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Subtle Completed Fertility Recovery in Cohorts who Entered the Labor Market during the Deep Recession in Japan*

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Abstract

Despite the popular belief that the deterioration of youth employment prospects accelerated fertility decline in Japan, women born in the late 1970s and early 1980s who entered the labor market during the worst job market "ice-age", have slightly more children than older cohorts. After demonstrating this fact, this study discusses the potential reasons for this subtle fertility recovery. I consider two potential mechanisms. First, the lower potential earnings of women increase fertility through lowering the opportunity cost of parenthood. Second, the simultaneous improvement in public support and work environment has enabled more women to continue working after childbirth. Women who had a regular job before childbearing benefit more from these changes. I show that the subtle increase in fertility was driven by college educated women, providing suggestive evidence for the second explanation.

Keywords: completed fertility, cohort fertility
JEL classification: J11, J13

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1. Introduction

The Japanese economy experienced a prolonged recession starting in the 1990s. The burden of this recession was born disproportionately by young people who graduated and entered the labor market during this period. They have been called the "ice-age cohorts," named after unprecedented cool down in labor demand for new graduates during this period. The cohorts who entered the labor market at the bottom of this recession were born in the late 1970s and early 1980s. Meanwhile, as population aging has become a pressing issue in Japan, the popular media often associates the low fertility rate and deteriorated youth employment conditions.

This study documents that contrary to popular belief, this ice age cohort born in the late 1970s and early 1980s had slightly more children than cohorts born in the early 1970s. Specifically, I calculate the average number of children born to a woman in each birthyear cohort by ages 35 and 40 using both the Vital Statistics (Ministry of Health, Labour and Welfare) and Population Census (Statistics Bureau, Ministry of Internal Affairs and Communications). The average number of children born by age 40 can be interpreted as completed fertility. This indicator hit its lowest for the cohorts born in the early 1970s and slightly increased for those born in the late 1970s. Cumulative fertility by age 35 also started to recover, with those born in the mid-1970s at the bottom.

There are two potential explanations for this subtle fertility recovery. The first one is the lower opportunity cost of child rearing due to the weaker employment opportunities for young women. In economic theory, the relationship between labor market conditions and fertility is ambiguous. On the one hand, the lower earnings of women mean lower opportunity cost of time spent on children. Thus, it generates a positive substitution effect. On the other hand, the lower earnings of both men and women have negative income effects because they cannot afford the financial cost of raising children. The evidence on the long-run effect of labor market conditions at youth on completed fertility is mixed: Currie and Schwandt (2014) find that the negative income effects of unemployment rate at age 20–24 dominated for women born in 1961–1970 in the United States. Meanwhile, Maclean et al. (2016) find a positive correlation between fertility and unemployment rate at school leaving year for those who left school in 1976–1989 in the United States. Using German data, Hofman and Hohmeyer (2016) also find that a recession at college graduation accelerates the timing of first births. Regarding Japan, Hashimoto and Kondo (2012) and Raymo and Shibata (2017) find a positive substitution effect of lower opportunity cost for Japanese women of older cohorts. However, this explanation is unlikely to hold any more as the correlation between contemporaneous local labor market

conditions and fertility turned to positive in the 2000s.

The second explanation is that unrelated to the labor market conditions at entry, these cohorts benefited from improved public support and work environment, which enabled more women to continue working after childbirth. This study provides suggestive evidence for the second explanation. The gender gap in employment narrowed substantially in recent decades partly because more women continued working at the same job after child births. This implies that the tradeoff between career and family has become weaker. If women could not pursue both career and family goals, the correlation between earnings capacity and fertility should be negative because high earnings capacity means a high opportunity cost of having children. The weakened tradeoff between career and family implies that this negative correlation becomes weaker or even turns positive.

As supportive evidence, I show that while the number of children born to high school educated women kept decreasing, the number of children born to college educated women started increasing for the cohort born in the late 1970s. This opposite change in fertility unconditional on marital status is primarily driven by decrease in marriage for less educated women and increase in fertility within marriage for more educated women. Furthermore, among women who had not borne any children by age 25, the correlation between salary earnings at age 25, and the number of children born by age 35 and 40 was negative for the cohort born in the late 1960s but turned positive for the cohort born in the 1970s. The emergence of this positive association between earning capacity and fertility is consistent with the weaker tradeoff between career and family. Meanwhile, it contradicts the first explanation—lower opportunity cost due to lower earnings—because the fertility of high school educated women kept falling.

These findings also relate to a broader literature on the reversal of the relationship between female labor market participation and fertility in developed countries. The correlation between these two aspects used to be negative but has turned positive in western countries, reflecting the changing gender norms and institutions that enabled women to pursue both career and family (Ahn and Mira 2002, Adserà 2004, Feyrer et al. 2008). Goldscheider (2015) argues that in the first half of the gender revolution when women go out of the home, fertility decreases with female labor force participation. However, in the second half when men start engaging in housework, a more gender-equal society has higher fertility. Similarly, Doepke et al. (2023) argue that, as working-age women's labor force participation becomes near universal, the ease of combining career and family has become a major determinant of fertility. In addition to the country level correlation, at the individual level, the correlation between women's education/earnings capacity and fertility has turned positive in recent decades.

Even in Japan, which is often considered as a conservative country in terms of gender norms, the relationship between marriage and women's education used to be negative (Raymo 2003) but turned positive in the 2020s (Fukuda et al. 2020). Furthermore, Fukuda (2013) shows that the relationship between female earnings and marriage has turned positive for Japanese women born in the 1970s. Ghaznavi et al. (2022) find a similar reversal in the education gradient on women's fertility. This study shows that the timing of this reversal coincides with the timing when the ice-age cohorts have children, and adds evidence for the correlation between earnings capacity, proxied by earnings at age 25, and fertility.

This remainder of this study is organized as follows. Section 2 provides the background information on the fertility trend in Japan and labor market conditions at entry for the cohorts of interest. Section 3 presents the number of children born to a woman by the mother's birthyear cohort calculated from the Vital Statistics and Population Census. Then, Section 4 discusses the potential explanation for the subtle fertility increase in the cohorts born in the late 1970s to early 1980s and shows suggestive evidence for one of the explanations. Section 5 presents the conclusions of this study.

2. Background

2.1 Fertility trend in Japan

Figure 1 shows time series of the number of births and total fertility rate (TFR) in Japan. Aside from the dip in 1966 caused by *hinoeuma* (a superstitious belief that women born in this year would kill their husbands), the number of births were increasing until the mid-1970s while TFR stayed flat. Since the early 1970s was the peak of childbearing by the baby-boomers (born in 1947–1949), cohorts born in the early 1970s are called "Baby-boomer jr." Since the mid-1970s, both the number of births and TFR decreased until 2005; however, a closer look reveals that the number of births and TFR do not always move in parallel. For example, in the 1990s, the decline in the number of births slowed down while the TFR fell rapidly because the population of potential mothers were increasing as the baby-boomer jr. cohorts reached child-bearing age.

In contrast, in 2005–2015, the TFR was increasing although the number of births kept decreasing. The number of births was decreasing because the cohort size of women in their 20s and 30s was decreasing due to the decline in TFR in the 1970s and 1980s. Nonetheless, the TFR increased from 1.25 in 2005 to 1.45 in 2015. Admittedly, this recovery of TFR partly reflects the tempo effect, that is, some women delayed

childbearing from the late 1990s - early 2000s to the late 2000s – early 2010s. However, as shown later, the number of children each woman has also slightly increased for the cohorts born around 1980.

To avoid confounding tempo effect, the remaining of this paper focuses on completed fertility or number of children born by a certain age.

2.2 Labor market conditions at entry for cohorts born in the late 1970s and early 1980s

The Japanese economy experienced a prolonged recession that began in 1992, the effects of which were disproportionately borne by young people who graduated from school and entered the labor market during this period (Brinton 2011). Consequently, there exist substantial and persistent gaps in earnings and job quality between the cohorts who entered the labor market in 1993–2004, also described as the job market "ice-age," and older cohorts (Kondo 2024).

