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The Effects of Housing Wealth on Fertility Decisions: Evidence from Japan

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Abstract

This study is an empirical attempt to investigate how household resources affect fertility decisions in Japan. The presented analysis is based on changes in housing wealth as measured by changes in home value during the housing bust period. Using data from the Japanese Panel Survey of Consumers, I show that with an increase (decrease) in home value, homeowners with housing loans are more (less) likely to bear a child. For homeowners without housing loans and renters, however, housing wealth has no significant effect on fertility decisions. Furthermore, the results do not appear to be driven by local macroeconomic factors.

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1 Introduction

Like most developed countries, Japan, as is well known, has been facing a declining fertility rate for decades. Its fertility rate has been below both the replacement level (around 2.08) and the OECD average for the past three decades. Indeed, only five OECD countries had lower fertility rates than that of Japan in 2010 and addressing this issue has become one of the most serious economic challenges facing the country. In particular, the relationship between childbearing and household resources has captured the interest of economists as a topic with important policy implications against the background of the Japanese economy having experienced prolonged recessions and deflation since the early 1990s.[1] These recessions have influenced household resources through a variety of channels such as labor markets, asset markets, and housing markets.

This study examines how fertility decisions respond to household resources, focusing especially on the role of housing wealth. The analytical focus on housing wealth in the fertility literature makes for an interesting study for two main reasons. First, housing is by far the largest asset of most Japanese households.[2] Hence, changes in household wealth reflect variations in the value of existing assets (such as stocks and houses) in the household portfolio that are not consumed. Housing wealth, therefore, can be an informative component in assessing the effects of total household resources on fertility decisions. In this study, I use house prices or changes in the home price (value) to measure housing wealth.

Second, changes in housing wealth driven by changes in house prices are less likely to affect the opportunity cost of time. Changes in household resources are most likely to be driven by changes in household income and wealth. Most existing empirical studies based on microdata focus on the fertility impact of household income, especially labor income—earnings or market wage rates, for example.[3] However, estimating the effects of income on fertility is difficult to accomplish.[4] In this study, therefore, I use house prices to examine how changes in household resources, through changes in housing wealth induced by home value changes, affect fertility decisions, considering home value changes as exogenous variations to the opportunity cost of time.

Here, let me consider the fertility decision in response to changes in housing wealth. Assuming, as is conventional, that children are normal goods, a rise in home value leads to an increase in demand for children through the housing wealth effect (the wealth effect and/or the equity extraction effect), because house price changes are capitalized into household wealth for a given homeowner. On the other hand, a rise in home value implies an increase in housing cost for both renters and homeowners who would buy a home or move to a larger home with the birth of a child. Since housing is considered as one of the goods associated with raising a child, an increase in housing cost encourages the household to have fewer children (the substitution effect).

Only a few recent studies in the fertility literature have exploited house prices or their varia-

[1] Notable examples of recessions include Japan's "lost decades" following the asset bubble burst in 1990 and the Great Recession triggered by the global financial crisis of 2008.

[2] According to the National Survey of Family Income and Expenditure, housing and residential land assets accounted for about 70% of total household assets as of 2009.

[3] Since the classic 1960 study and subsequent works of Becker (e.g., Becker 1960, 1965; Becker and Lewis 1973), economists have proposed frameworks that consider both demand for children and parental investment per child as household choice variables. An implication of these frameworks is that household income affects fertility decisions through at least two channels, namely the income effect and the substitution effect.

[4] The need to estimate the effects of household income and the price of children has motivated a large number of empirical studies in this stream of the literature.

tions to measure household resources (e.g., Lovenheim and Mumford 2013; Dettling and Kearney 2014). However, these studies have mainly been concerned with documenting evidence for housing boom periods.[5] The present study contributes to the body of knowledge on this topic by providing evidence based on individual-level (household-level) data for the housing bust period, which in Japan is characterized by the bursting of the housing bubble in the early 1990s and subsequent decline in house prices.[6]

Moreover, the second-hand housing market in Japan is not particularly vibrant, and home equity loans are actually less common. These features may thus be well suited for an analysis of the housing wealth effect on fertility, because they could reduce the possibility that any positive effect of a rise in home value on fertility for current homeowners can include a negative substitution effect from the increase in housing costs, as discussed above. On the contrary, these features discourage households from tapping into their homes as (fungible) assets. However, a survey conducted by the Ministry of Economy, Trade and Industry in 2003 reports that more than 40% of households think asset deflation has negative effects on households. The presented analysis can provide evidence that households begin to recognize housing wealth under prolonged recessions and asset deflation, which leads to housing wealth influencing household behavior, including fertility decisions. Thus, this work complements previous studies that have documented the effect of housing wealth on fertility decisions during housing boom periods.

