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THE NEW LIFECYCLE OF WOMEN'S EMPLOYMENT: DISAPPEARING HUMPS, SAGGING MIDDLES, EXPANDING TOPS

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ABSTRACT

A new lifecycle of women's employment emerged with cohorts born in the 1950s. For prior cohorts, lifecycle employment had a hump shape; it increased from the twenties to the forties, hit a peak and then declined starting in the fifties. The new lifecycle of employment is initially high and flat, there is a dip in the middle and a phasing out that is more prolonged than for previous cohorts. The hump is gone, the middle is a bit sagging and the top has greatly expanded. We explore the increase in cumulative work experience for women from the 1930s to the 1970s birth cohorts using the SIPP and the HRS. We investigate the changing labor force impact of a birth event across cohorts and by education and also the impact of taking leave or quitting. We find greatly increased labor force experience across cohorts, far less time out after a birth and greater labor force recovery for those who take paid or unpaid leave. Increased employment of women in their older ages is related to more continuous work experience across the lifecycle.

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For US women born before the 1950s, labor force participation over the life cycle followed a distinct inverted-U shape—or what could be termed a "hump." Specifically, labor force involvement for birth cohorts of women before the 1950s rose steeply from the time the women were in their 20s to when they were in their late 40s. Participation rates then decreased after women reached their early 50s. However, the hump has now disappeared.

A new life cycle of women's labor force participation has emerged. For cohorts born since the mid-1950s, the female labor force participation rate is high during the decade or so after schooling ends. Labor force participation rates then decrease somewhat when women are in their 30s and early 40s, a feature we term the "sagging middle." Participation then increases a bit, before phasing out as cohorts move into their 60s and beyond. We cannot yet observe more recent cohorts in their older years, but for earlier cohorts, labor force participation has greatly expanded for women in their 60s and 70s relative to previous cohorts. Thus, it seems plausible that later stages of the life cycle will involve a more prolonged phasing out of work—an expanding top relative to the past. The full new life cycle of women's labor force participation now looks relatively high and fairly flat, vaguely like that of men's but with a somewhat lower level and squishier middle.

The combination of the sagging middle and expanding top has produced a "twist" in the labor force rates of cohorts at the start, middle, and completion of their working lives. What we mean by a twist is that historically, more recent cohorts have had the highest participation rates at each age and earlier cohorts the lowest. It remains true that for women in their 20s and 30s, the most recent cohorts have the highest labor force participation levels, followed by the earlier cohorts, and so on in almost perfect chronological order. A similar pattern is found for women older than around 55 years: that is, the most recent cohorts that can be followed to those ages also have the highest levels of labor force participation and the earlier cohorts have lower levels in strict year of birth order. But in the middle years, the most recent cohorts of women have somewhat lower participation force participation than some of the earlier ones. Thus, there has been a twist in the ordering.

Our description of changes in labor force participation relies on three customary effects: period (year), cohort (year of birth), and life cycle (age). These three effects are linearly related (for example, the current year = year of birth + age). Yet despite the inherent difficulty for researchers in identifying their separate influences, there are reasons to believe that different forces affect each. Period effects influence all individuals in a year, independent of their age. Wars or recessions, for example, could lead individuals at all ages to increase or decrease their desired labor supply during a given period. Cohort effects determine the intercept of a life-cycle path, in effect shifting life-cycle labor force participation of a cohort up or down. Each cohort can have a similarly shaped labor force path but be above (or below) the others. The lifecycle effect determines the shape of the function by age and can be altered by changes in the age at marriage and at first birth, among other factors. We will assume in this discussion that period or year effects are negligible, and that cohort and life-cycle effects dominate.

Both the sagging middle and the expanding top have attracted attention. The observations of a sagging middle led, around a decade ago, to a disparagement that young women were "opting out." The expanding top has recently led some to comment optimistically that older women are working in greater numbers than before because they are healthier and find greater enjoyment in their jobs. Others, expressing some pessimism, have noted that many women have insufficient financial resources to enjoy their older years and end their employment (for discussion, see the papers in Goldin and Katz forthcoming).

The changes in employment in the middle and the top of the age range may appear to be opposing trends. We will argue that they are not. The sagging middle emerged because the increases in the cohort effect have decelerated and have been trivial recently. Instead, we are now seeing the life-cycle or aging effect almost entirely. The life-cycle effect, moreover, changed with the 1950s and 1960s birth cohorts. Those cohorts of women began to marry later and have their children at older ages than did previous cohorts (on the role of the pill see Bailey 2010 and Goldin and Katz 2002). Most of their members participated in the labor force early on and delayed childbearing. Some withdrew for a

while in their middle years and later returned. A large fraction will (most probably) have a less steep decline in employment in their later years than did previous cohorts. But since none of the more recent cohorts has yet to reach the older years, the later chapters of their life-cycle story have yet to be written.

The female population has been distinctly heterogeneous in its labor supply for some time (Goldin 1989; Heckman and Willis 1977). Labor supply heterogeneity means that women who are in the labor force remain in for a long time, while those who are out of the labor force enter as the cohort rate increases. As they enter, they, too, remain in. That is, heterogeneity in this case is based on the observation that there is considerable persistence among those currently in the labor force. In contrast, a homogeneous labor force would mean that all women work an equal fraction of the year, sometimes low and sometimes high. Persistence has implications for the role of employment early in life for that later and it also implies consequences for lengthy spells out of the labor force to care for children and others. We first explore the general labor force trends and then examine the heterogeneity of the population as the earlier life-cycle of women's employment has morphed into the new.

We first map out the general trends using synthetic, rather than actual longitudinal, cohorts that we have created based on data from the Current Population Survey (CPS). We then move to using true longitudinal data from the Survey of Income and Program Participation (SIPP) and the Health and Retirement Study (HRS), both linked to the Social Security Administration (SSA) earnings data (from 1957 for the SIPP and from 1951 for the HRS) and income tax (W-2) records (from 1978 for the SIPP and 1980 for the HRS). We estimate the distribution of years for women in the labor force and examine the heterogeneity of female labor force participants. We then turn to the changing impact of births on employment using an event study analysis and also consider the role of leave policy. We end with a discussion of the reasons why these changes have occurred and the future of US female employment.

Our bottom line is that the US female labor force has greatly expanded and evolved, but that birth events that had always produced a temporary retreat from employment are

now occurring later with the delay in marriage and childbirth. They are, moreover, more apparent because of the increase in employment at younger ages. The increased employment of women in their older years appears to be a continuing trend but only time will tell.

The Evolving Life Cycle of Women's Employment

A "synthetic" birth cohort links age groups over time for a given cohort: for example, those who were born from 1935-40 will all be between ages 25-30 in 1965, and between ages 30-35 in 1970, and so on. In this way, one can track the experiences of the group over time without having data on specific individuals. One can condition on time-invariant variables such as education level, for those beyond school age, and birth place. Synthetic labor force participation rates for different cohorts can be created by linking data by birth cohort using the annual figures from the Current Population Survey March surveys (which is also known as the CPS Annual Social and Economic Supplement (ASEC)). We do this for all women and also by education level for college graduates and all others. We use native-born only women when those data begin in 1994.[1]

Our focus is on nine cohorts born during five-year intervals from 1930 to 1974, for consistency with our later discussion of longitudinal administrative and survey data from the Survey of Income and Program Participation and the Health and Retirement Study. We begin the analysis with age 25 to avoid confusing increases in higher education with decreases in labor force participation. Because the CPS micro-data starts with 1962, we cannot include information for some of the early cohorts in their younger years.

Figure 1A shows the results of this synthetic cohort labor force data for women born from 1930 to 1974. Labor force participation rates for women have generally increased with each cohort, as shown by increases in the intercept. Within cohorts, participation has often increased for a time, before declining. However, labor force participation has not

[1] The reason to use native-born only is because the foreign born could enter at any age. In addition, our later use of the HRS and SIPP requires using the native-born since we use longitudinal information from Social Security records. See the online Appendix available with this paper at http://e-jep.org for figures that include all women regardless of birthplace.

uniformly increased for each subsequent cohort and has also not necessarily increased within each cohort, among the most recent cohorts. The most recent cohorts have the highest participation rates in their mid- to late-20s (their lines are the highest at the upper left of the figure), but they no longer do when in their middle years. For the cohorts we can observe in their older years the ordering returns to one that is more strictly chronological. These features have produced the sagging middle of lower labor force participation rates among women those in their 30 and 40s, along with a twist in terms of the ordering of the cohorts.

Figure 1B shows labor force participation rates by cohort for college graduate women and Figure 1C gives detail on the five most recent college graduate cohorts born in five-year intervals from1950 to 1974. The fraction of women born in the 1980s who will be college graduates by the time they are 35 years old is today almost 45 percent.[2] Therefore, the new life-cycle labor force participation of women is tending to look more like the five cohorts in Figure 1C—beginning high, dipping down a bit in the mid-30s and then increasing again. Because the earlier cohorts among these five did not start out as high and did not dip as much as the most recent ones, the cohort lines are no longer one on top of each other in strict chronological procession. Rather, the arrangement of the lines distinctly twists. The order begins chronological with the latest cohort on top. But by the early 40s it reverses with earlier cohorts having the highest participation and the more recent ones the lowest. It is still too early to know whether the ordering will once again return to the strict chronology, but from the slopes of the lines, it looks like it will.

In this new lifecycle, for all education groups, the hump-shape of labor force participation apparent for older cohorts of women largely disappears. Instead, participation rates for the average woman do not change much until older ages with the phasing out of employment. One way to think about these changes is that the cohort effect has become swamped by the life-cycle effect. For earlier cohorts, each line is above its predecessor, but with much the same shape. However, participation rates for recent

[2] The fraction is about 40 percent for native-born women from the 1980 cohort who were 35 years old and extrapolations suggest that 44 percent will graduate by 35 years old for the 1987 cohort. Calculations use the March CPS-ASEC.

cohorts (1950s onwards) in their 20s are high and do not vary much. With a diminished cohort effect, the life-cycle effect of decreased participation in child-rearing years has become more apparent. Because the child rearing years are now later, a sagging middle has resulted. We will show the effects of child-rearing and persistence in the labor force in the next section, using true longitudinal information by mothers' cohort.

Longitudinal Data

Aggregate synthetic cohort data can demonstrate, as we just did, the evolution of a new life cycle of women's employment. But these data cannot reveal the degree to which specific women persisted in the labor force and whether those in the labor force earlier in their lives remained in with a greater likelihood. The synthetic cohort data cannot show how women's employment has changed by cohort over time in response to important life cycle events, such as births. Moreover, synthetic cohort data do not allow us to distinguish among women within a cohort to see the fractions of their post-schooling lives that are spent in the labor force and how that distribution changed within and across cohorts.