The bottom of this recession was the period between the bankruptcy of several financial institutions in 1997, and peak of the unemployment rate in 2002 and 2003. Kondo (2024) shows that male workers who graduated from schools during this period had lower annual earnings than older cohorts even 15 years after graduation. They were also less likely to be in regular employment in the first 10 years after graduation.[1]

This bottom of the recession coincides with the timing when the birthyear cohort born in the late 1970s and early 1980s graduated from schools and entered the labor market. Thus, the entry level labor market was very bad for them. At least for men, persistent gaps in earnings and job stability exist between this cohort and older cohorts.

2.3 Narrowing gender gap in employment

This subsection presents the gender gap in employment using the Labour Force

[1] Similar to other developed countries (for a survey, see von Wachter, 2020), empirical studies have shown that a recession while entering a labor market has persistent negative effects on employment and earnings in Japan (Ohtake and Inoki 1997, Genda et al. 2010). Relatedly, Kondo (2007) and Hamaaki et al. (2013) show that the failure to obtain a regular full-time job upon graduation lowers the likelihood of having a regular full-time job in subsequent years in Japan. However, Kondo (2024) casts doubt on the view that the gaps between "the ice-age" and older cohorts are explained by labor market condition at entry only because the younger cohorts who enter the labor market during a recovery period do not perform better. Moreover, the effect of unemployment at entry has become weaker for younger cohorts.

Survey. This survey are nationally representative cross-sectional data collected annually by the Statistics Bureau of Japan. I use microdata from the Special Surveys conducted in February 1987–2001 and detailed questionnaires from January-March in 2002–2021.[2] Appendix Table A1 presents the summary statistics.

Figure 2 shows the gender gap in employment at age 31–35, the peak of age-specific fertility in Japan, based on the Labour Force Survey. The vertical axis shows the difference in the employment and regular employment rates between men and women; for example, high school educated women born in 1965 are 40 percentage-points less likely to be employed and 50 percentage-points less likely to have a regular job. The gender gaps in employment and regular employment are narrowing rapidly for all education groups.

Although this narrowing gender gap is partly attributable to the increase in unmarried women in this age group, the employment of women with children is also increasing.[3] Figure 3 shows the employment and regular employment rates in the population of married women living with a child. The maternal employment rate increased for women with any educational backgrounds, while the regular employment rate also increased for women with college and junior college education. The regular employment rate for high school educated mothers stagnated probably because the regular employment rate of high school educated workers decreased regardless of gender or family status.

The fact that more women continue to work after childbirth is confirmed from other sources such as Japanese National Fertility Survey conducted by the National Institute of Population and Social Security Research. According to the 16th survey conducted in 2021, the proportion of new mothers who continue working after their first childbirth increased from 27.5% in 2000–2004 to 53.8% in 2015–2019. This is a drastic change compared to the small increase from 23.9% in 1985–1989 to 27.5% in 2000–2004. Furthermore, the timing coincides with the period when TFR was increasing (2005–2015), and the peak of childrearing of cohorts born in the late 1970s and early 1980s.

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[2] Since 2002, detailed surveys were conducted monthly. However, to avoid complications from seasonality and keep the sample size comparable, I limit the sample to January-March surveys.

[3] Kawaguchi et al. (2021) also show that a substantial part of the increase in female employment is attributable to the increased transition from inactive to employment for women aged 15–34, which is consistent with increased re-entry into the labor market after childbearing. The authors argue that the increased demand for employment of working-age females in the 2010s is due in large part to the substantial secular aging of the population and expansionary macroeconomic policies. The authors also acknowledge that family policies that helped married women to work had some effects too.

3. Number of children born to a woman by their birthyear cohort

This section describes the number of children born to each woman by their birthyear cohort. The main data source is publicly available tabulations from the Population Census and Vital Statistics 1980–2021.

First, the table of the numbers of children born in each year by mother's age is taken from that year's Vital Statistics Annual Reports. These tables give the number of births given by each birthyear cohort at each age. Then, I sum these numbers by birthyear cohort up to age 35 and 40 to calculate the total number of births given by each cohort of women by specific age.

Then, I interpolate the quinquennial Population Census 1980–2015 to obtain the female population by birthyear cohort. The average number of children born to a woman by specific age is obtained by dividing the total number of births given by each cohort by the female population.[4]

Figure 4 plots the average number of children born by age 35 and 40 based on the above calculation. Women born in the late 1970s have slightly more children by age 40 than those born in the early 1970s, although they faced significantly worse labor market conditions at entry. Furthermore, women born in the early 1980s have more children by age 35 than older cohorts, while they faced as bad labor market conditions at entry as those born in the late 1970s. Despite the popular belief that the deterioration of youth

[4] For both the Census and Vital Statistics, I defined the birthyear as the survey year minus age. Strictly speaking, the timings of age recorded by the Census and Vital Statistics are different. The Vital Statistics records the mother's age at the time of their children's birth, which spreads from January to December, while the Census reports age as of October of each year. This difference is ignorable except for the 1966 cohort. Since the population born in 1966 is 25% smaller than those born in 1965 and 1967 dues to the superstition of *hinoeuma*, I made the following adjustment. The Census records age as of October 1. Hence, three-fourth of the one-year-olds in the survey year 1966 were born in 1966 and one-fourth were born in 1965. For the Vital Statistics, assuming a uniform distribution of birth timing, half were born in 1966 and 1965 each. Letting P denote the population of cohorts 1965 and 1967, the population of 1966 cohort is 0.75P. Hence,
1966 cohort in Census = 3/4*0.75P + 1/4P = 13/16P
1966 cohort in Vital Statistics = 1/2*0.75P + 1/2P = 14/16P
1967 cohort in Census = 3/4*P + 1/4*0.75P = 15/16P
1967 cohort in Vital Statistics = 1/2P + 1/2*0.75P = 14/16P
Thus, I correct the gap by multiplying the average number of children per woman by 13/14 for the 1966 cohort and 15/14 for the 1967 cohort.
Appendix Figure A1 shows the graph without this adjustment.

labor market conditions accelerated declining fertility in Japan, fertility stopped falling for the cohorts that faced the worst labor market conditions in their youth.

In Japan, where very few children are born out-of-wedlock, fertility and marriage rate are closely related. As shown in Figure A2 in the appendix, proportion of married in the population of women aged 30-34 and 35-39 move parallel to the number of children ever born by age 35 and 40, respectively. In the meantime, fertility within marriage did not change much: the number of children born to a married couple by wife's age 40 fell from 1.85 for wives born in 1965-69 to 1.75 for those born in 1970-74, stays flat as 1.75 for those born in 1975-79 and increase to 1.85[5] for those born in 1981-85, according to the Japanese National Fertility Survey.

4. Why did fertility stop falling?

4.1 Potential mechanisms

Why did fertility stop falling for the cohort born in the late 1970s, which entered the labor market during the bottom of the prolonged recession? I consider the following two explanations for the observed subtle recovery in fertility.[6]

The first explanation is the substitution effect from the lower opportunity cost for time spent on family. In economic theory, the effect of lower earnings for women on fertility is ambiguous and can be positive. On the one hand, the lower earnings of women mean a lower opportunity cost of time spent on children. Thus, it increases fertility. On the other hand, the lower earnings of both men and women have negative income effects because they cannot afford the financial cost of raising children. The claim associating the deterioration of employment prospects of young Japanese with the further decline in the number of children implicitly assumes that the income effect dominates the substitution effect. Conversely, if the substitution effect dominates, the fertility recovery should be larger for those who were hit more severely by the recession at entry to the labor market.

The second explanation is unrelated to the labor market conditions at entry. Since the 1990s, the Japanese government has tried to improve public support to make it feasible for women to continue working after childbearing. For example, the coverage for legally guaranteed parental leave has been expanded and length has been gradually increased since its introduction in 1991. Further, the replacement rate of parental leave

[5] Age category in the 16th survey (2020) was 35-39 instead of 36-40.