The rest of the paper is organized as follows. In Section 2, I lay out my estimation framework and describe the data used for the estimation. Section 3 estimates the impact of housing wealth on fertility decisions. The paper concludes in Section 4.

2 Empirical Approach and Data

2.1 Empirical Model

This subsection describes the simple econometric model used to analyze the relationship between fertility decisions and changes in housing wealth herein. I assume that the decision to have a baby at the present time can be written as

$$birth_{ijt} = \alpha + \beta \Delta P_{ijt-1} + \gamma X_{ijt-1} + \theta_j + \phi_t + \varepsilon_{ijt} \tag{1}$$

where i denotes a married woman, j the prefecture, and t the survey year. The dependent variable $birth_{ijt}$ equals one if the married woman i living in prefecture j bore a child in the previous survey year t and zero otherwise.[7] θ_j and ϕ_t represent prefecture fixed effects and time trends, respectively.[8] The vector X is a set of observable individual or household characteristics, and ε_{ijt} is an error term.

The coefficient of primary interest is β, which shows the degree to which movements in house prices affect the fertility decision. The variable P_{ijt-1} is the house price at time $t-1$ and ΔP_{ijt-1} represents the two-year change in home value. House price growth implies an increase

[5] Although none of these directly focuses on housing bust periods, Dettling and Kearney (2014) estimate several alternative specifications and data, including individual-level data and housing bust period data, to probe the robustness of their results obtained from aggregate data (at the level of the metropolitan statistical area).

[6] As explained above, the decline in asset values in Japan has persisted since the bubble burst. For example, the Land Market Value Publication of 2010 reports a downward trend in land prices after 1992, except for 2007 and 2008.

[7] As explained in Section 2.2, the regressors are based on information derived from the previous survey.

[8] Japan is divided into 47 prefectures for administrative purposes.

in household wealth, because house price changes are capitalized into wealth for a given homeowner. In this study, following Lovenheim and Mumford (2013), I focus on individual-level changes in house prices because contemporaneous house prices may only be roughly associated with household resources.[9] Equation (1) is thus estimated as a linear probability model for homeowners.[10]

Housing loans are typically a burden to homeowners. Unlike many countries that adopt nonrecourse loans, however, Japan has a system based on recourse housing loans. If households suffer a decline in collateral home value, the negative shocks that stem from this decline may differ between households with and without housing loans. For an investigation of household behavior, it would be worthwhile considering variations in collateral house values with and without housing loans. Therefore, I examine the effect of changes in house prices separately for homeowners who buy houses with and without housing loans. I do so to consider not only the net housing wealth effect that increases demand for children but also the possibility that households that are otherwise credit-constrained would use some of the new housing wealth to fund current period consumption, including childbearing.

The main identifying assumption in equation (1) is that short-run house price changes are conditionally uncorrelated with unobserved factors that affect the fertility decision. However, one possible concern is that the effect on the fertility decision of changes in housing wealth due to house price changes may capture local macroeconomic conditions. To address this issue, the presented empirical analysis controls for time-varying prefecture-level economic conditions such as the unemployment rate and real wage rate (men and women). In addition, I estimate the model for both homeowners and renters. Although both homeowners and renters experience similar local macroeconomic fluctuations, renters do not yield housing wealth changes, because changes in rent do not lead to an increase in their household wealth. These estimates allow me to gauge whether the housing wealth effects on homeowners could not be induced by any bias due to unobserved local macroeconomic factors.

Another concern comes from the possibility that systematic sorting behavior by households—based to some extent on their expectations of the number of children—may generate biases. My estimates of housing wealth changes may be biased upward if, for example, women who plan to give birth or to have more children intend to move to regions where house prices are supposed to increase. To mitigate this issue, some specifications include in the regressions prefecture-specific time trends as additional controls.

