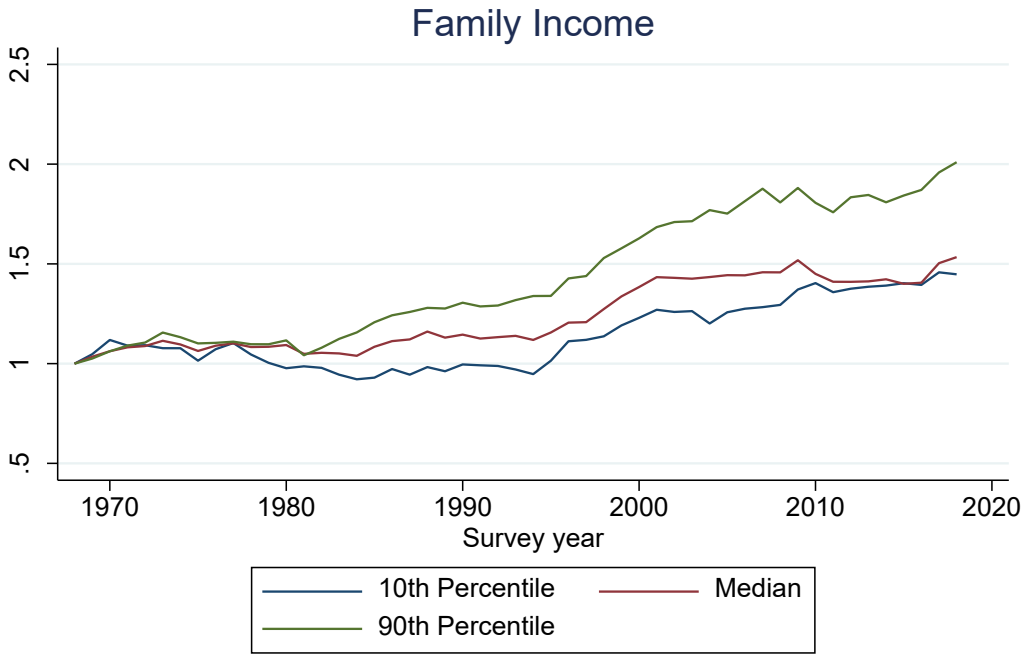
1968 SPM is reweighted by number of children and mothers' age for each year.
Source: Historical Supplemental Poverty Measure Data.
Center on Poverty and Social Policy at Columbia University.