[6]

compensation has been gradually raised from 25% to 67%. Furthermore, the capacity of publicly subsidized childcare centers has expanded rapidly, especially in urban areas.[7] Simultaneously, social norms have changed and the gender gap in employment has narrowed. The cohorts born in the late 1970s and early 1980s experienced these changes during their child-bearing age, which lowered the cost of childbearing and rearing, and thus, increased fertility.

These two explanations have opposite implications for the differences in the fertility trend across the education or earnings capacity of women. The first explanation implies that fertility would increase among women suffering from unstable employment and lower earnings capacity. Conversely, since the benefit from being able to continue working after childbirth is greater for women with higher pre-birth earnings, the second explanation implies that fertility should increase more for women with higher earnings capacity. Motivated by these implications, the remainder of this section explores the association between women's earnings capacity and fertility.

4.2 Emergence of a positive association between earnings capacity and fertility

Figure 5 plots the percentage of women living with a child and the average number of children in the household over the birthyear cohort of women by education, as a proxy for potential earning capacity. The data are from the Labour Force Survey. A child is defined as a household member younger than 15. The sample includes unmarried women. Note that children older than 15 as of the survey date are not counted. Thus, this may understate the actual fertility. This downward bias is stronger for older cohorts and less educated groups, who tend to have a child at younger age.

Keeping this reservation in mind, the graph exhibits an interesting contrast between high school and college educated women. For high school educated women, the proportion of those living with a child and number of children in the household are both decreasing regardless of the age at survey. In contrast, the fertility of college educated women in their late 30s started increasing from the cohorts born in the mid-1970s. For the cohorts born in the late 1970s, college educated women have more children than high school educated ones.

[7] According to the Report on Social Welfare Administration and Services, the capacity of accredited childcare centers increased by 20% from 2000 to 2014 across Japan. The expansion was more drastic in prefectures surrounding Tokyo, such as 76% for Kanagawa and 48% for Saitama. Although the statistic was discontinued after 2015 due to the change in the classification of childcare facilities, the capacity kept increasing in the late 2010s.

Furthermore, Table 1 shows decomposition of change in the number of children unconditional on marital status into changes of marriage rate and fertility within marriage. Ignoring births of women who never married,

Δ number of children in HH = Δ%married*(num of children in HH | married, cohort69-71) + Δ(num of children in HH | married)*%married of cohort69-71+ Δ%married*Δ(num of children in HH | married).

In reality, births of women who never married is not strictly zero, so "residuals" in Table 1 include both residuals arising from children of never married women and the second order term.

Table 1 indicates that the decrease of children born to high school educated women is primarily driven by the decrease in marriage rate. In contrast, the increase of children born to college educated women, especially born in their late 30s, comes from an increase in the number of children born to a married woman. Appendix figures A3 and A4 confirm this trend with graphs in the same format as Figure 5.

If college educated women have higher earnings capacity and labor force attachment, this can be interpreted as evidence for the reversal of the relationship between female labor force participation and fertility. Yet, the composition of educational background substantially differs across cohorts (Appendix Table A2), thus change in the selection of college educated women may have affected the fertility. Therefore, as another supportive evidence for this reversal, I examine the correlation between earnings at age 25 on the number of children born by age 35 and 40 using the Japan Panel Survey of Consumers (JPSC).

JPSC is panel data of women started by the Institute for Research on Household Economics in 1993 and conducted by Keio University until 2021. The sample of the first wave consists of 1,500 women aged 24–34 years in 1993; that is, the cohorts born in 1959–1969. Then, the cohorts born in 1970–1973, 1974–1979, 1980–84, and 1985–1989 were added in 1997, 2003, 2008, and 2013, respectively. Since older cohorts of each added sample were already older than 25 at their first survey and the last added sample are too young, I limit my sample to birthyear cohorts 1968–1969, 1972–1973, 1978–1979, and 1983–1984.

Approximately 20%–30% of each cohort already had a child by age 25. They are excluded from the analysis sample (Appendix Table A3). Admittedly, this may cause sample selection bias, and the observed correlation between earnings at age 25 and number of children born by older ages should not be interpreted as a causal effect. In

particular, the probability of having a child by age 25 is negatively correlated with the years of education. Nonetheless, I have picked 25 as the baseline because most people graduate from college by age 25.

Using this analysis sample, I estimate the following linear regression:

$$Y_{age,\,i} = \beta_c I_{25,\,i} + \theta_c + \varepsilon_i$$

where Y_{age} is the number of children born by *age* (35 or 40), I_{25} is the annual salary income at age 25, c denotes the cohort (1968–1969, 1972–1973, 1978–1979, 1983–1984), and the coefficient of the income at age 25 is allowed to vary with *c*. θ_c denotes the cohort fixed effect.

Figure 6 shows the estimated β_c and confidence intervals.[8] The correlation between earnings at age 25 and the number of children is negative (though not statistically significant) for the 1968–1969 cohort, but it turns positive for the 1978–1979 cohort.[9]

Furthermore, college educated women are more likely to intend to continue working at a regular job after childbearing. Thus, they benefit more from institutional changes that allow women to continue with their regular job after childbirth. Raymo and Lim (2011) show that college educated women in Japan are both more likely to remain in and less likely to reenter the labor force after childbearing because they are more likely to have career-oriented jobs before childbearing. This implies a higher cost of quitting pre-birth jobs for more educated women.

One institution to facilitate women to continue working after childbirth is publicly subsidized childcare centers. The expansion of these centers mainly benefits women with a regular full-time job before childbirth because the rule for assigning slots at childcare facilities prioritize parents working fulltime (Yamaguchi et al. 2018, Fukai and Kondo 2024).

Figure 7 shows that the change in the capacity of publicly subsidized childcare centers and the fertility of college educated women are positively correlated at the prefecture level. The data on childcare center capacity at the prefecture-year level are taken from the Report on Social Welfare Administration and Services. The percent change

[8] The point estimates and standard errors of the coefficients shown in Figure 6 are presented in Appendix Table A4, and summary statistics are in Appendix Table A5.

[9] Sample attrition between age 25 and 35 or 40 is not negligible; Sakamoto (2006) reports that 42% of the original sample dropped out in the first 10 years. Moreover, marriage and childbearing are major reasons of sample attrition, and those who are initially unmarried are more likely to drop out. However, unless the correlation between attrition and life event and individual characteristics systematically changed across cohorts, the bias caused by attrition is unlikely to affect the interpretation of this analysis qualitatively.

in the capacity of accredited childcare centers from 2000 to 2014 is used as the measure of the expansion in childcare capacity.[10] The vertical is the change in the percent of women living with a child between cohorts born in 1971–1975 and 1976–1980, which is calculated from the Labour Force Survey, and collapsed by cohort groups and prefecture.

Another potential factor that may have disproportionately affected more educated women is better access to assisted reproductive technology (ART). Subsidy for ART was introduced in 2004 and gradually expanded during the late 2000s -2010s. Probably thanks to both the subsidy and technological progress, the number of births by ART increased, especially for mothers older than 35. College educated women may use ART more than high school educated women because they tend to decide to have children later, and also they are more likely to afford the monetary cost of ART. This is a different mechanism than the cost of childbearing and rearing while working. However, as shown in Figure A5, the number of non ART births to mothers older than 35 is increasing, too. Thus, while its contribution to the total fertility is substantial, the increase of ART cannot explain the whole increase of births by college educated women in their late 30s.

Another complementary evidence is that fertility turned pro-cyclical in the 2000s,[11] consistent with trends observed in western countries (Sobotka et al. 2011, Jones and Schoonbroodt 2016, Matysiak et al. 2021, Coskun and Dalgic 2023). This implies a weakened short-run substitution effect of worse labor market opportunities for women. Further, it is consistent with the fact that more women wish to continue with their regular job after childbearing. Figure 8 plots the number of births per 1000 population taken from the Vital Statistics and the Job Opening to Vacancy Ratio in the previous year as a proxy for the labor market conditions. Both numbers are at the prefecture-year level, and net of prefecture and nation-wide year effects. The correlation is insignificant in the 1980s and 1990s but becomes significantly positive in the 2000s and 2010s.