Even if regressions include time-varying local economic conditions and prefecture-specific time trends, there may remain a source of endogeneity, for example, unobserved factors other than economic conditions that affect both home value changes and fertility, and no systematic sorting patterns, with a change over time across areas, or with households moving to areas disproportionately. Although one of the common approaches to circumvent these issues is the instrumental variable method, proposing a valid instrument for house prices at the individual level is challenging in practice. Therefore, the estimated coefficient of housing wealth from any regression requires careful interpretation.

[9]The change in one's home value would be a good measure of short-run change in household resources due to house price changes, according to Lovenheim and Mumford (2013). In fact, as described later, the presented estimates based on home value suggest that fertility decisions are unlikely to respond to house prices.

[10]I also estimated nonlinear models, but I report only the results from the linear probability model given the easy and clear interpretation. Note that marginal effects from a logit model generally yield similar findings; these are available upon request.

2.2 Data

The data used in the analysis are taken from the Japanese Panel Survey of Consumers (JPSC), conducted annually by the Institute for Research on Household Economics. The JPSC began in 1993 with a nationally representative sample of 1,500 women aged 24–34 years, adding 500 women aged 24–27 in 1997, 836 women aged 24–29 in 2003, and 636 women aged 24–28 in 2008. Throughout the paper, I use the 19 waves of JPSC data covering 1993 to 2011.

In addition to individual demographic and socioeconomic information, the JPSC contains detailed information on housing such as homeownership status (homeowner, renter) and housing wealth as well as a rich set of family background characteristics.[11] The main advantage of JPSC data over other available survey data in Japan is that the former represent one of the few Japanese longitudinal datasets at the individual (household) level that allow one to trace changes in housing wealth prior to a child's birth.

I restrict the analysis to married women under 45 years because the birthrate among women over 45 years is, in general, extremely low in Japan (no birth has been recorded in the JPSC for women over 45 years).[12] Further, I include only women who lived for not less than two years in the same residence in order to capture changes in the value of their houses.

Childbearing is identified by a survey question that asks the respondent whether she bore a child in the past year.[13] The answer to this question is used as the dependent variable, which takes one if a woman bore a child in the previous year and zero otherwise. Any independent variables developed based on information for the same survey year as for the dependent variable would capture attributes after childbirth. In order to capture attributes and factors prior to a child's birth, the independent variables are matched to observations by the year prior to the survey year.

In this analysis, housing wealth is measured by self-reported home value in each survey year as ascertained by the question "*How much do you think your home would sell for now?*" A potentially important limitation of the JPSC data is that home value is self-reported to the nearest Japanese yen (JPY), which raises the issue of measurement error. Indeed, it is important to remember that homeowners' housing wealth measures are somewhat subjective.[14] Housing wealth measures are also matched to observations for the year prior to the survey year, since households that intend to have a baby in the current year would consider housing wealth prior to conception.[15] This study, as noted above, mainly uses the two-year change in home value, rather than home value per se, to measure housing wealth before households make a fertility choice.[16] This housing wealth measure has a positive sign if it increases compared with the value two years ago. For renters who experience local macroeconomic shocks but no gains from housing wealth increases, self-reported monthly rent is used as the housing wealth measure instead.

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[11] With regard to the married women in the sample, the JPSC includes information on their husbands in addition to household characteristics.

[12] According to Vital Statistics in Japan, the fertility rate among women over 45 was 0.0010 as of 2010, which is very low compared with the rates for the 40–44 (0.0387) and 35–39 (0.2318) age groups.

[13] Since the JPSC is conducted in October each year, "the past year" in the questionnaire indicates the period from October of the previous year to September of the survey year.

[14] Although some skepticism regarding self-reported home value is warranted, considering instances of misreporting or lack of knowledge of market values, Kiel and Zabel (1999) and Lovenheim (2011) show that homeowner valuations are by and large accurate, suggesting that self-reported home value introduces little systematic bias.

[15] Here, I use year minus one as an approximation because the JPSC does not contain accurate birth-date or gestation-period information.

[16] Change in home value is calculated as $P_{ijt-1} - P_{ijt-3}$, where P_{ijt-1} is the home value in the year prior to the survey year.