To make better sense of the evolution of the new life cycle of work we turn to longitudinal data from the Survey of Income and Program Participation and the Health and Retirement Study, both linked to the Social Security Administration earnings records and W-2 forms. The linkage to the SSA records provides extensive longitudinal information on the earnings of large numbers of individuals across cohorts born from the early 1930s to the mid-1970s. This section describes our longitudinal data; the next section describes the labor force patterns based on the data.

These two longitudinal data sets offer rich and complementary information. Because they are each complicated in their construction, we will summarize only those aspects pertinent to this article.[3] The Health and Retirement Study began in 1992 with 51 to 61 year-olds who were then interviewed biennially. Additional cohorts were added in 1998, 2004 and 2010 for respondents who were then 51 to 56 years old. Together with the

[3] See the online Appendix available with this paper at http://e-jep.org for more information on the Health and Retirement Study and the Survey of Income and Program Participation.

spouses of the respondents who became age-eligible at some later date, these are the main birth cohorts we use from the HRS. They span birth years from 1931 to 1959. Respondents were given the option of having their Social Security earnings records linked to their HRS surveys. Because this was done during each interview, the earlier cohorts have a higher fraction linked. Linkage rates are 80 percent on average and about 88 percent for those born before 1943.

The Survey of Income and Program Participation (SIPP) was begun in 1984 with new panels added in 1996, 2001, 2004 and 2008. Each panel begins with individuals who are between 30 and 60 years old and are interviewed for four consecutive years. We use the Gold Standard File, which is a harmonized set of SIPP panels linked to longitudinal earnings records.[4] Our analysis uses SIPP panels 1996, 2001, 2004, and 2008 and integrates information from the fertility history topical modules. Our overall sample begins with women who range from around 30 to 60 years old at the time of their fertility history interview.

Our primary interest is in the work history information. Each of the two datasets has a survey component and an administrative portion from the Social Security Administration earnings records. Although the administrative component is identical, the data sets differ in their coverage of retrospective information that bears on the work history. For example, the Health and Retirement Study provides retrospective information on the respondent's longest occupation and also the years when the individual worked for a government agency for upwards of two periods. The Survey of Income and Program Participation contains information that bears on whether the woman took job protected or paid leave after having a birth, whether she returned to the same employer after that leave, and whether she quit her current job around the time of the birth event. Both the HRS and the SIPP contain variables that are (reasonably) time invariant (for example, the level of education for those beyond age 35; children ever born by age 40) and both have time-variant longitudinal information for the duration of the surveys.

[4] Data from the SIPP Gold Standard File are confidential. All results have been formally reviewed to ensure that no confidential Census Bureau data have been disclosed.

The work history information from the Social Security Administration earnings records, W-2 forms and the survey data provide annual labor earnings, but not labor force participation, or hours and weeks of work, except for the survey years. We generate an estimate of labor force "participation" for the years we have the SSA and W-2 records by assuming that individuals are labor force participants if they earned more than some minimum amount—equivalent to 10 hours a week for 52 weeks at the federal minimum wage—in that year. Our estimated participation rates are nearly identical to those from the CPS-ASEC for the overlapping years.[5]

We cobble together our data on cohort labor force participation by using each of our longitudinal data sets when it seems the most complete. For example, some occupations such as most teachers and other government employees were exempt from Social Security tax and would not have earnings reported in the SSA data even when they were employed. But they can be included after 1977 when W-2 data are available for the Survey of Income and Program Participation and after 1979 for the Health and Retirement Study. These workers can also be folded in for the HRS in the years the respondent listed retrospective information on government employment. Our choice of whether to use the SIPP-SSA or the HRS-SSA data is a function of the birth cohort and the age of the individual. Because we employ ten-year age intervals, our decision depends on the youngest age in the interval. The exempt worker issue is far less of a problem for the non-college graduate group since they would not have been teachers and are less likely to have been government employees in general. The SIPP and HRS longitudinal labor force data that we generate from the SSA records closely match each other for overlapping birth cohorts, so any measurement error introduced by comparisons between the two longitudinal datasets should be modest.

[5] For details of the comparison between our estimate and the Current Population Survey estimate, see the Appendix available with this paper at http://e-jep.org. The CPS labor force estimate comes from a question about whether the individual was working for pay or profit during at least one hour in the survey week or was actively searching for work. The Social Security administration data are annual and there is no obvious amount of annual income that would be equivalent to the CPS labor force question. Because most labor force respondents are working a reasonable number of hours during a survey week, we chose our definition of ten hours at the minimum wage.

Evidence on New and Old Lifecycles from Administrative Data

Labor Force Experience

Our longitudinal data from a combination of these datasets allow us to estimate labor market experience for women born from 1935 to 1974 by age and by education. The aggregate data are given in Figure 2 for three groups—all women, college graduates, and non-college graduates. The data are shown for the full 25 to 54 year-old group, then for the youngest group 25 to 34 years old, and finally for all women in three ten-year age groups using more high frequency birth cohorts. Only longitudinal data can be used to construct work experience; for example, the Current Population Survey did not ask respondents how long they had been employed.[6]

The entire 25-54 year-old group, shown in Figure 2A, can be observed for (native-born) birth cohorts up to 1959. For those cohorts, mean years of work experience in that 30-year interval increased from 16.4 to 22.2. For the most recent of the cohorts in our data (1955-59), the average woman was employed for 74 percent of the 30-year period. For college graduates in the most recent cohorts, the figure is 82 percent. Much of the total increase in mean years of work experience occurred in the youngest of the age groups (25-34). Figure 2B shows cumulative experience within the 25-34 year group for birth cohorts from 1935 to 1974.

The increase for the youngest age group was large: slightly more than half of the total increase from 25 to 54 years old among women born from 1935 to 1959 (3.05 of the total of 5.9 years) occurred in the 25-34 year group. But most of it occurred for cohorts born before 1959. The increase for the 25-34 year-old group from the 1955-59 to the 1970-74 birth cohorts was less than an additional year.

For the 25-34 year-old group average work experience in that interval reached around 8.7 years for college graduates and around 7.3 years for the non-college group. The

[6] In another study using a different source of longitudinal data, Attanasio, Low and Sánchez-Marcos (2008) use the Panel Study of Income Dynamics (PSID) and analyze the different lifecycle employment among three cohorts of women, those born at the end of the 1930s, 1940s and 1950s.

change from the 1935 to the 1974 birth cohorts for all women, it should be noted, was almost 4 years, a bit greater than for the two separate educational components—the college and non-college groups—because of a relative increase in the college graduate group. But the main findings are not much different for each group separately.

Figure 2.C puts the three ten-year age groups together in one graph. Total cumulative experience for the 25 to 34-year old group doubled from around 3.9 years for the late 1930s cohorts to 7.85 years for the early 1970s cohorts. The other two ten-year age groups show sturdy increases until around the early 1950s cohorts. Looking at the cohorts born around 1965 reveals that the fraction of 25-34 year old women in the labor force began to exceed that for the 35-44 year old group (both being around 7.5 years out of the 10). Previously the older group's fraction had exceeded the younger for all previous cohorts. Delay of childbirth, we will soon suggest, led to increased participation for the youngest group but also caused slower increases for the middle group—yet another way of understanding the appearance of a sagging middle.

Distribution of Work Years

Work experience clearly increased for women across birth cohorts from the 1930s to the 1970s. But the aggregate numbers do not reveal the distribution of work years: for example, a 60 percent labor force participation rate could mean that all women work 60 percent of the time or that 40 percent are never at work and 60 percent work full-time. The former scenario is termed "homogeneous" (since all women are the same) and the latter "heterogeneous" (since women in that scenario greatly differ). Most estimates have found considerably more heterogeneity than homogeneity and our data will reveal the same. But as labor force participation rates rise, there is less room for heterogeneity.

To explore heterogeneity among labor force participants we compute the distribution of years in the labor force for each birth cohort by age interval. As summary statistics we provide the fractions at the two tails of the distribution: the fraction working more than 80 percent of the period and the fraction working less than 20 percent.

For the most recent cohorts that can be observed across the full 30-year period from age 25-54—that is, those born in 1957-58 in our data—53.3 percent of women were employed for more than 80 percent of the 30-year period and just 9 percent were employed for less than 20 percent, as shown in the right-hand tails of the lines in Figure 3A. For the earlier cohorts, born in the 1930s, the distribution of employment across the life cycle is far different. It is almost uniform, with around 20 percent employed less than 20 percent of the entire period and 20 percent employed for more than 80 percent. Indeed, about 20 percent of the 1930s cohort is employed in each of the quintiles. Because labor force participation for these early cohorts was only around 30 percent for the 25 to 29-year group and then rose to around 60 percent as the cohorts aged, for those 50 to 54 years old, the findings on the distribution of life-cycle employment for this cohort are more consistent with a heterogeneous model of participation rather than a homogeneous one.

Figure 3B presents the same evidence, but for the 25-34 year-old group and thus for more recent cohorts. For the most recent cohorts shown greater than 60 percent are employed more than 80 percent of the ten years, whereas only about 16 percent had been for the earliest cohorts shown, those born in the 1930s.

There has been considerable persistence in participation among women: that is, those who work more when young also continue in the labor force when older. We have examined the labor force participation of those who worked a considerable amount—more than 60 percent—of the period they were 25 to 34 years old. Among women who worked more than 60 percent of those years, 76 percent in the 1950s birth cohorts worked more than 80 percent from 35 to 44 and 76 percent did from 45 to 54 years old. Conversely, just 32 percent of those who worked no more than five years of the 25 to 34 year old period were employed more than 80 percent of the next decade and 50 percent of the following one.

There are important implications of increased lifecycle employment for continued work later in life. In related work, Goldin and Katz (2016) find that greater employment early in one's life is strongly related to employment at the later ages (they examine participation at ages 59 to 63), given education and birth cohort. Thus, the increase in life-

cycle employment for those 25-54 implies delayed retirement. But even though the college educated would appear to have hit a plateau in their lifecycle employment around the 1950 cohort, Goldin and Katz (2016) caution that other factors have led to the increased employment of college graduate women at older years and will probably do the same for the more recent cohorts.

What about the role of delayed childbirth for the most recent cohorts? We find using the Health and Retirement Study that an increase in the age at which the first child is born, say from 25 years to 30 years, is correlated with increased participation in the 25 to 34-year interval but decreased participation in the 35 to 44-year interval, even holding the number of children born constant.[7] This finding implies that a later age at first birth is an important factor in the twist in life-cycle labor force participation. It is still the case, however, that later births mean greater participation for the entire 25 to 44-year period probably because substantial human capital investments are made early on. We turn now to an analysis of the role of childbirth and labor force participation across cohorts.