5. Conclusion

Although the reduced youth employment opportunities are often blamed as a cause of the fertility decline in Japan, few studies have examined whether the cohort which entered the labor market during a recession has lower fertility in Japan. This study shows

[10] As already mentioned, the statistic was discontinued after 2015 due to the change in the classification of childcare facilities.

[11] The short-run effect of contemporaneous unemployment rate on the period fertility may not necessarily imply a decline in completed fertility because women who postponed birth may have a child later.

that women born in the late 1970s and early 1980s, who experienced the worst labor market conditions at entry since the end of the World War II in Japan, have slightly more children than older cohorts who experienced better labor market conditions.

Exploring the underlying changes, cohort level data reveal that the correlation between fertility and women's education turned from negative to positive for these late 1970s and early 1980s cohorts. The emergence of this positive association between earnings capacity and fertility is likely attributable to the improved public support and work environment, which enabled women with a regular job to continue the job after childbirth.

Despite the weakened labor market conditions at youth, cohorts who are likely to have benefited from the public policies and employers' efforts to support female workers to continue working after childbirth increased fertility of more educated women. This has a very important policy implication, although this study is only descriptive and a more rigorous examination of the causal effects of each policy are needed.

While this study provides evidence contrary to the popular belief that the ice-age cohort had fewer children than older cohorts, it does not rule out the possibility that their fertility would have been higher with better employment opportunities. Increasing economic turbulence and growing job insecurity have been linked to delayed transitions to marriage and parenthood in Japan (Retherford and Ogawa 2006, Brinton 2011, Raymo et al. 2015). Piotrowski et al. (2015) show that, at the individual level, experiencing non-regular employment delays marriage for men. Brinton and Lee (2016) argue that worse labor market conditions for men discourage family formation, especially in countries with stronger male-breadwinner social norms, such as East Asian countries suffering from ultra-low fertility. My findings suggest that such norms may have weakened in Japan so that fertility slightly increased for college educated women despite the potential negative income effect.

Indeed, high school educated women's fertility has been decreasing in Japan even for the ice-age cohorts. This implies growing inequality in family resources across less and more educated Japanese women. In western countries, as the primary gains from marriage shifted from production of household services to commitment to investment in children, more educated parents continue engaging in a stable marriage and invest more on their children. Meanwhile, fewer resources are available for children of less educated parents (McLanahan 2004, Lundberg et al. 2016). As summarized by Raymo and Iwasawa (2017), it is an empirical question how and to what extent such a bifurcation in family behaviors, known as "diverging destinies" (McLanahan 2004), occur in Japan. My findings, combined with the fact that the share of non-marital childbearing is still very

low in Japan, implies that the inequality in family resources emerges with the increasing childlessness among less educated women, rather than the increase in single parent families.

Another puzzle is why the total fertility rate started declining again in the mid-2010s, while the policy support for working mothers continued to improve. Exploring what happened in the second half of the 2010s is an important future task.

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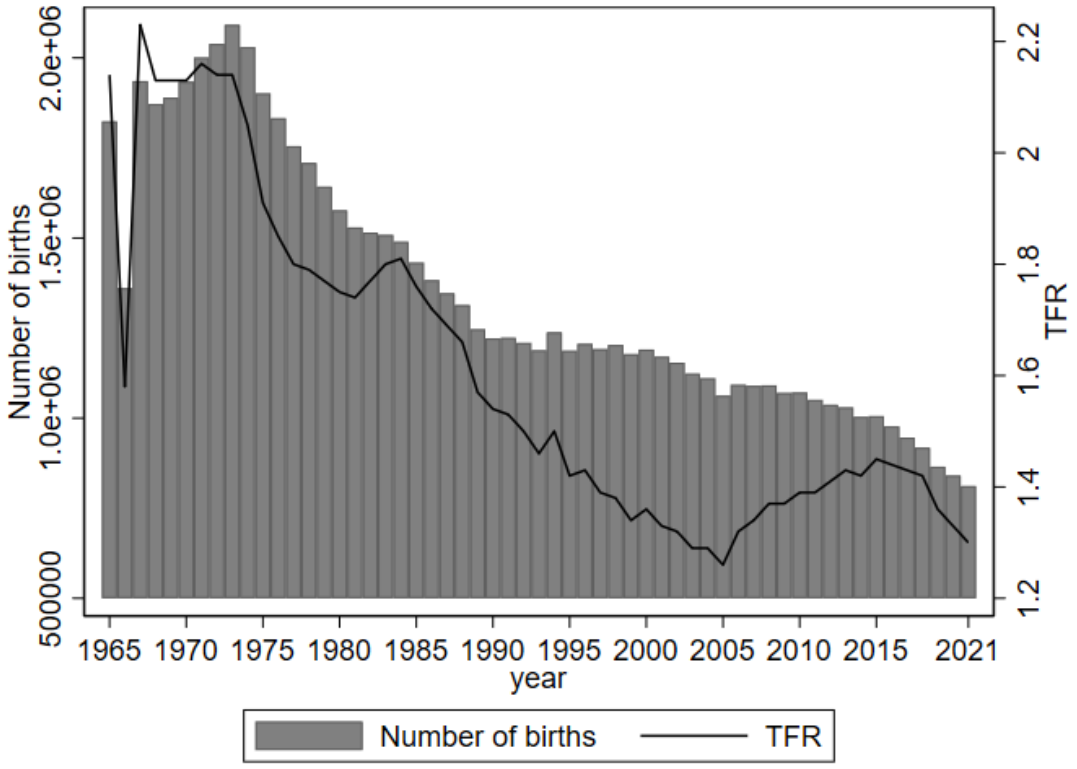