Regarding the other variables used in the analysis, demographic characteristics and prefecture-specific factors are included as controls. Demographic characteristics include age, annual household income, years of education, employment status, and the number of preexisting children in the household. Information on prefecture-specific factors is not obtained directly from the JPSC. The restricted-access prefecture codes from the JPSC allow me to match data on prefecture characteristics to each respondent. Information on these characteristics, including the unemployment rate and real wage rate, is obtained from various sources. Detailed descriptions and data sources are shown in the appendix.

In the following estimation, I consider three subgroups: homeowners with housing loans, homeowners without housing loans, and renters. Table I compares the summary statistics across subsamples, showing that the average fertility rate of renters is higher than that of homeowners. The table also shows that, in comparison with homeowners, renters are on average less likely to live in towns or villages and are younger, but rarely differ in years of education. For homeowners with housing loans, the average home value is about 15 million yen. The average two-year change in home value is -1.55 million yen for homeowners both with and without housing loans. There are substantial variations in both variables of housing wealth measures, with large standard deviations. For homeowners both with and without housing loans, the average number of preexisting children is around 2.0. Similarly, with respect to household income and age, there is little difference between homeowners with and without housing loans.

3 Estimation Results

To assess the relationship between housing wealth and fertility decisions, Table II first presents estimates for all homeowners based on the housing wealth measure of the two-year change in home value. All regressions include controls for the size of cities, prefectures, and time trends. Prefecture-by-year unemployment rates and real wage rates are also included in columns (3) to (6). The estimates in columns (5) and (6) of Table II are derived from models that additionally include prefecture-specific time trends.

Columns (1), (3), and (5) show that positive changes in home value do not significantly increase the probability of childbirth for homeowners overall. In order to shed some light on whether housing wealth effects on fertility differ for homeowners with and without housing loans, I include the interaction term for two-year home value change with a housing loan indicator in the fertility regression (columns (2), (4), and (6)). The estimated coefficients on the interaction terms with housing loans are positive and statistically significant. Adding the interaction term leaves all the estimated impact of variables other than two-year home value change and the interaction unchanged. This result indicates that housing wealth effects on fertility decisions are significantly different depending on whether homeowners have taken out housing loans to finance their home purchase.

To investigate the differential effects across homeownership and housing loan status further, I run regressions separately for the three previously presented subgroups. Panel (A) of Table III presents the estimates for homeowners with housing loans. The coefficients of the two-year change in home value are positive and statistically significant. A 10-million-yen increase in the two-year change in home value results in a 0.0088-point, or 21.5% (= 0.0088/0.041), increase in the probability of childbirth. During the sample period, the average two-year change in home value is -1.55 million yen. The finding in Panel (A) indicates that this decrease leads to a 0.14-percentage-point reduction in the probability of childbirth among homeowners with housing loans, everything else being constant. Compared with the baseline probability of childbirth of

4.1%, this corresponds to a decrease in the probability of fertility by 3.4% (=0.14/4.1).

For homeowners without housing loans, the estimates in Panel (B) of Table III point to the negative effects of changes in home value on fertility decisions. For no column of Panel (B), however, can I reject the null hypothesis that the coefficient is zero. The home value changes in Panel (A) compared with those in Panel (B) hold a possible clue to their effect—homeowners with housing loans are more likely to be credit-constrained on fertility decisions given a decrease in home value.

The estimated impact of the log of annual household income is not significantly different from zero for fertility decisions in any of the columns in Table III. The regression models include only household income as a control variable to gauge each woman's economic characteristics at the household level. Therefore, as discussed above, the estimated household income coefficient most likely fails to identify the causal effect on fertility decisions. Although this is not a central concern in this study, note that the effect of household income needs to be interpreted with caution because no instrumental variable that captures exogenous changes in household income is adopted here. However, my estimates generally seem to be robust to the exclusion of annual household income.

In all the columns of Table III, except (1) and (4), I control for the prefecture-by-year economic conditions. Since the surge in the unemployment rate after the recession, unemployment in Japan has remained relatively high; however, the current rate is still low compared with those of other OECD countries. Unemployment rates may affect household resources through labor markets. As shown in Table III, however, the effects of unemployment rates are negligible across specifications. Columns (2) and (3) indicate that fertility decisions for homeowners with housing loans are more likely respond to housing wealth than to the unemployment rate.