Childbirth and Life-cycle Participation

The changed timing and number of children are important parts of the transition to the new life cycle of women's employment. Not only are children in more recent cohorts being born to older mothers but also there are fewer children in these families than in the earlier cohorts. The previous norm was one in which women had their children when young, then left the labor force and reentered employment somewhat later. In the current era women have their children when older, have greater attachment to the labor force, take less time off and later reestablish their employment and careers faster. The one possible exception, we will see, is college graduate women in the most recent cohorts we can track. Their participation rates at first birth are very high but do not return to those levels a decade after the first birth.

[7] The regressions are estimated for the fraction of the 25-34 year and 35-44 year intervals in the labor force across birth cohorts from 1931 to 1954 for women with at least one birth. Cohort, number of children, education and race dummies are included. Age of the mother at the first birth is entered as a quadratic.

Both the Survey of Income and Program Participation and the Health and Retirement Study contain information on the year of birth for the first child and the number of subsequent births. We use the data to create event studies for all women who had a first birth. The event study evidence is given in Figure 4A for all women and separately in Figure 4B for those with a four-year college degree. We use the HRS for the 1935 to 1949 birth cohorts and the SIPP for the 1950 to 1969 birth cohorts for reasons mentioned earlier (specifically, the HRS is better at identifying workers exempt from Social Security in the pre-1978 period).

Looking first at all women in Figure 4A, the cohorts born from 1935 to 1944 had initial participation rates a bit higher than 0.5 before the first birth. These rates plummet to around 0.24 to 0.28 just after the birth and never recover to pre-birth levels in the ten subsequent years. These are "baby boom" mothers, for whom the number of children (conditional on having one) is 3.26 for the 1935-1939 cohort and 2.85 for the 1940-1944 cohort (using the CPS June Fertility Supplements micro-data for women 40 years and older).[8] A more detailed look at the data shows that even for women with just one or two births until they are in their 40s, labor force participation rates never reach pre-birth levels in the next ten years. Mothers in the 1935-44 birth cohorts retreated from the labor force for some time. But since births are staggered and pre-birth participation rates for these cohorts were low, the increase in participation across the life cycle as women aged produced the hump shape seen in Figure 1.

Labor force recovery for the 1945-49 cohorts, unlike their predecessors, is complete by ten years after the first birth even though the initial participation rates are much higher. Participation rates for the cohorts born from 1950-54 to the early 1960s begin around 0.6 to 0.7 and for those that can be observed ten years out, rates equal or exceed those before

[8] In the online Appendix available with this paper at http://e-jep.org, Appendix Table 1 contains the mean age at first birth to ever-moms, the numbers of children eventually born to ever-moms and the fraction of the group with zero births in the Health and Retirement Study and Survey of Income and Program Participation. Appendix Table 1 also has the numbers of children for ever-moms and fraction of the group with zero births from the much larger CPS June Fertility Supplements micro-data. Data are provided for all and college graduate women (native-born in the more recent cohorts due to availability in the CPS).

the birth. The number of eventual births was 2.48 in the 1945-49 cohort and 2.29 for the 1955-59 cohort.[9]

The data for the college group shown in Figure 4B are similar but noisier, due to the smaller number of observations. The levels are considerably higher than for the total group that include all education levels. As with the total group, there is a sharp break with the 1945-49 cohort. Whereas participation rates of previous cohorts did not fully recover, the 1945-49 and 1950-54 cohorts did so after ten years. Subsequent cohorts, however, have pre-birth labor force rates around 0.83 to 0.88, and those that we can observe ten years after the birth do not fully recover. In fact, the rates for the 1960-64 cohorts are lower than for the 1955-59 cohorts. These facts are consistent with the crossing of the synthetic cohort participation lines for college graduates born from 1955-59 and 1960-64, shown earlier in Figures 1B and 1C.

One may have wondered why there is an increase in participation just before the birth. Because some births occur while the mother is still in school or several years after school completion, labor force participation often increases in the three years preceding the first birth in both Figure 4 graphs. When we focus only on first births occurring after age 24, labor force participation no longer increases in the pre-birth years.

The effect of children on the employment of women in their 20s and early 30s has consequences for later employment. Thus, the decrease in years out of the labor force by mothers in more recent cohorts, as seen in Figures 4A, is predictive of greater employment later in their lives.

The modules in the Survey of Income and Program Participation contain

[9] See online Appendix 1. These means are conditional on having at least one birth and use the CPS June Fertility Supplement micro-data for women 40 years and older. Similar findings are given in Attanasio, Low and Sánchez-Marcos (2008, figure 7) although they present data on employment only 12 months before and 12 months after the birth. See also Angelov, Johansson and Lindahl (2016) on Sweden and Kleven, Landais, and Søgaard (2016) on Denmark for birth event analyses that track labor force participation, hours and earnings for at least ten years after the birth. Kleven et al. find substantial and persistent decreases in labor force participation that are greater than those we estimate for all US women, showing that the motherhood penalty is substantial even in nations with generous leave policy.

information on the use of paid and unpaid leave during the year a woman's first child is born, as well as whether the woman quit her current job in that interval. Rather than presenting the information by mother's birth cohort, as we did for the labor force data, a more meaningful arrangement is by the birth year of the first child. All the women in our analysis sample had a birth in one of three periods—1980-1989, 1990-1999 and 2000-2007—and all reported employment in the SIPP at some point in their pregnancy.[10] Because we begin with 1980s births, the mothers are part of cohorts born since 1955 and are, therefore, part of the group of women exhibiting the new life cycle of work.

The fraction of women who reported that they quit their jobs around the time of the birth decreased from 28 percent for those having their first child in the 1980s to 19 percent in the early 2000s.[11] The fraction taking paid leave increased from 34 percent in the 1880s to 42 percent in the 2000s and the fraction on unpaid leave stayed fairly constant at around 30 percent (29 percent in the 1980s and 31 percent in the 2000s), where paid and unpaid leave include sick, vacation, disability, maternity and other. About 8 percent in each of the three periods made no declaration of any type of leave or quit. Therefore, the fractions in each of the categories changed, with leaves increasing and quits decreasing by almost 20 percentage points for the entire group.

We estimate the labor force participation of first-time mothers depending upon their leave or quit status during the pregnancy and at birth and track their post-birth participation for ten years and their pre-birth participation for three years. Recall that the sample is defined in terms of mothers who reported in the SIPP that they worked at some point during pregnancy but that we estimate labor force participation in each calendar year as having administrative earnings above a minimum threshold. Because the participation rates are derived from annual earnings data, we cannot precisely identify the moment of

[10] We begin the analysis with the 1980s to get around the problem that exempt workers pose for the SIPP data, mentioned earlier in the text.

[11] About one-quarter of the respondents gave multiple leave types (e.g., paid and unpaid leave) and we proportionately allocate leaves for each birth. Changes regarding leave type in the SIPP are greater if we extend the analysis to births in the 1960s and 1970s. But the earlier data are not fully consistent with later data and the exemption issue, discussed before, would affect many government workers in the earlier cohorts. HRS data cannot be used instead.

the pregnancy and only know the year of the birth. If the birth was early in the year, the pregnancy would have mainly been in the previous year and the woman could be considered out of the labor force the year of the birth. But if the birth was late in the year, the woman could be deemed in the labor force that year. Since many mothers have low annual incomes due to unpaid leaves or quits and because the leaves can be staggered for the group, the aggregate rates shown in Figure 5 for the year before the birth are less than 100 percent. For the group that eventually quit, they are considerably lower.

Interestingly, during the 33-year period observed (1980 to 2012) and conditional on leave type, new mothers did not change their behavior much in terms of employment after their first birth. Because the results for all years given leave type are similar we show the data in Figure 5 only for women who were new mothers in the 1990s.

Those on paid leave have the highest employment rates before, during and after pregnancy, followed by those on unpaid leave. The lowest rates are for those who quit during the pregnancy although ten years after the first birth their participation rate is 64 percent. Those on paid leave have a participation rate of 82 percent after ten years, considerably higher. Without an analysis of what determines who falls in each of these different categories it is impossible to infer the impact that paid-leave, or longer protected-leave, policies would have on women's employment. But taking leave and staving off quits would appear to increase participation after a birth.[12]

Some International Comparisons

Current labor market participation rates of US women are low compared with those of other OECD nations. Moreover, the US rank in terms of these rates has deteriorated in the last 25 years. For women in the 25-54 year-old group among 21 OECD countries, the

[12] Olivetti and Petrongolo, in their paper in this issue, have an extensive discussion of the family leave literature. Their own empirical work shows that guaranteed and paid leave will increase women's employment to a point, but can reduce it for extensive leave policies. Only a few US states have paid leave, and protected leave is generally limited to that covered by the Family and Medical Leave Act of 1993. Rossin-Slater, Ruhm and Waldfogel (2013) find that California's paid leave policy (which took effect in 2004) expanded leave use and had no negative employment effects and possibly positive ones.

United States ranked sixth highest in 1990, ninth in 2000, and seventeenth in 2014. The US does much better when full-time rates are considered, because part-time work is more common in other OECD countries, particularly for women. Using the OECD common definition of full-time employment (30 hours per week in the usual job), the US was fourth (out of 18) in 1990, fifth (out of 20) in 2000, and eighth in 2014.[13] The topic of hours of work—the intensive margin—is a large and separate issue that we do not address here.

Paid and protected leaves—by definition—imply higher labor force participation rates because, in most data, individuals on leave are counted in the labor force. That factor can account for 4 to 4.5 percentage points (for the 25-54-year-old group) of the higher labor force participation among women 25 to 54 years old in Austria, Denmark, Norway and Sweden, which are nations with very generous leave policies relative to the United States, the least generous. The actual differences in labor force participation between women 25 to 54 years old in the United States and in these countries are 10 to 14 percentage points in 2014. That is, measurement can explain around 30 to 40 percent of the difference. Among women in their 30s, the entire difference in participation rates between the US and Denmark, Norway and Sweden can be attributed to how women on leave are counted. But leave policy could have more than a definitional impact.

The roles played by public and private leave policies in accounting for these cross-national differences are complicated. Blau and Kahn (2013) find a positive relationship between leave policies and labor force participation, but also emphasize that the low-hours jobs women often have in these nations generally preclude careers. The fundamental question is whether new mothers who want to spend more weeks at home than allowed end up quitting their job and then have difficulty finding another position. When mandated parental leaves are greatly extended another issue is whether firms reduce demand for women in the age bracket who might be more likely to use long protected leaves (as discussed in the paper by Olivetti and Petrongolo in this issue).

[13] The 21 countries are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Great Britain, Greece, Ireland, Italy, Japan, Luxemburg, Netherlands, Norway, New Zealand, Portugal, Spain, Sweden and the US. The full-time measure is not always available.

Comparisons between the lifecycle employment patterns presented in this article with those for other OECD nations reveal that extensive protected and paid leave is probably not the main reason for the differences and thus not the primary reason for the slow recovery time in the birth event analysis. Lifecycle participation graphs for the United Kingdom look like those for the United States, despite its longer protected and paid leave. But lifecycle employment patterns for France and Denmark, for example, have continued to increase with age. The lower cost and higher quality of childcare is probably the main factor (a conclusion arrived at by Olivetti and Petrongolo in their paper in this issue).