Figure 1 Number of births and total fertility rate (TFR) of Japan

Source: Vital Statistics Annual Report 2021

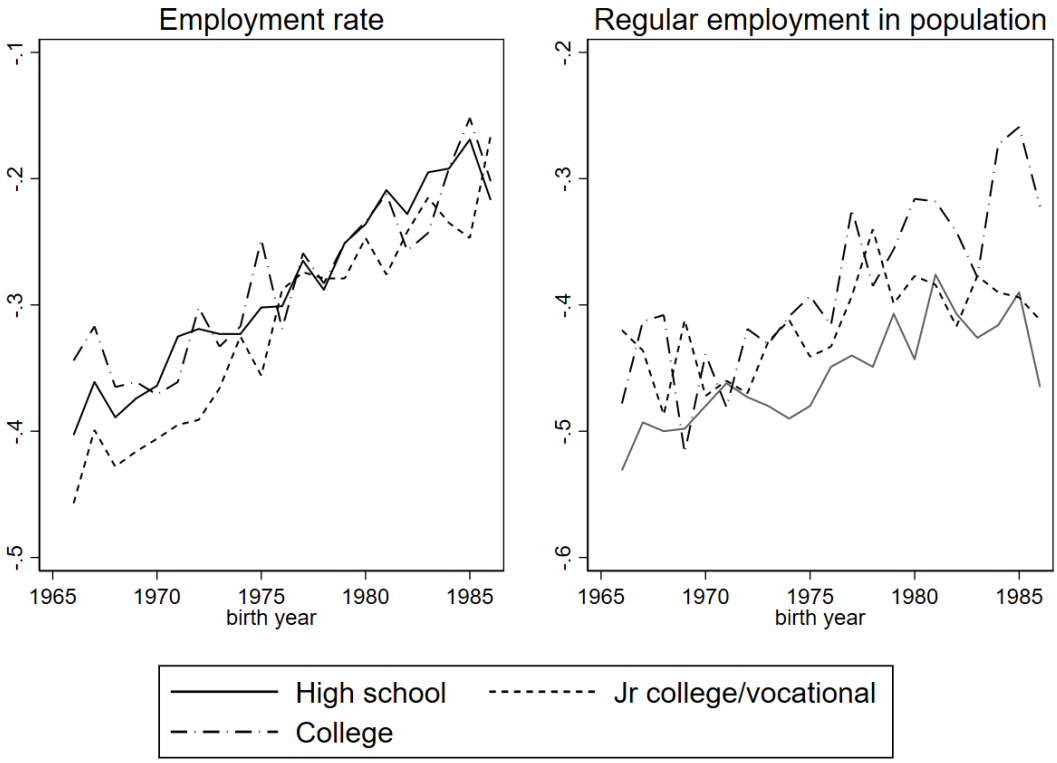


Figure 2 Gender gap at age 31-35, by education and birthyear

Source: Labour Force Survey

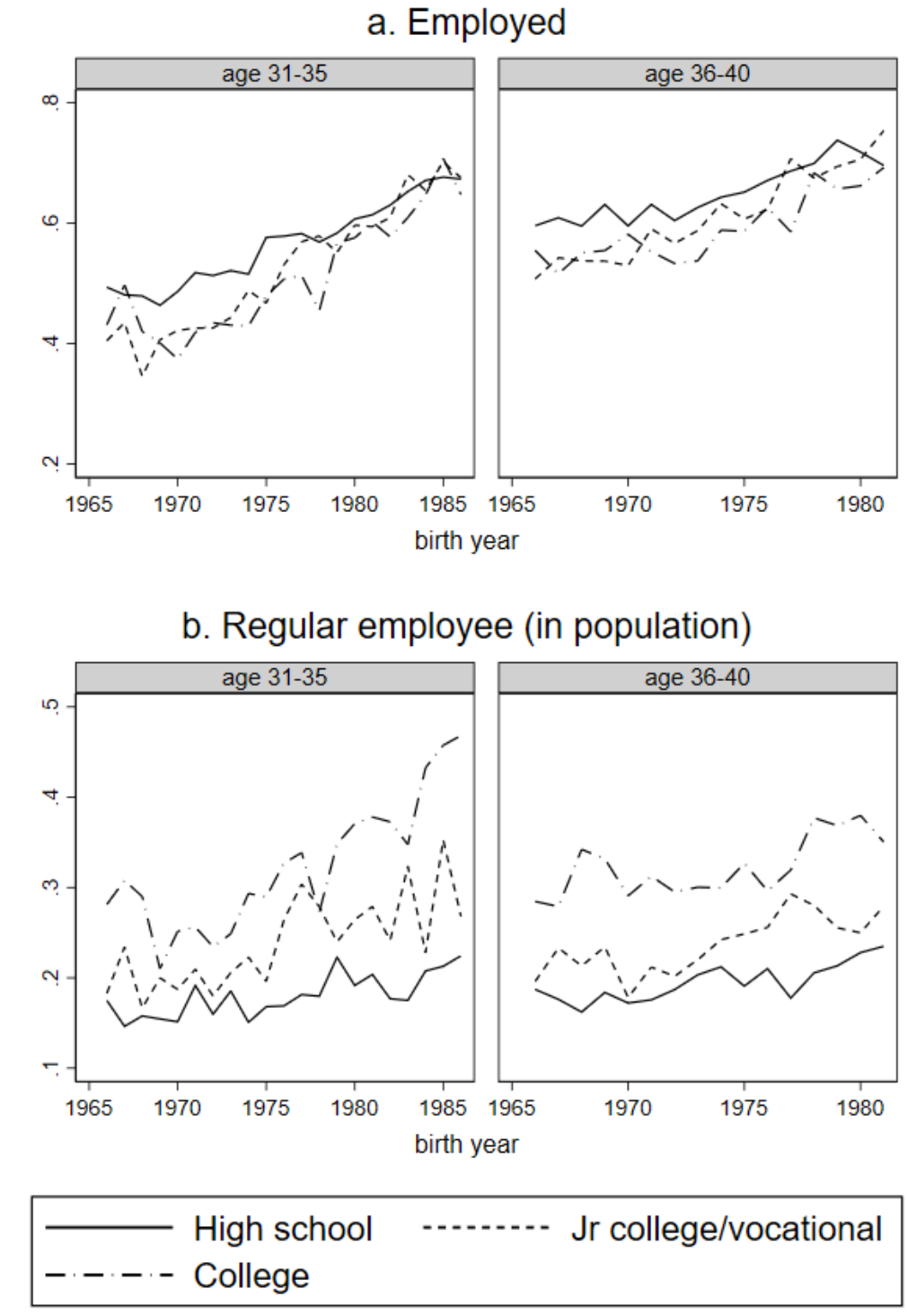


Figure 3 Maternal employment by education and birthyear

Source: Labour Force Survey

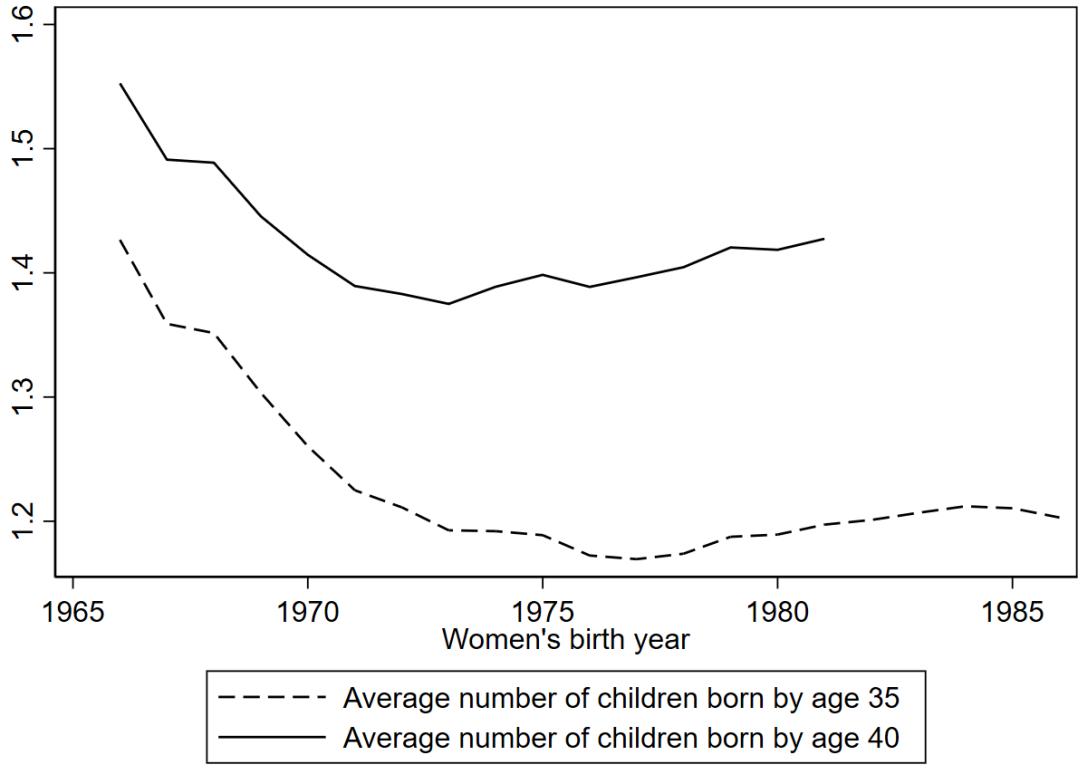


Figure 4 Average number of children born by age 35 and 40

See the main text for the source.