By contrast, Table IV examines the effect of rent on the renter's fertility decisions. For a renter, rising rents is not regarded as an increase in household wealth. Rather, rising rents, ceteris paribus, may induce a substitution effect on demand for children in the current period for renters owing to increases in housing costs (i.e., potential homeowners who would buy a home with the birth of a child) if children and housing are complements. Regardless, rent has no significant effects on fertility decisions in all of the columns in Table IV, in either levels or changes. Taken together, the evidence in Table IV that renters do not respond to changes in rent would broadly support the notion that the presented estimates are unlikely to be biased by unobserved local macroeconomic shocks.

To explain my findings on homeowners with housing loans, I also explore whether the effect of housing wealth on fertility differ by the respondent's age and cohort. Table V presents the results of the regressions where the two-year change in home value is interacted with the dummies for the age groups (column (1)) and with an indicator for the younger cohort (column (2)). All specifications include the same set of control variables as in column (2) of Table III. Although the effect of housing wealth is not different significantly by cohort (column (2)), the result in column (1) shows that the effect of housing wealth is positive for each age category with the coefficient decreasing among older women but statistically significant only among those aged 24–29. There might be a significant effect of housing wealth for younger women, because the timing of births may be less likely to be constrained for this segment of the population. By contrast, older women may make fertility decisions irrespective of housing wealth since it becomes more difficult to postpone childbirth with advancing age.

One potential concern is that the results presented thus far have used home value change as the housing wealth measure. Indeed, households' fertility decisions may respond to contemporaneous house prices rather than house price changes. Further, the effect on fertility could be induced only by unanticipated sharp changes in house prices. To address these concerns, Table

VI presents the results obtained by using two alternative housing wealth measures. Column (2) of this table reports the estimation result from the fertility regression, which uses home value as the housing wealth measure. As shown, the coefficient of home value is positive but statistically insignificant, suggesting little association between home value and the likelihood of childbirth. In other words, home value does not sufficiently capture, or seems to be a poor measure of, housing wealth. The second measure of housing wealth considered is a house price shock. This "shock" variable, calculated as the cumulative sum of the residuals of a second-order autoregressive process from the past three years, represents a household's unexpected proportion of the change in home value. As shown in column (3), no significant effect of a house price shock on fertility is observed, implying that the presented results that use home value change do not appear to be driven only by an unexpected sharp movement in home value.

4 Conclusion

Using Japanese longitudinal data at the individual (household) level, this study attempted to shed light on the role of housing wealth in fertility decisions during the housing bust period in Japan by investigating the impact of changes in home value. Considering the features of Japanese housing markets and housing loans, which are mostly based on recourse lending unlike in many other countries, I found a positive and significant effect of housing wealth on fertility decisions only for households with housing loans during this period. However, I found no evidence that homeowners without housing loans and renters are more (less) likely to bear a child when home value increases (decreases). This evidence adds to the findings proposed by previous studies such as Lovenheim and Mumford (2013) and Dettling and Kearney (2014).

These empirical results also suggest that accounting for only household income may overlook important aspects of households' fertility behavior. The declining fertility rate in Japan therefore needs to be examined by taking account of changes in household resources caused by housing market fluctuations and features.

A number of questions pertaining to the effect of housing wealth on fertility are left open by my analysis. Although the presented estimates were obtained under the assumption that changes in house prices and fertility decisions are exogenous, a much-needed avenue of research would be addressing the potential endogeneity between households' fertility decisions and house prices at the individual level. Further, considering the child quantity–quality trade-off (human capital investment) in the context of housing wealth effects would be another important future research direction.

Appendix Variable Definitions and Data Sources

The baseline sample consists of married women under 45 years old who have lived for at least two years in the same residence in each wave of the JPSC. Unless otherwise noted, the independent variables in this study are developed from information for the previous survey year. As described below, the information on prefecture characteristics is obtained from various sources.