Conclusions

A new life cycle of women's labor force participation emerged with cohorts born in the 1950s. It is flatter and higher with no hump, but with a dip in the middle and a phasing out that is later than for previous cohorts. High levels of female employment early in life are predictive of working longer at older ages, although no cohorts with the new lifecycle characteristics are yet old enough to observe in their 60s and 70s.

What brought about the new lifecycle of women's work? The most important part of the story is the increase in participation by a succession of cohorts. That tale begins in the early twentieth century and is mainly about the impact of the growth in real wages combined with an increased importance of the substitution effect and a declining importance of the income effect (Blau and Kahn 2007). Later, young women in the late 1960s and 1970s began to have more realistic expectations of their future employment and started to make educational investments that could lead to longer and fulfilling careers (Goldin 2006). The "quiet revolution" that resulted further expanded women's employment. Together with the improved ability of young women to control the timing of childbirth (with the "pill"), the marriage age rose, and births were delayed. Motherhood came later in life and its impact on employment and careers was lessened.

More recent trends do not seem to have led to a great backpedaling in female employment. The scare about women's "opting out" of the workforce in the early 2000s was a misinterpretation of the changes in the lifecycle of work. The sagging middle has

been the result of a greater employment of women in their 20s together with a delay of childbirth and a negative (but smaller) employment impact of motherhood. The negative impact of motherhood is often attributed to the short-term nature of (federally) protected parental leave in the United States. Yet this explanation can only be a partial one. Many college graduates who have paid leave or more weeks of protected leave than the 12 weeks guaranteed to many workers by the 1993 Family and Medical Leave Act (FMLA), have employment that also discloses a sagging middle.

Yet, relative to several other rich nations, women in the United States have been working a lower fraction of their lives when 25-54 years old. These other nations have had continued cohort effects and it is unclear whether this is due to leave policy, child care provision or hours differences. On the plus side, however, is that US women remain in the labor force longer, what we term the expanding top.

An implication of the new life cycle of labor force participation for women is that cohorts entering their older years have more work experience, often have satisfying careers rather than just jobs, have invested more in their vocations, have more of their identity bound up in their work. and have more steeply sloped earnings trajectories. It is no wonder that employment has greatly increased at older ages and these underlying dynamics give reason to believe that it will continue to do so.

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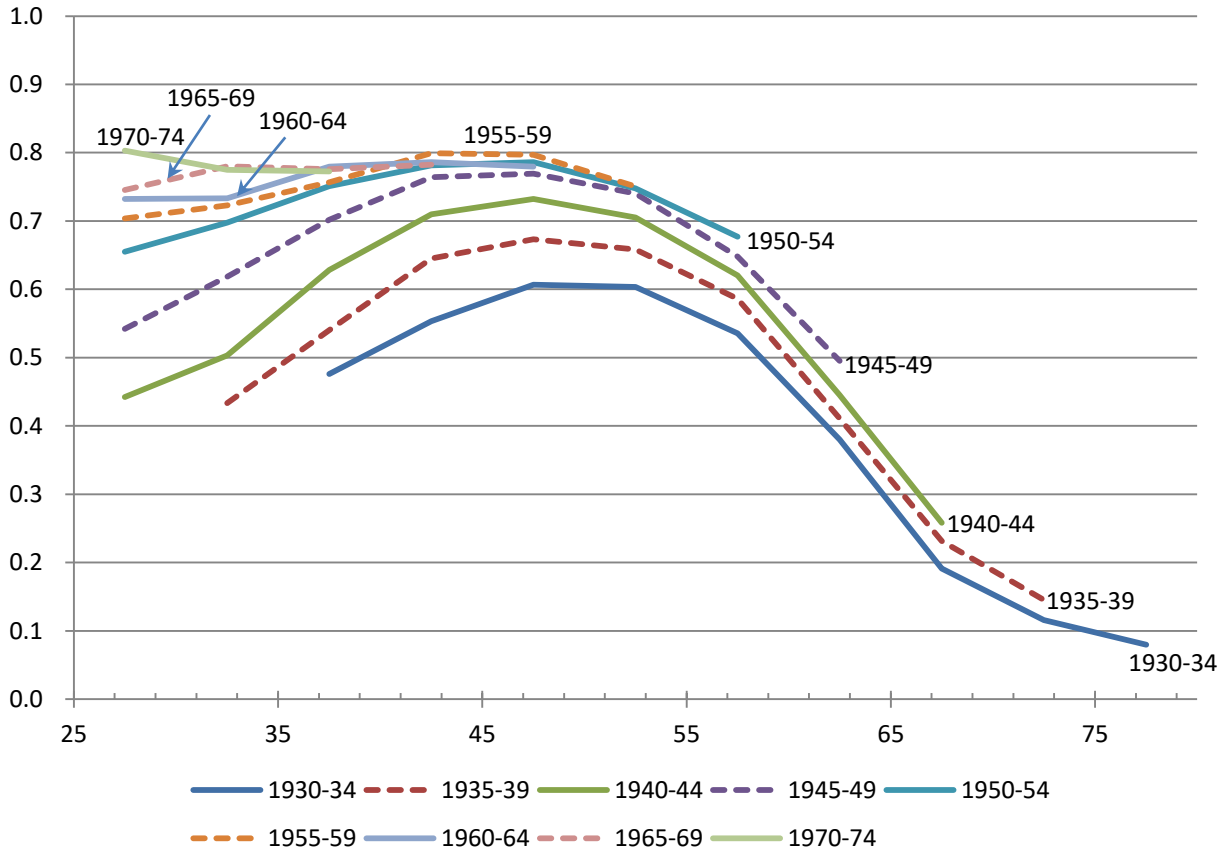
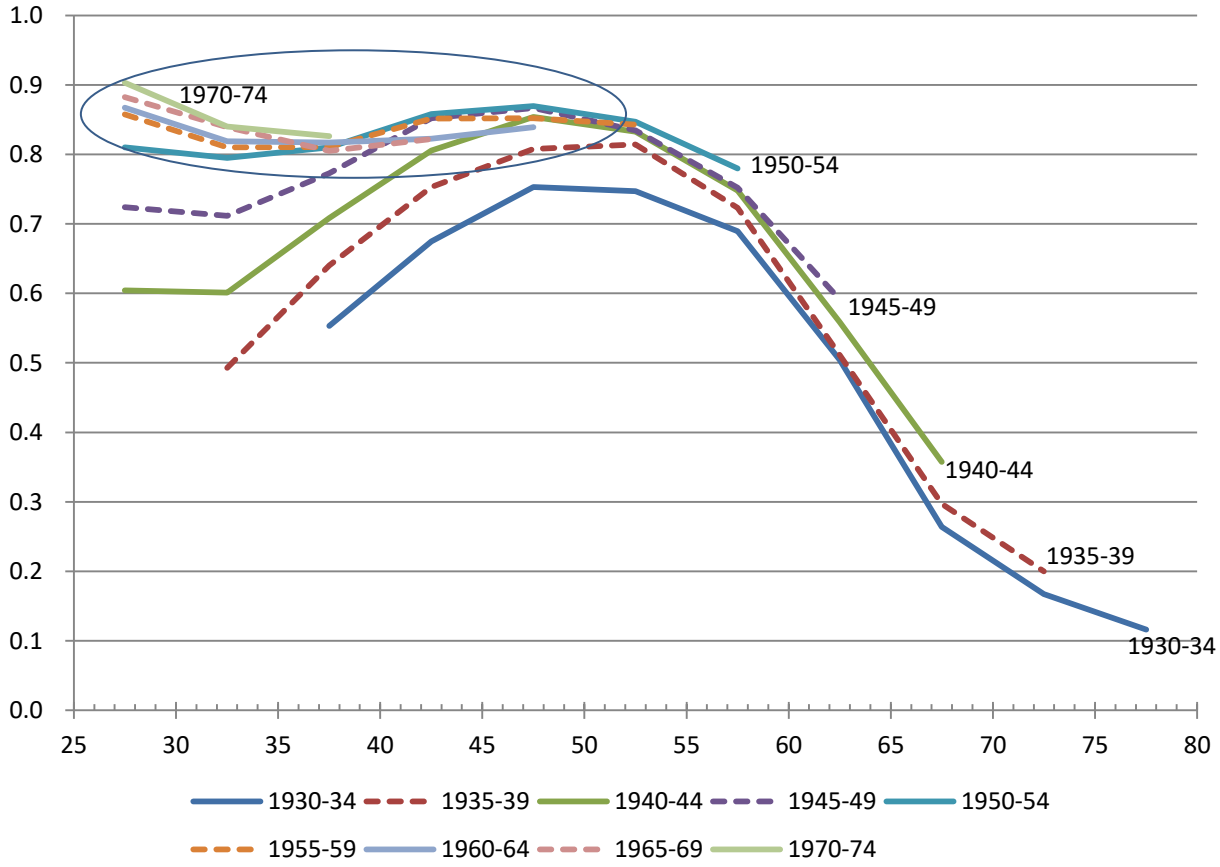
Figure 1: Female Labor Force Participation Rates by Cohorts Born from 1930 to 1974 by Five-Year Age Groups and Five-Year Birth Cohorts