Figure 7

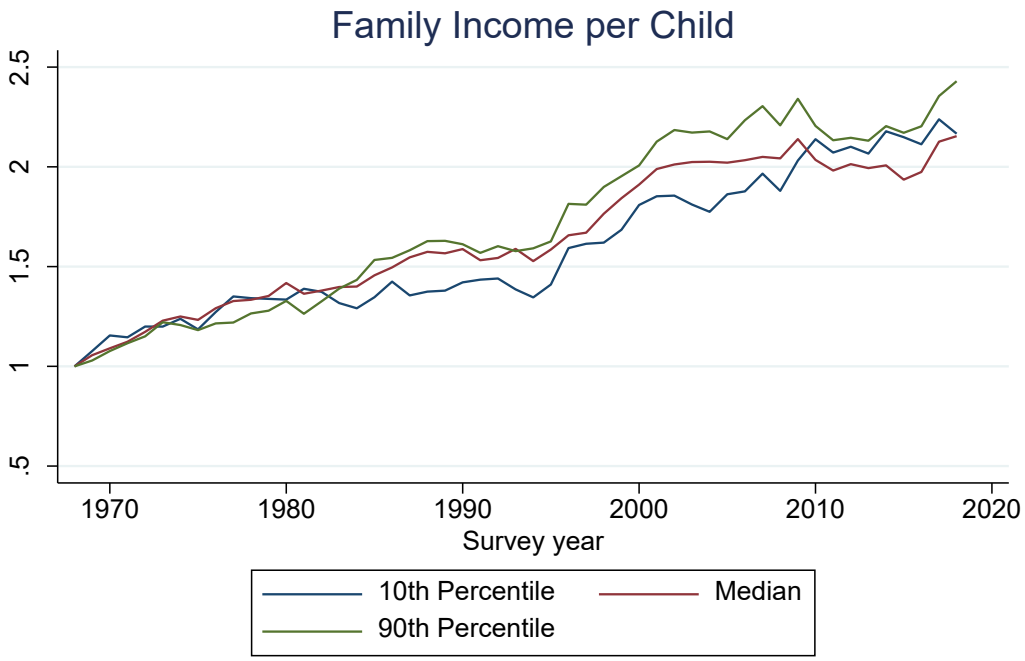


Note: Each line shows the cumulative percentage-point contribution to the change in SPM poverty since 1967. Source: Historical Supplemental Poverty Measure Data. Center on Poverty and Social Policy at Columbia University.

Figure 8



Source: Historical Supplemental Poverty Measure Data.
Center on Poverty and Social Policy at Columbia University.



Source: Historical Supplemental Poverty Measure Data.
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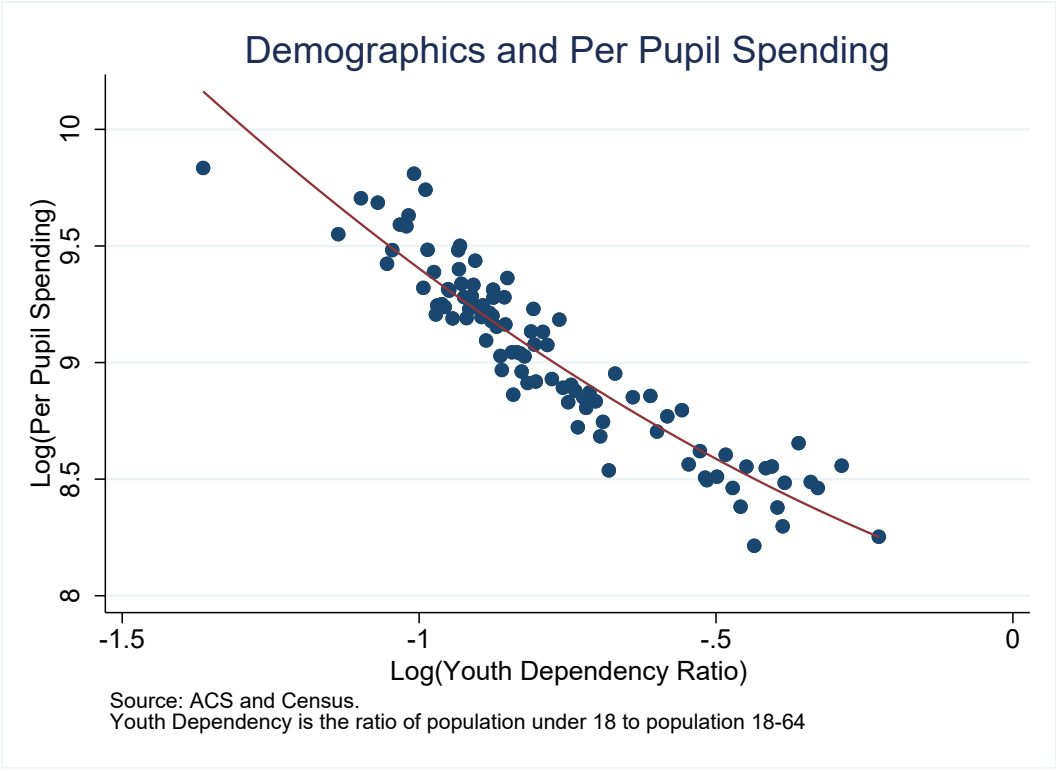
Figure 9



Source: ACS and Census.
Youth Dependency is the ratio of population under 18 to population 18-64