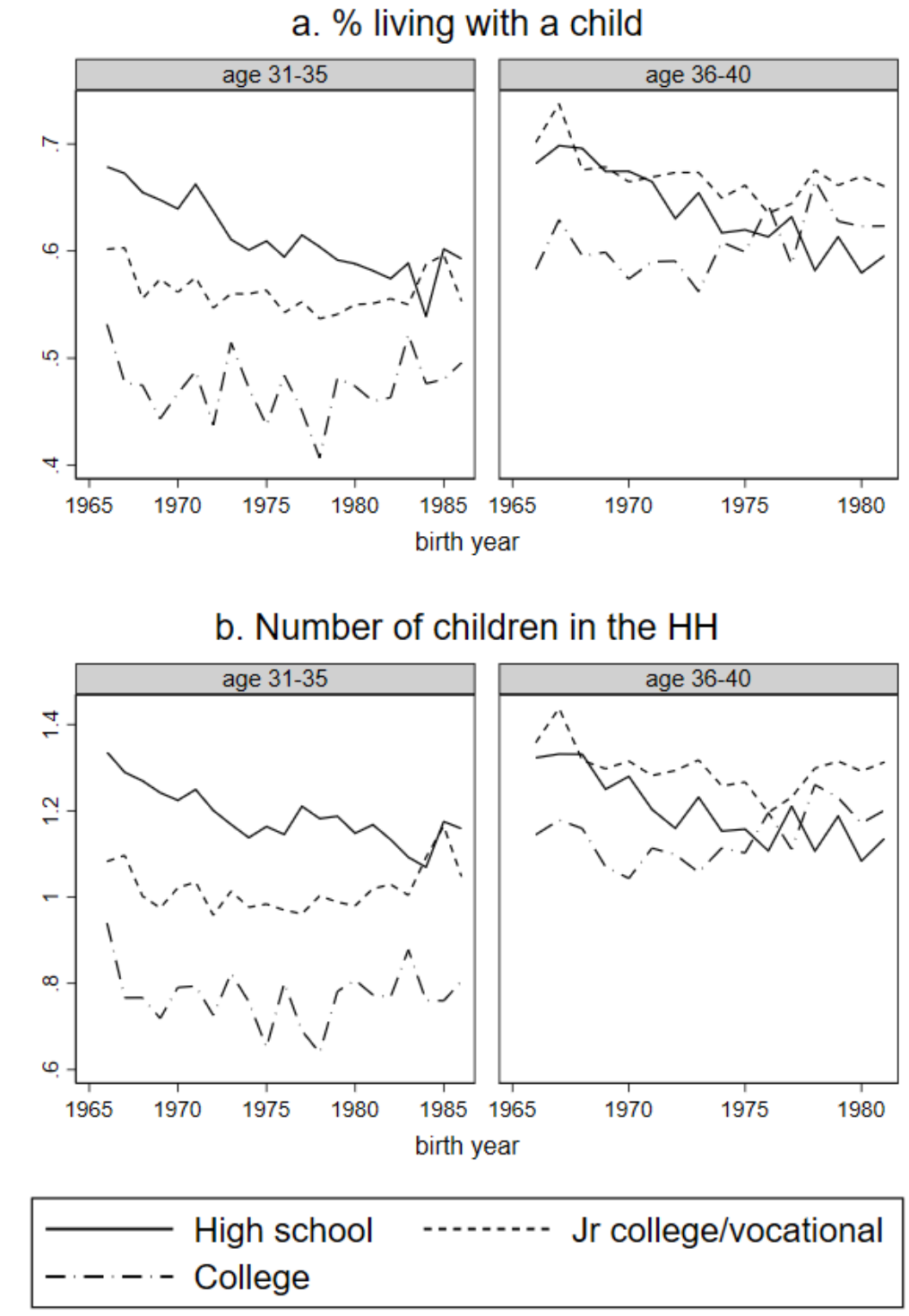


Figure 5 Fertility indicators by education and birthyear

Source: Labour Force Survey

Table 1 Decomposition of change in the number of children in the household

a. Age 31-35, change from cohort born in 1969-71 to those born in 1984-86

	High school	Jr college/ vocational	College
Δnumber of children in HH	-0.104	0.091	0.007
Δ%married*(num of children in HH | married, cohort69-71)	-0.142	-0.030	-0.017
Δ(num of children in HH | married)*%married of cohort69-71	0.037	0.127	0.024
Residuals	0.001	-0.006	0.001

b. Age 36-40, change from chort born in 11969-71 to those born in 1979-81

	High school	Jr college/ vocational	College
Δnumber of children in HH	-0.108	0.008	0.125
Δ%married*(num of children in HH | married, cohort69-71)	-0.084	-0.053	0.024
Δ(num of children in HH | married)*%married of cohort69-71	-0.025	0.065	0.108
Residuals	0.001	-0.003	-0.007

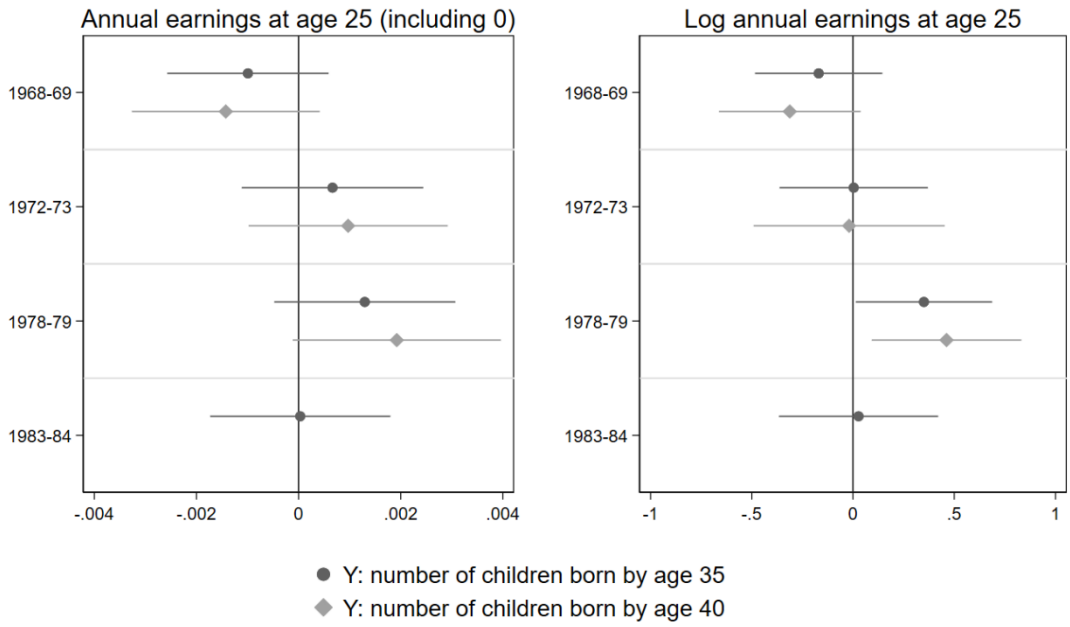


Figure 6 Estimated coefficients of salary income at age 25 interacted with cohort dummies