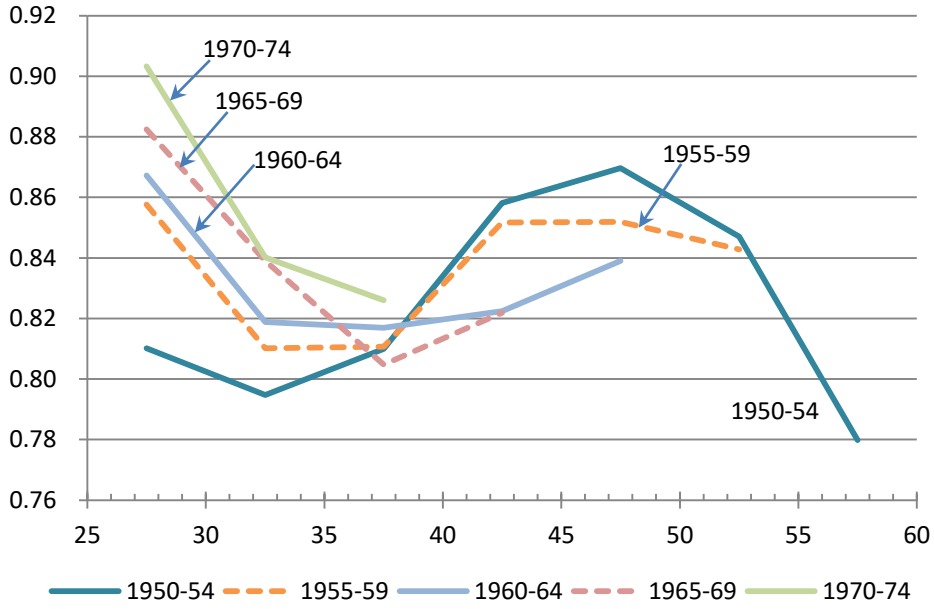
A. All Education Groups



B. College Graduates



C. College Graduates, Four Recent Cohorts (Area Circled in B.)

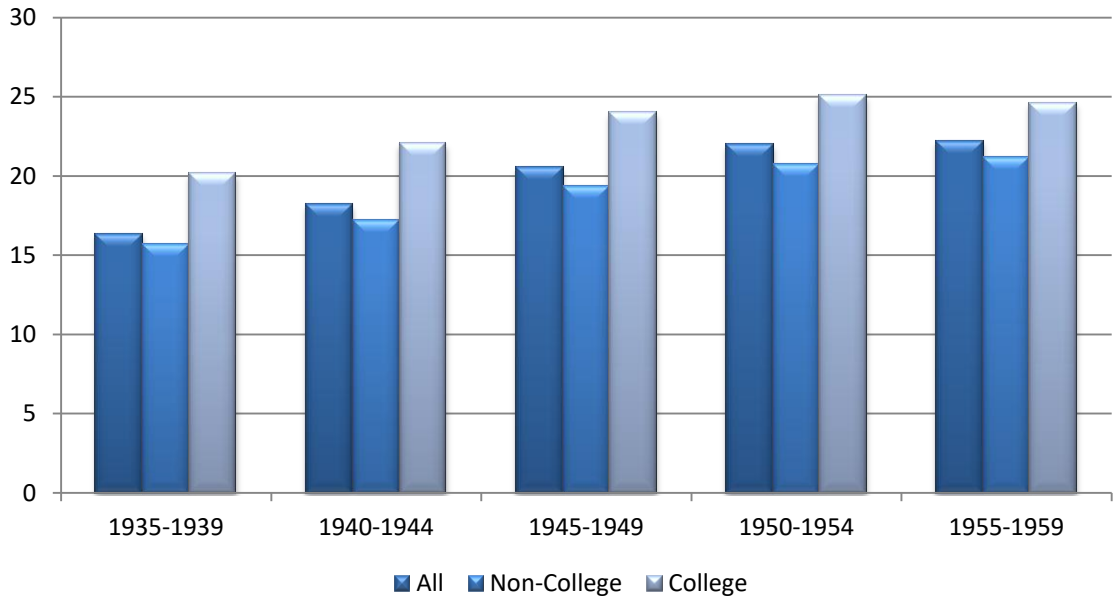


Source: CPS-ASEC micro-data, March, 1963 to 2014.

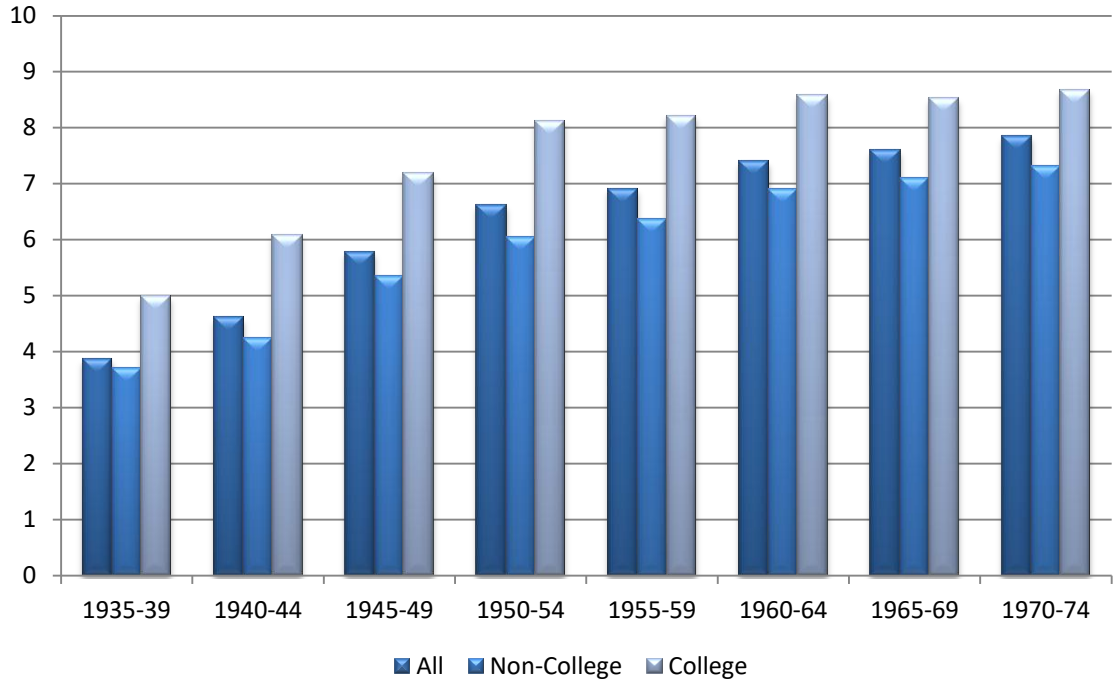
Notes: Every point on the graphs is the average of 25 cells (5 single year of age groups and 5 single year of birth cohorts). Native-born only women can be identified in the CPS-ASEC in 1994 and after. Data for native-born only are shown for the 1955-59 birth cohort 40-44 to 50-54 years; 1960-64, 35-39 to 45-49 years; 1965-69, 30-34 to 50-54 years; and 1970-74, 25-29 to 45-49 years. The difference between the total and that for native-born only is small and is largest (0.03) for the 1970-74 birth cohort. The graphs for all women are in the on-line Appendix available with this paper at http://e-jep.org.

Figure 2: Labor Force Experience for Women Born 1935 to 1974 and by Education Level

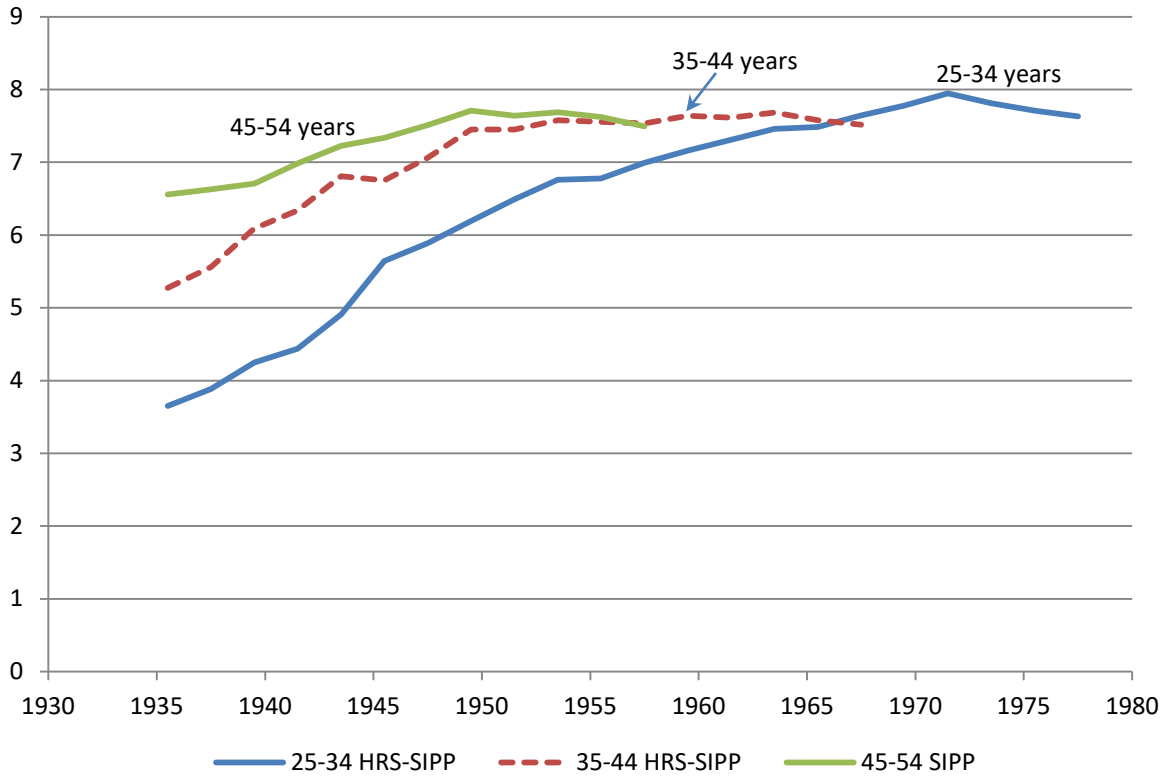
A. Cumulative Experience from 25 to 54 Years



B. Cumulative Experience from 25 to 34 Years



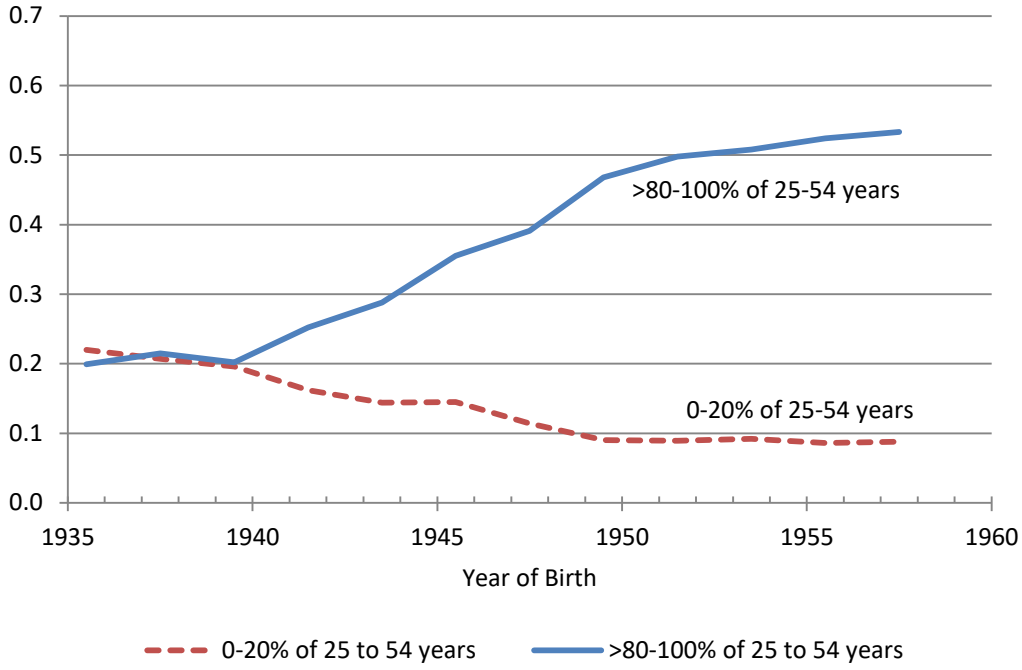
C. Labor Force Experience of All Women by Ten-Year Age Groups