- *Birth dummy* (dependent variable): unity if a woman bore a child in the previous year and zero otherwise.
- *Home value*: the current value of the respondent's home if she is a homeowner—the answer to the question "How much do you think your home would sell for now?" This self-reported market value of the home measured in 100 thousands of JPY is converted into 10 millions of JPY.
- *2-year home value change*: two-year change in *Home value*.
- *Rent*: monthly rent paid for the respondent's home if she is a renter (in 10,000 JPY).
- *2-year rent change*: two-year change in *Rent*.
- *ln(Real annual household income)*: log of pretax annual household income (in 10,000 JPY). Pretax annual household income is deflated by the Consumer Price Index of the Ministry of Internal Affairs and Communications.
- *Age*: respondent's age at the time of the JPSC survey for each year.
- *Number of preexisting children*: the number of children in a household except newborn babies.
- *Years of education*: the number of years of education completed by respondents. JPSC respondents are not asked exactly how many years of education they have completed. Rather, they are asked to report the level of education they graduated (or dropped out of). The variable is coded 9 for respondents who graduated junior high schools, 12 for respondents who graduated high schools, 14 for respondents who graduated vocational schools or junior/technical colleges, 16 for respondents who graduated universities or four-year colleges, and 18 for respondents who completed graduate schools.
- *Employment status*: unity if the respondent is one of the following types of workers: *Not employed, Self-employed, Non-regular employment, and Regular employment* and zero otherwise.
- *City size dummy*: unity if the respondent resides in one of the following municipality types: *Major city, City, and Town or village* and zero otherwise. Japan has three main types of municipalities: city, town, and village. The Tokyo metropolitan government includes 23 special wards other than cities, towns, and villages.

  Major city: unity if the respondent resides in one of the 23 special wards of the Tokyo metropolitan government or ordinance-designated cities and zero otherwise.

  City: unity if the respondent resides in one of the cities other than the ordinance-designated ones and zero otherwise.

  Town or village: unity if the respondent resides is one of the towns or villages and zero otherwise.

Prefectural Characteristics

- *Unemployment rate*: the number of unemployed people as a proportion of the labor force by prefecture. Source: *Labour Force Survey*, Statistical Survey Department, Ministry of Internal Affairs and Communications.

- *Real male wage*: scheduled cash earnings of ordinary male workers by prefecture (in 10,000 JPY) deflated using the Consumer Price Index of the Ministry of Internal Affairs and Communications at 2010 constant prices. Source: *Basic Survey on Wage Structure*, Ministry of Health, Labour and Welfare. *2010-Base Consumer Price Index*, the Statistics Bureau, Ministry of Internal Affairs and Communications.
- *Real female wage*: scheduled cash earnings of ordinary female workers by prefecture (in 10,000 JPY) deflated using the Consumer Price Index of the Ministry of Internal Affairs and Communications at 2010 constant prices. Source: *Basic Survey on Wage Structure*, Ministry of Health, Labour and Welfare. *2010-Base Consumer Price Index*, the Statistics Bureau, Ministry of Internal Affairs and Communications.