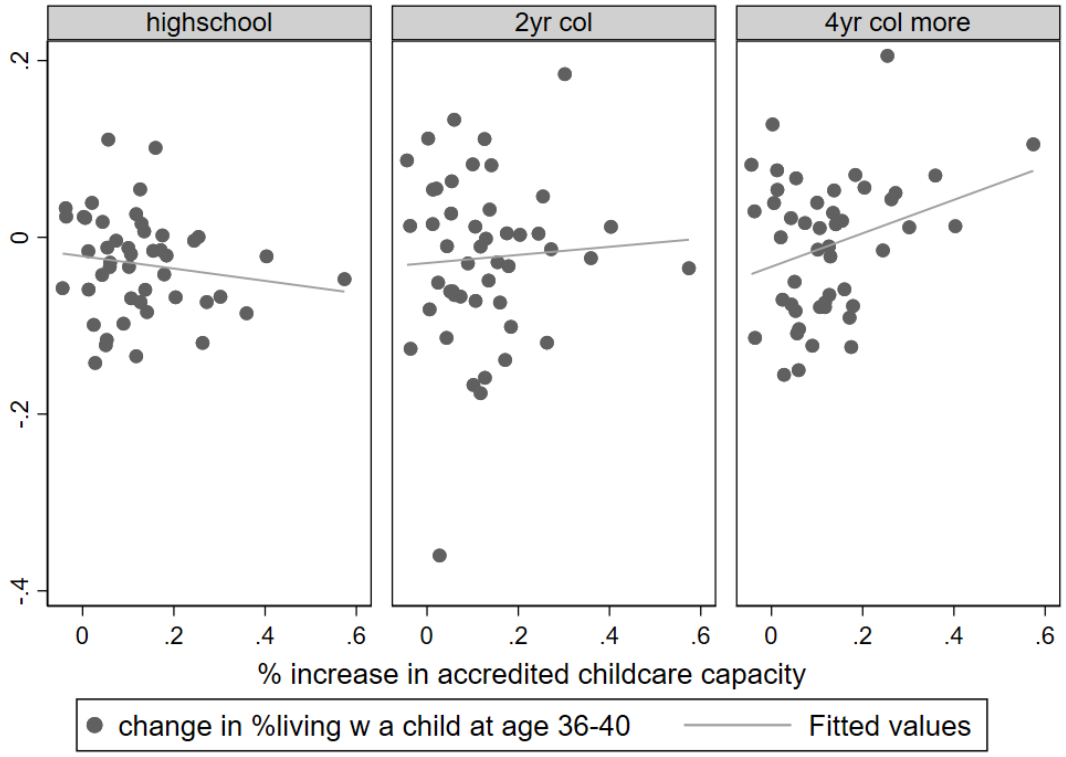


Figure 7 Correlation between the increase of childcare capacity and fertility, by educational background

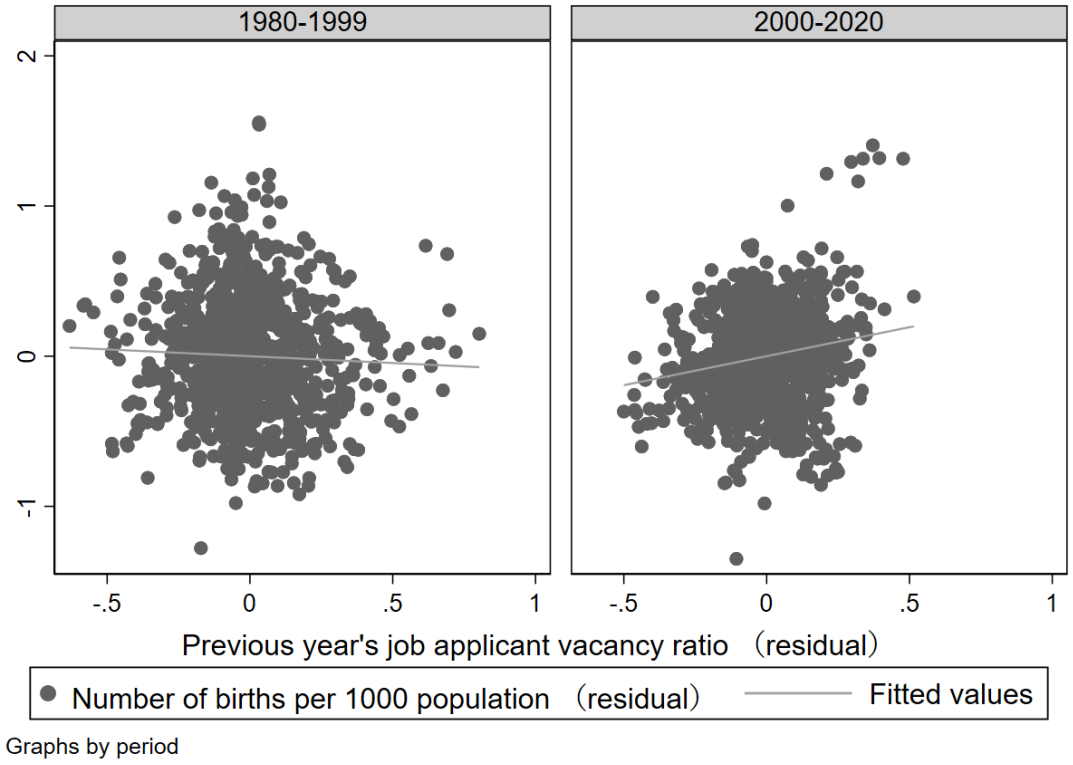


Figure 8 Correlation between fertility and job applicant to vacancy ratio

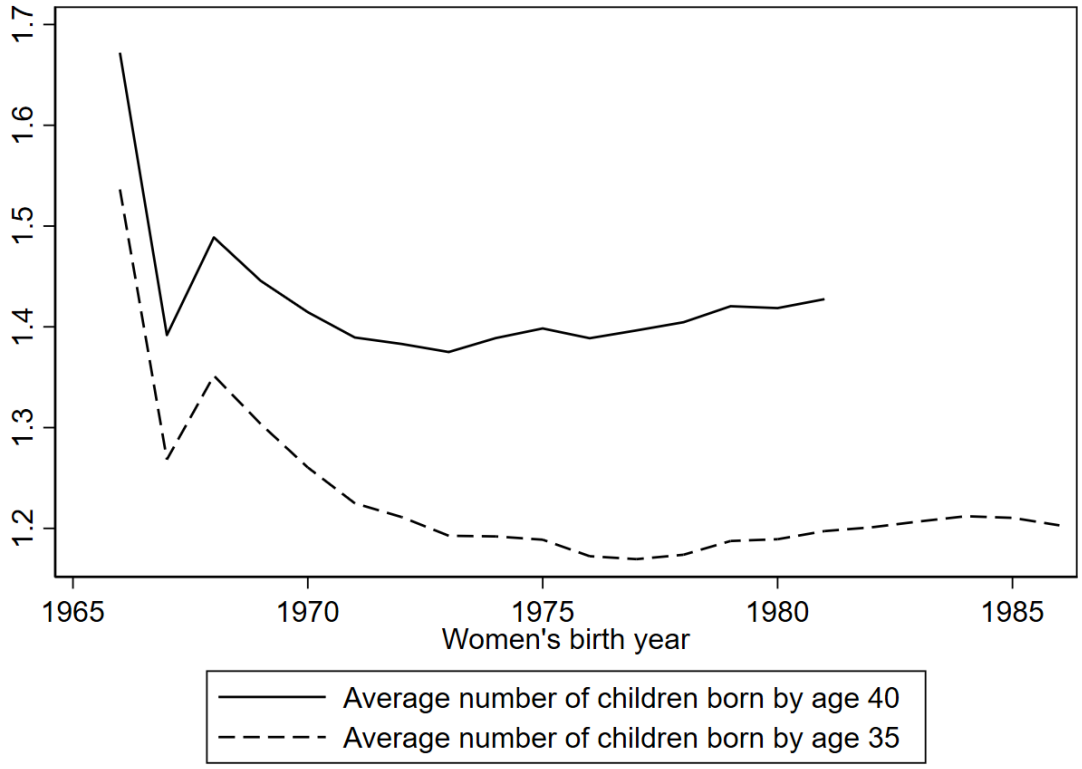
Appendix Table A1 Summary statistics of the Labour Force Survey sample used for Figures 3–5

Sample used in Figure 3

	Male	Female
Birthyear cohort range	1966–1984	
Employed	93.0%	62.3%
Regular employee	75.9%	32.0%
Education		
High school	52.5%	48.5%
Jr. college/vocational	13.9%	32.8%
Four-year college	33.6%	18.7%
Sample size	39,468	40,544