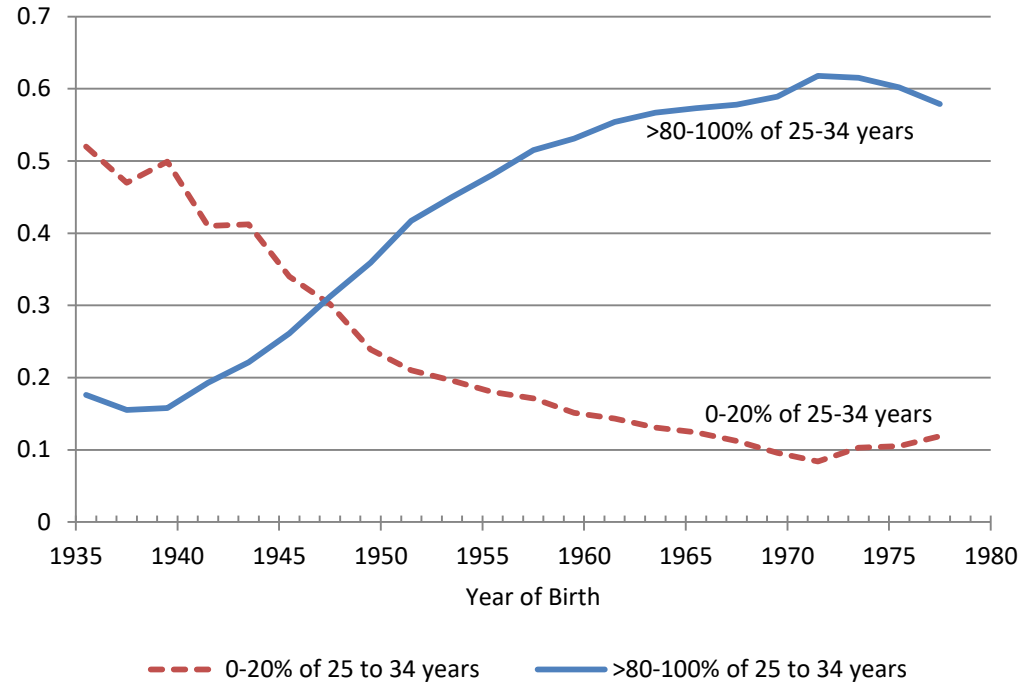
Sources and Notes: Labor force experience for an age group and birth cohort (only native-born) is computed from our estimates of participation rates (see Appendix) from the HRS-SSA and SIPP-SSA. We use HRS-SSA data for 25 to 34 year olds for birth cohorts from 1935 to 1954 and for those 35 to 44 years old for the 1935 to 1944 birth cohorts. For all other cohorts we use the data from the SIPP-SSA. To compute the totals for the 25 to 54 year span we sum the separate ten-year age groups independent of the source. In all cases, we use native-born women only. The data for overlapping cohorts between the HRS-SSA and SIPP-SSA are generally very close. Our reason for using the HRS-SSA rather than the SIPP-SSA concerns the issue of exempt workers. See text.

Figure 3: Heterogeneity in Lifecycle Labor Force Participation by Age Group and Birth Year

A. All Women, 25 to 54 Years



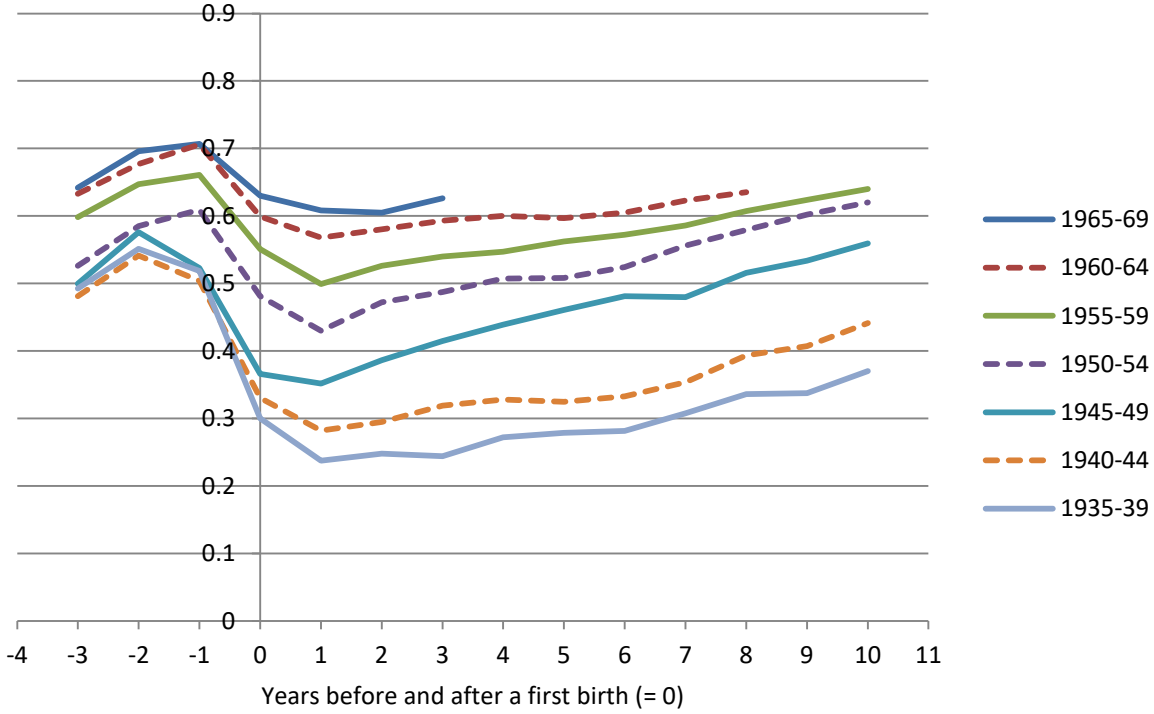
B. All Women, 25 to 34 Years



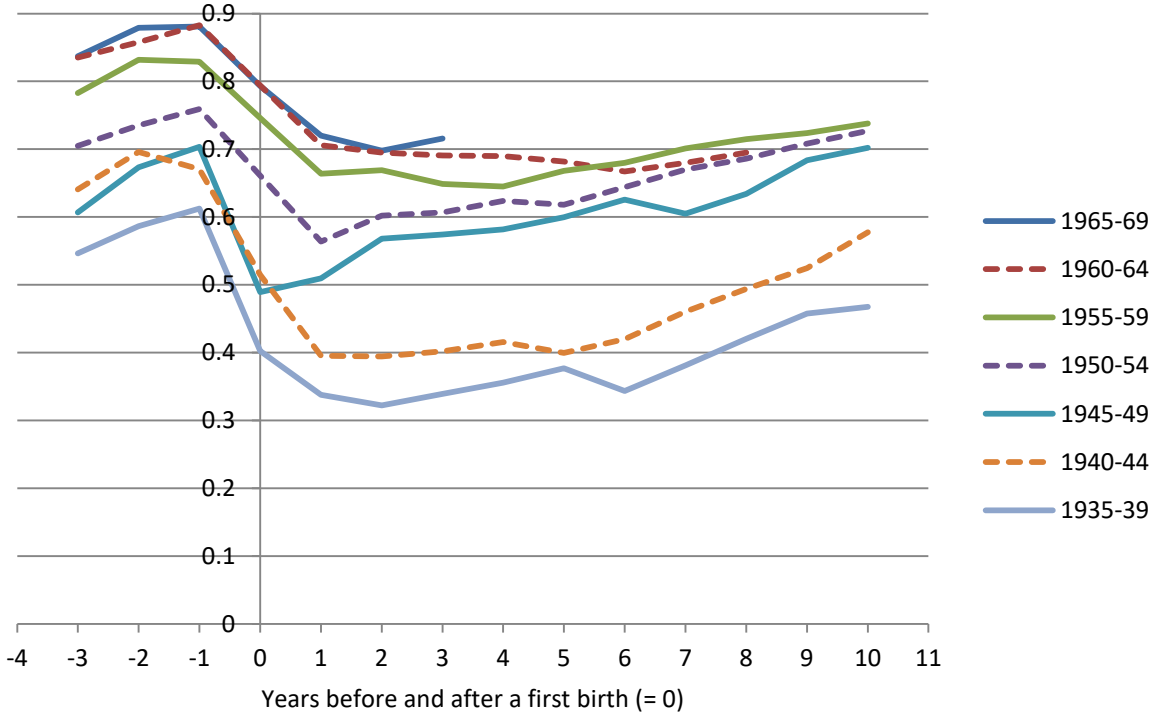
Sources and Notes: SIPP-SSA data are for native-born women only. HRS-SSA gives somewhat higher fractions in the lowest and highest groups in the earlier period. Because the fraction of college graduate women in these cohorts is not very large, we chose to use a consistent series for the distribution even though some workers in exempt occupations will be excluded prior to 1978 using the SIPP.

Figure 4: Labor Force Participation Before and After a First Birth, 1935 to 1969 Cohorts

A. All Women

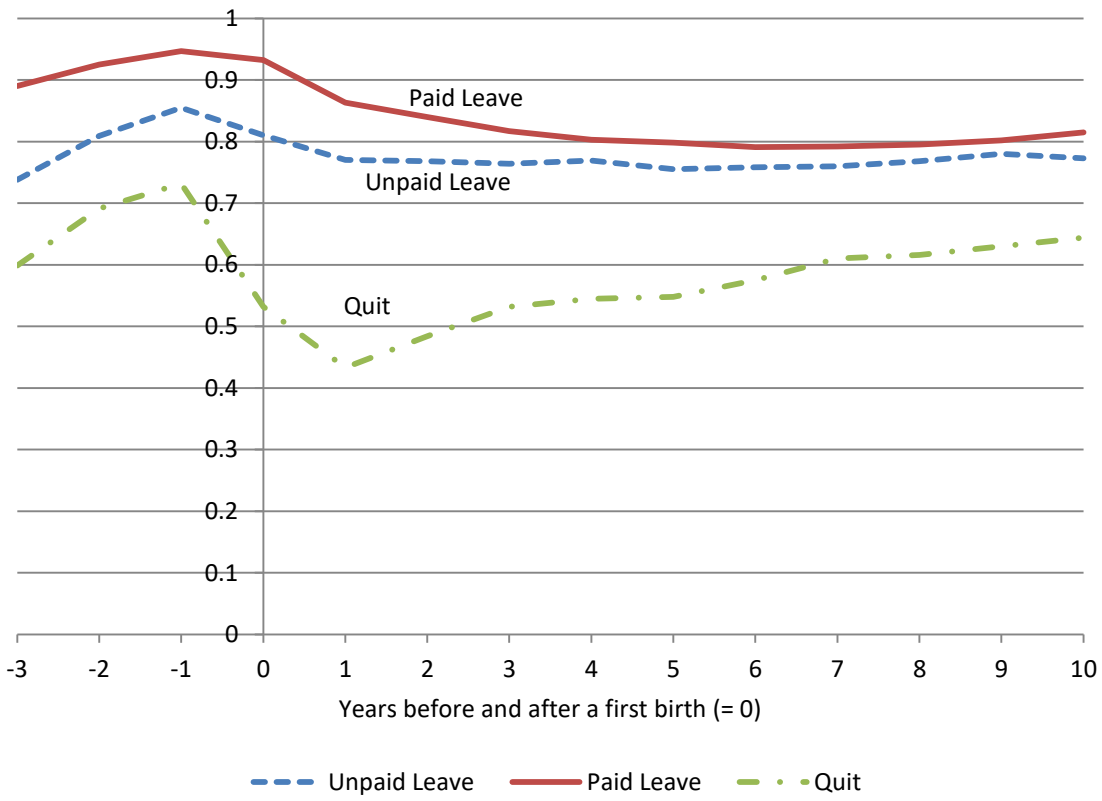


B. College Graduate Women



Sources and Notes: Includes only native-born women with a first birth. HRS-SSA is used for the 1935 to 1949 birth cohorts; SIPP-SSA is used for 1950 to 1969 birth cohorts. See text.

Figure 5: Labor Force Participation Pre- and Post-Birth Years of First Child by SIPP Leave Status, 1990s



Source: SIPP-SSA and SIPP Fertility History Topical Modules

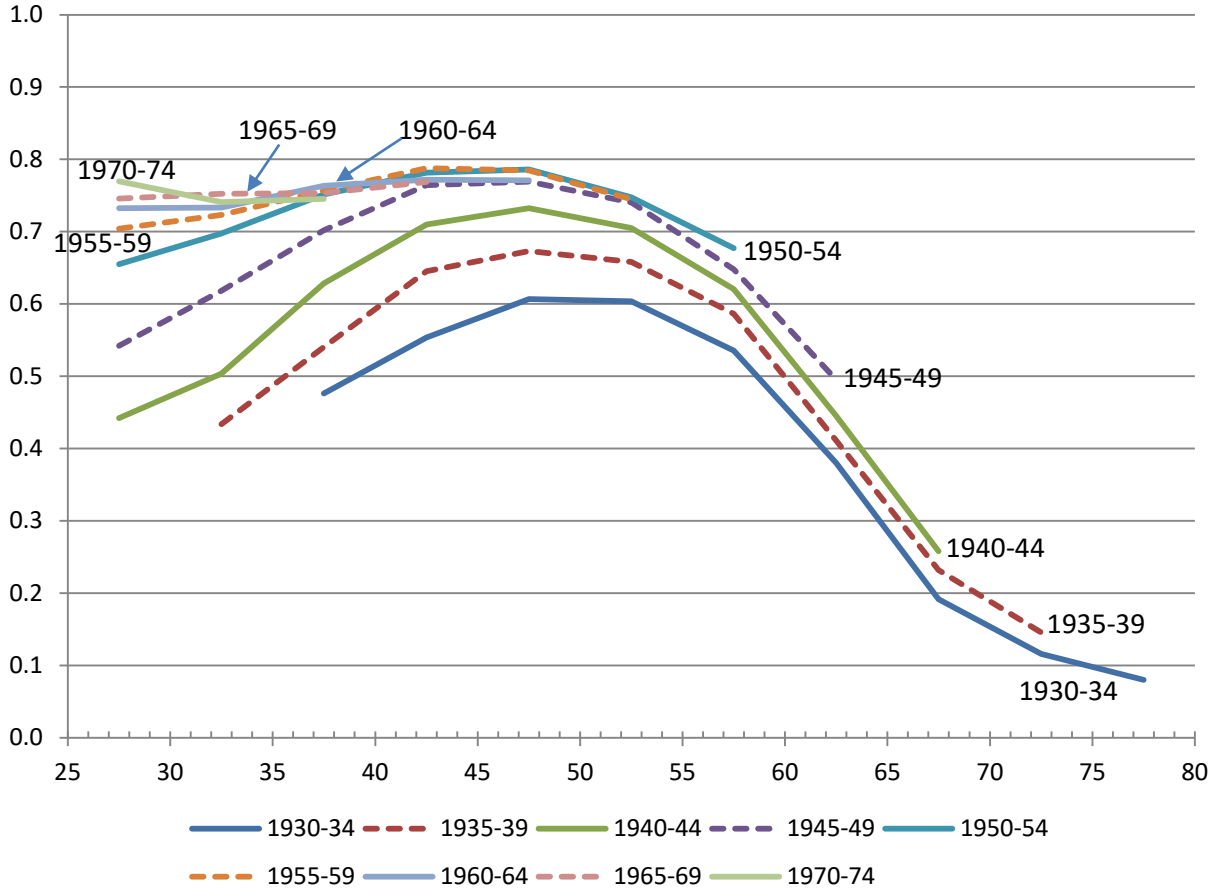
Notes: Includes native-born only women who had a first child from 1990 to 1999. Because the earnings data, from which the labor force data are derived, are for the calendar year, the precise moment of the birth cannot be linked to the earnings information. The SIPP Fertility History Topical Module lists whether the woman said she had unpaid leave, paid leave and if she quit just before or after the birth. Some women listed more than one type and are included in more than one group.

Appendix Material to

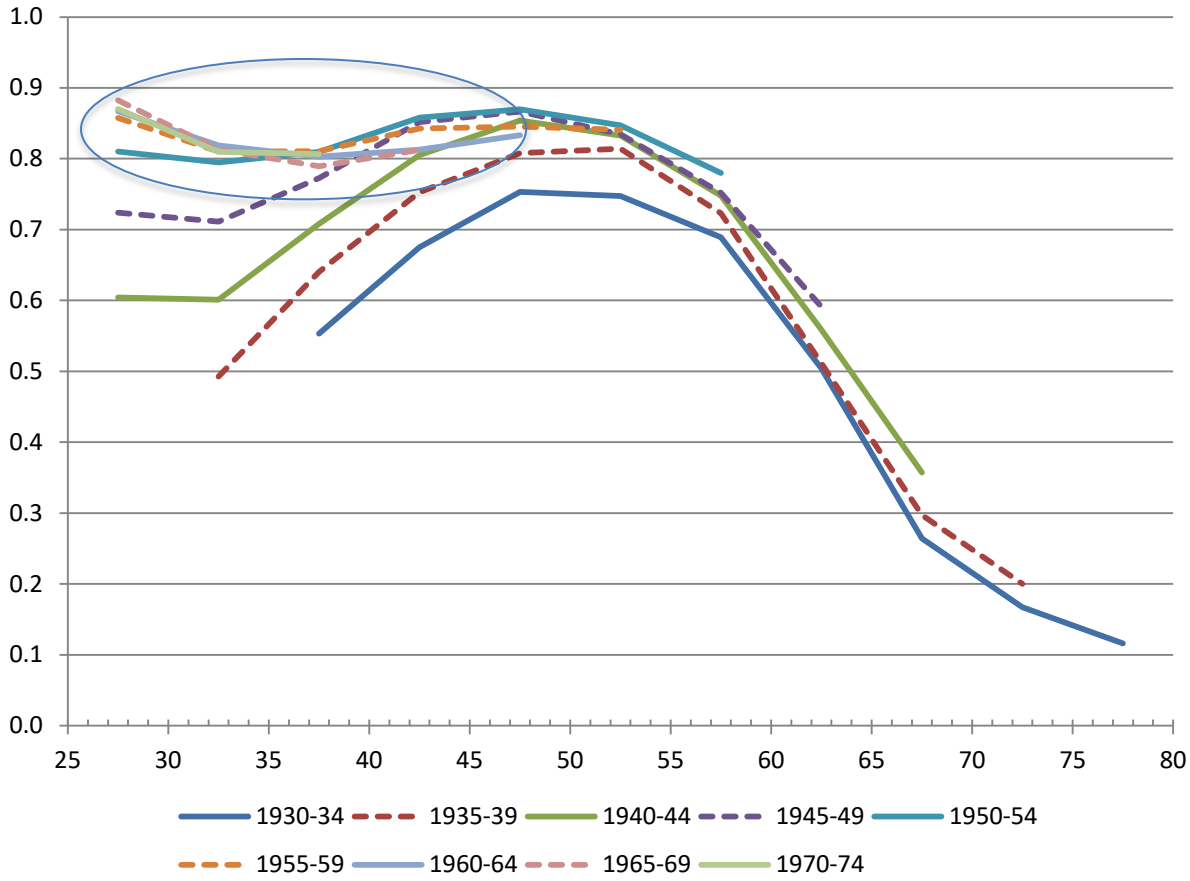
C. Goldin and J. Mitchell, "A New Lifecycle of Women's Employment"

Appendix Figure 1: Female Labor Force Participation Rates by Cohorts Born for 1930 to 1974 by Five-Year Age Groups and Five-Year Birth Cohorts (for all women by education)

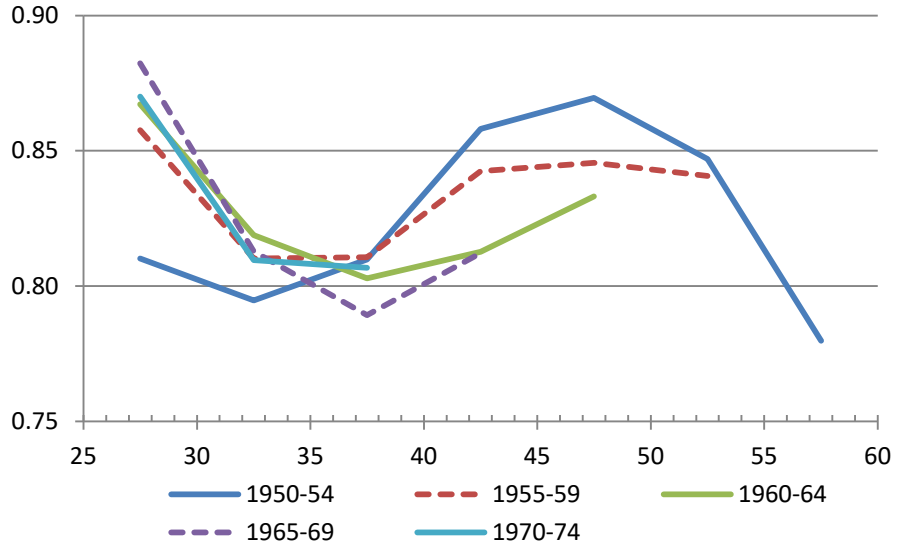
A. All Education Groups



B. College Graduate Women



C. College Graduates, Four Recent Cohorts (Area Circled in B.)



Source: CPS micro-data, March, 1963 to 2014.