Sample used in Figures 4 and 5

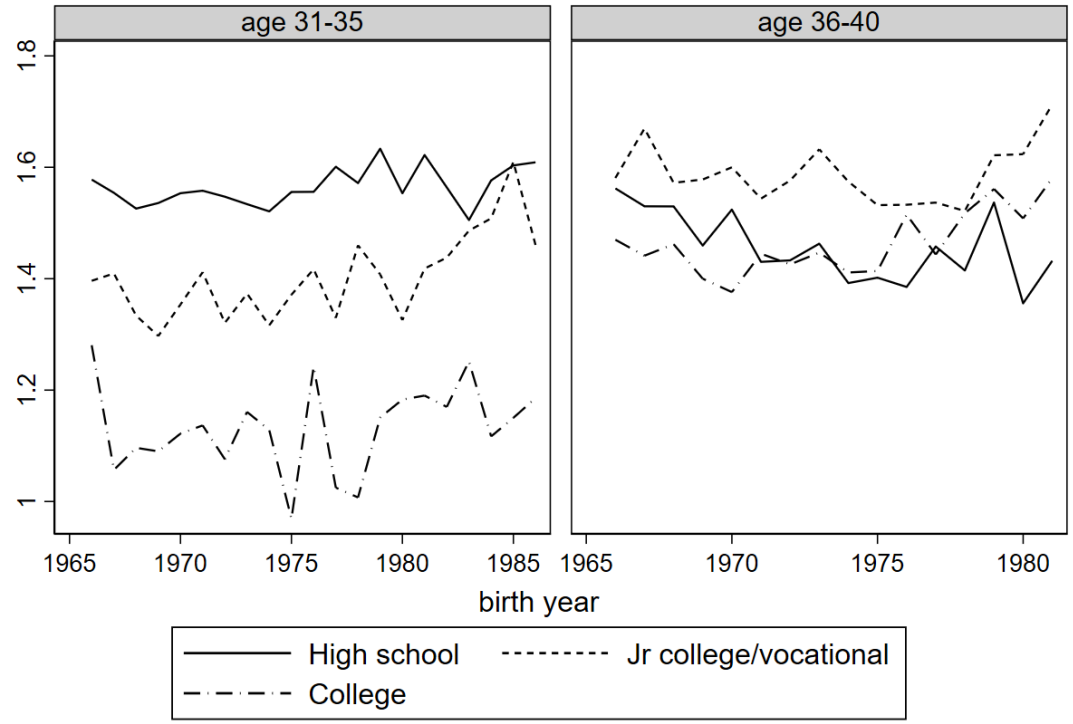
	Age 31–35	Age 36–40
Birthyear cohort range	1966–1984	1966–1979
Living with a child	57.6%	65.0%
Number of children in the same household	1.06	1.23
Employed	62.3%	66.4%
Regular employee	32.0%	29.1%
Married	68.0%	73.9%
education		
High school	48.5%	48.4%
Jr. college/vocational	32.8%	34.3%
Four-year college	18.7%	17.4%
Sample size	40,544	30,911



Appendix Figure A1 Average number of children born by age 35 and 40 without adjustment for the 1966 cohort

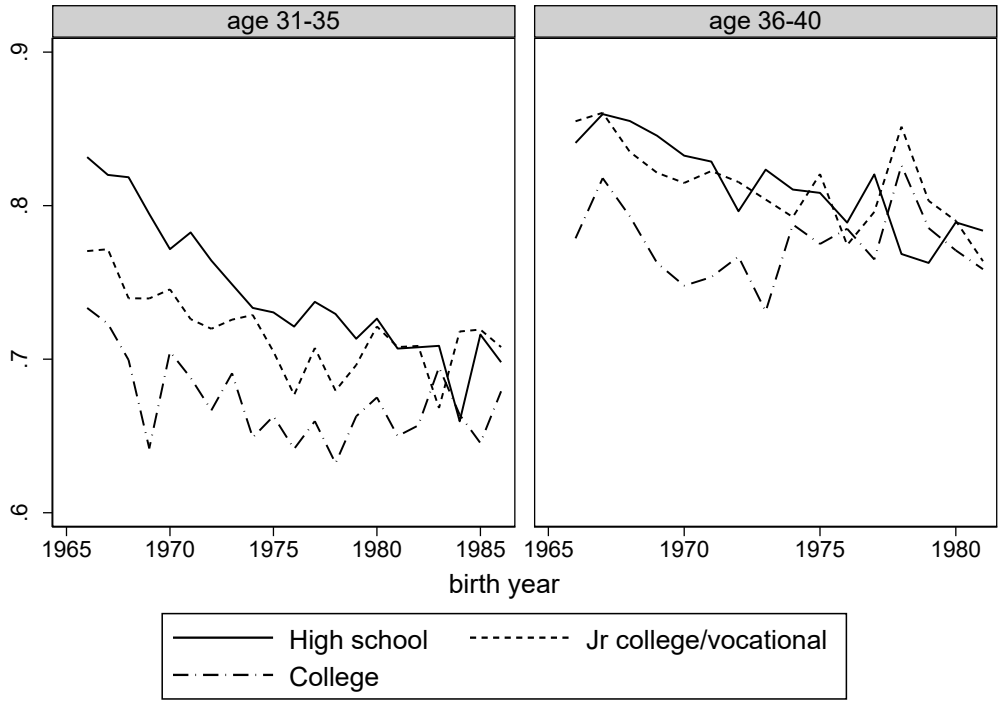
Appendix Figure A2 % of married as of survey, women by birth year cohort

Source: Poulation Census 1995-2020



Population = ever married women

Appendix Figure A3 Number of children living in the household for women who have ever married by education and birth-year



Appendix Figure A4 % married, women by education and birth-year

Appendix Figure A5: Contribution of ART in the increase in births to women aged 31-35 and 36-40

Source: The number of ART births by mother's age are taken from ART databook 2021, Japan Society of Obstetrics and Gynecology. Number of all births and population estimates of women by cohort are the same as used in Figure 4.

Appendix Table A2 Composition of educational background of women by cohorts

	high school or less	jr college/vocational	college and more
1966-70	54.3%	31.6%	14.0%
1971-75	45.6%	36.0%	18.4%
1976-80	39.5%	35.2%	25.2%
1981-85	37.4%	29.3%	33.3%
1986-90	34.9%	26.1%	39.0%

Source: Population Census 2000, 2010, 2020 (as of age 30-34 or 35-39)

Appendix Table A3 Percent of women who already had a child by age 25 among those who were surveyed at age 35 (dropped from the analysis sample)

Cohort	%
1968–1969	29.4%
1972–1973	21.7%
1978–1979	27.4%
1983–1984	26.0%

Appendix Table A4 Point estimates and standard errors of the coefficients shown in Figure 6 and cohort dummies

(1)(3) Y: Number of children born by age 35

(2)(4) Y: Number of children born by age 40

	(1)	(2)	(3)	(4)
Eanings at age 25 (in JPY 10,000)	-0.001	-0.001		
* 1968–1969	[0.001]	[0.001]		
Eanings at age 25 (in JPY 10,000)	0.001	0.001		
* 1972–1973	[0.001]	[0.001]		
Eanings at age 25 (in JPY 10,000)	0.001	0.002*		
* 1978–1979	[0.001]	[0.001]		
Eanings at age 25 (in JPY 10,000)	0			
* 1984–1983	[0.001]			
Log (earnings at age 25)			-0.170	-0.312*
* 1968–1969			[0.160]	[0.178]
Log (earnings at age 25)			0.003	-0.019
* 1972–1973			[0.186]	[0.240]
Log (earnings at age 25)			0.350**	0.462**
* 1978–1979			[0.171]	[0.188]
Log (earnings at age 25)			0.027	
* 1984–1983			[0.200]	
1972–1973	-0.529*	-0.619*	-1.037	-1.602
	[0.306]	[0.346]	[1.334]	[1.625]
1978–1979	-0.645**	-0.733**	-2.918**	-4.118***
	[0.287]	[0.329]	[1.252]	[1.379]
1984–1983	-0.48		-1.287	
	[0.306]		[1.393]	
Observations	413	278	378	254

Appendix Table A5 Summary statistics of JPSC sample used in Figure 6

	(1)	(2)	(3)	(4)
Number of children	1.01	1.25	1.02	1.26
Earnings at age 25 (in JPY 10,000)	218.9	217.5	239.2	238.0
Sample size	413	278	378	254

Note: Column numbers correspond to those in Appendix Table A3.