Note: These graphs are identical those in Figure 1.A to 1.C of the article but include all women, not just the native-born for the CPS data beginning with 1994. All other details are the same as in Figure 1.

Appendix on the Health and Retirement Study and the Survey of Income and Program Participation

1. Health and Retirement Study (HRS)

Both the Health and Retirement Study (known as the HRS) and the Survey of Income and Program Participation (known as the SIPP) are widely used data sets. Our analyses use restricted access versions of the data. Information on and public use data for the HRS can be found at http://hrsonline.isr.umich.edu/ The U.S. Census Bureau supports external researchers' use of the SIPP through the Research Data Center network www.census.gov/ces and public-use data can be accessed through www.sipp.census.gov/sipp/ (click "Access SIPP Synthetic Data"). This brief Appendix discusses certain details of the data relevant to this paper.

The HRS, supported by the National Institute on Aging and the Social Security Administration, was begun in 1992 with a random sample of households in which at least one member was born between 1931 and 1941 and thus between 51 and 61 years old. This initial sample is known as the HRS cohort, is also termed the "Intermezzo" cohort. In households containing a married or partnered couple, the "spouse" and "respondent" categories were randomly assigned to age-eligible individuals. "Spouses" were not given positive sample weights until 1998, if born from 1931 to 1941. If they were born from 1942 to 1947, they are not given positive sample weights until the "War Baby" (WB) cohort was added. The "War Baby" (WB) cohort was born 1942 to 1947. The "Early Baby Boomer" (EBB) cohort, born 1948 to 1953, was added in 2004. The Mid-Boomer (MBB) cohort, 1954 to 1959 was added in 2010. The WB, EBB, and MBB cohorts were between 51 and 56 years old at the start of the survey.

The cohorts mentioned have been surveyed every two years. Additional cohorts born before 1931 are also part of the HRS, but the HRS, WB and EBB are the primary ones we use here. At the time of this writing, the HRS data are available to 2012. Individuals were asked at each interview if they would agree to have their Social Security earnings records linked. Therefore the fraction with a linkage increases with the number of interviews. Among the 1931 to 1942 birth cohort the linkage rate is 89 percent. It is 85 percent for the 1943 to 1945 cohort, 79 percent for the 1946 to 1948 cohort and 71 percent for the 1949 to 1951 group.

2. Survey of Income and Program Participation (SIPP)

The Survey of Income and Program Participation (SIPP) Gold Standard File consists of a harmonized set of SIPP panels linked to longitudinal earnings records. Our analysis

uses SIPP panels 1996, 2001, 2004, and 2008 and integrates information from the fertility history topical modules conducted in Wave 2 of each panel. We combine basic demographic information from the Gold Standard File with information from the topical modules on the number of children, year the first child is born and mothers' use of leave-taking. The variables we use from each SIPP survey are cross-sectional, not longitudinal. The panel dimension of the data comes exclusively from the linked earnings records. Linkage rates vary by SIPP panel but are typically around 85 percent.

We restrict our overall sample to women approximately 30 to 60 years old when first interviewed (among those with a valid Social Security number [SSN] assigned). We estimate a logit regression for each panel using demographic characteristics to predict SSN assignment and multiply the survey weights by the inverse of the estimated propensity score. SSN assignment rates vary by panel but are typically around 85 percent.

The Social Security earnings records, to which both HRS and SIPP respondent data are linked, also contain W-2 forms from 1978. But the HRS was not originally linked to the full group of W-2 forms. Therefore, we use the W-2 forms for the HRS only after 1980 when the linkage is complete.

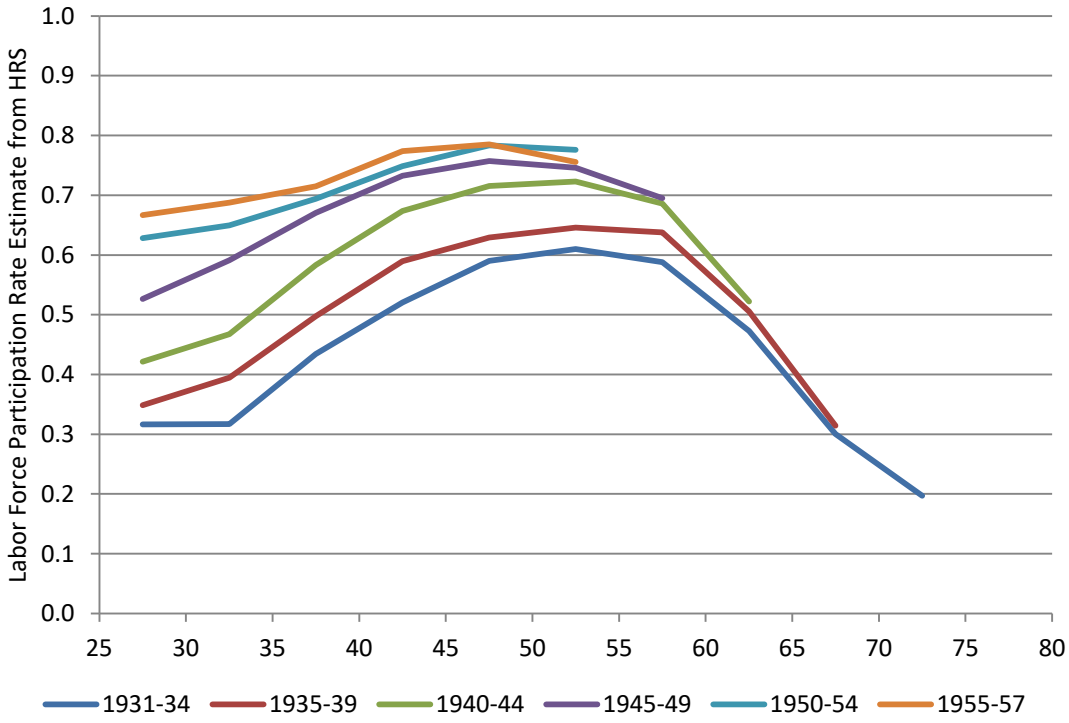
3. Construction of Labor Force Participation Rates Using the HRS-SSA and SIPP-SSA and Comparisons with the CPS-ASEC

The definition of labor force participation in the CPS-ASEC concerns whether the individual was working for pay or profit (or actively searching for work) during the census week. In using both the HRS-SSA and the SIPP-SSA we have annual income data and not a variable that corresponds to the one in the CPS-ASEC. Both the HRS and SIPP have contemporaneous questions about labor force participation but that does not exist going back in time.

Our labor force participation variable treats individuals as being a labor force participant if they earned (reported as SS or W-2 earnings) at least the equivalent of ten hours per week at the existing federal minimum wage for 52 weeks per year. The HRS respondents are included in the labor force if they stated they were "in the labor force" once the survey began or if they were working for a state, federal or municipal government in particular years prior to the HRS survey even if they had no SS earnings. Because the HRS is biennial, we averaged the two years when we used the HRS respondent information and some, therefore, have the value of 0.5 (the ages for these entries would older than 50 years). All others are non-participants.

But how close is that definition to the one in the CPS-ASEC? The answer is that it is very close. Appendix Figure 1 gives the participation rates for all women estimated from the HRS for cohorts born from 1931 to 1957. It can be compared with Figure 1 from the CPS-ASEC. Out of the 36 entries (five-year birth cohorts from 1930 to 1959 and five-year age groups from 25 to 54), just 14 are not within 5 percentage points (0.95 to 1.05 for the ratio HRS estimate/CPS-ASEC) and just one is not within 10 percentage points. For the 55 to 59 year old group the estimates are within 10 percentage points. For reasons that are not yet clear, the HRS overstates participation for those older than 60 years relative to the CPS. See also Goldin and Katz (2016) for other comparisons of the HRS and the CPS labor force data.

Appendix Figure 2: Labor Force Participation Rates Estimated from the HRS for Birth Cohorts from 1931-1957



Source and Notes: HRS restricted access version. Labor force participation rate estimates are computed using the algorithm described above.

Appendix Table 1: Age at First Birth, Number of Children and Fraction with Zero Births for All and College Graduate Women

Year of Birth	HRS (> 50 Years Old) and SIPP (≥ 44 Years Old)						CPS June Fertility Supplements (≥ 40 Years Old)			
	All Ever-Moms		Fraction with Zero Births, All Women	Ever-Mom College Graduates		Fraction with Zero Births, College Grads	Ever-Moms Number of Children	Fraction with Zero Births, All Women	College Graduates	
	Age at First Birth	Number of Children		Age at First Birth	Number of Children				Ever-Mom Number of Children	Fraction with Zero Births
1935-39	22.19	3.35	0.0752	25.34	2.83	0.160	3.26	0.101	2.68	0.172
1940-44	22.58	2.90	0.105	25.72	2.33	0.241	2.85	0.112	2.42	0.192
1945-49	23.25	2.53	0.126	26.56	2.19	0.211	2.48	0.151	2.23	0.243
1950-54	23.86	2.33	0.190	27.53	2.07	0.300	2.36	0.172	2.16	0.272
1955-59	24.22	2.36	0.200	28.48	2.16	0.320	2.29	0.191	2.22	0.272
1960-64	24.61	2.33	0.191	28.50	2.18	0.310	2.29	0.203	2.20	0.260
1965-69	24.84	2.38	0.200	28.22	2.26	0.230	2.29	0.189	2.20	0.231

Sources: HRS for 1935 to 1949 and SIPP (native-born) for 1950 to 1969. Micro-data for the CPS June Fertility Supplements, 1973 to 2014 (annually to 1988 except 1978 and then biennially except for 1995 rather than 1996). Native-born women can be identified consistently only with the 1994 CPS. The CPS has information on age at first birth only in 2014. See Goldin (2016) for description of the source; see especially the discussion of possible biases due to a change in the CPS imputation algorithm for missing information concerning births.

Notes: In all cases, number of children ever born is truncated at nine. Completed births are measured at 40 years old and above for the CPS, at 44 years and above for the SIPP and at 50 years and above for the HRS. The HRS calculations use the first non-zero weight. The CPS data has between 10,000 and 20,000 observations per five-year birth interval for all women. The SIPP contains about 400 respondents and the HRS from 1,200 to 2,300 per relevant five-year cohort. The HRS no-birth fractions appear to be too low, but the reason is not clear. One possibility that that the fraction of women who claim to be college graduates is somewhat overstated for cohorts born before around 1940. The most likely reason is that they were interviewed at older ages and inflated their education level.