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Table I: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
(A) Homeowners with housing loans ($N = 3,892$)				
Birth dummy (dependent variable)	0.041	0.199	0	1
Home value (in 10 millions of JPY)	1.490	1.052	0.01	10
Two-year home value change (in 10 millions of JPY)	−0.155	0.834	−12.2	8.2
ln(Real annual household income) (in 10,000 JPY)	6.392	1.054	0	8.506
Age	36.670	4.154	26	44
Number of preexisting children	1.932	0.858	0	5
Years of education	13.211	1.539	9	18
Employment status				
Not employed	0.405	0.491	0	1
Self-employed	0.056	0.230	0	1
Non-regular employment	0.347	0.476	0	1
Regular employment	0.192	0.394	0	1
City size dummy:				
Major city	0.260	0.439	0	1
City	0.581	0.493	0	1
Town or village	0.159	0.366	0	1
Prefecture characteristics:				
Unemployment rate ($N = 3,603$)	4.648	1.093	1.9	8.4
Real male wage	32.736	3.459	24.104	41.108
Real female wage	22.036	2.470	16.196	28.168
(B) Homeowners without housing loans ($N = 1,859$)				
Birth dummy (dependent variable)	0.041	0.199	0	1
Home value (in 10 millions of JPY)	1.102	1.412	0.01	20
Two-year home value change (in 10 millions of JPY)	−0.155	1.236	−18.5	10
ln(Real annual household income) (in 10,000 JPY)	6.368	1.124	0	8.843
Age	36.819	4.404	26	44
Number of preexisting children	2.004	0.915	0	4
Years of education	13.044	1.585	9	18
Employment status				
Not employed	0.414	0.493	0	1
Self-employed	0.082	0.274	0	1
Non-regular employment	0.288	0.453	0	1
Regular employment	0.216	0.411	0	1
City size dummy:				
Major city	0.152	0.359	0	1
City	0.646	0.478	0	1
Town or village	0.202	0.402	0	1
Prefecture characteristics:				
Unemployment rate ($N = 1,671$)	4.240	1.056	1.7	7.7
Real male wage	31.649	3.407	24.270	41.108
Real female wage	21.243	2.282	16.506	28.168
(C) Renter ($N = 3,115$)				
Birth dummy (dependent variable)	0.082	0.274	0	1
Rent (in 10,000 JPY)	5.668	3.524	0.2	40
Two-year rent change (in 10,000 JPY)	0.079	1.717	−14.7	17
ln(Real annual household income) (in 10,000 JPY)	5.976	1.327	0	8.100
Age	34.187	4.442	26	44
Number of preexisting children	1.670	1.027	0	7
Years of education	13.061	1.813	9	18
Employment status				
Not employed	0.527	0.499	0	1
Self-employed	0.040	0.196	0	1
Non-regular employment	0.286	0.452	0	1
Regular employment	0.147	0.354	0	1
City size dummy:				
Major city	0.275	0.447	0	1
City	0.632	0.482	0	1
Town or village	0.093	0.291	0	1
Prefecture characteristics:				
Unemployment rate ($N = 2,686$)	4.665	1.151	1.7	8.4
Real male wage	32.462	3.756	24.104	41.108
Real female wage	21.679	2.583	16.196	28.168

Table II: Effects of Housing Wealth on Birth Probability for All Homeowners

	Dependent Variable: Birth (Dummy = 1 if Childbirth Occurred in the Previous Year)					
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Two-year home value change	0.0014	−0.0052	0.0016	−0.0068	0.0015	−0.0073
	(0.0038)	(0.0047)	(0.0039)	(0.0059)	(0.0040)	(0.0060)
Two-year home value change × housing loans		0.0135**		0.0157**		0.0166**
		(0.0055)		(0.0070)		(0.0071)
ln(Real annual household income)	−0.0008	−0.0008	0.0013	0.0013	0.0011	0.0011
	(0.0022)	(0.0022)	(0.0023)	(0.0023)	(0.0023)	(0.0023)
Age	−0.0614***	−0.0613***	−0.0629***	−0.0624***	−0.0594***	−0.0589***
	(0.0119)	(0.0120)	(0.0126)	(0.0125)	(0.0126)	(0.0125)
Age^2	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***	0.0007***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Number of preexisting children	−0.0332***	−0.0333***	−0.0326***	−0.0326***	−0.0329***	−0.0329***
	(0.0033)	(0.0033)	(0.0031)	(0.0031)	(0.0031)	(0.0031)
Years of education	0.0045***	0.0045***	0.0042**	0.0042**	0.0038**	0.0038**
	(0.0016)	(0.0016)	(0.0017)	(0.0017)	(0.0016)	(0.0016)
Employment status						
Self-employed	−0.0313***	−0.0317***	−0.0290***	−0.0291***	−0.0284***	−0.0286***
	(0.0093)	(0.0093)	(0.0093)	(0.0095)	(0.0096)	(0.0097)
Non-regular employment	−0.0255***	−0.0254***	−0.0251***	−0.0250***	−0.0254***	−0.0252***
	(0.0055)	(0.0055)	(0.0052)	(0.0053)	(0.0052)	(0.0052)
Regular employment	0.0019	0.0015	−0.0011	−0.0015	−0.0013	−0.0017
	(0.0093)	(0.0093)	(0.0085)	(0.0085)	(0.0086)	(0.0086)
Prefecture characteristics:						
Unemployment rate			−0.0019	−0.0016	−0.0057	−0.0055
			(0.0037)	(0.0036)	(0.0036)	(0.0036)
Real male wage			0.0003	−0.0000	0.0011	0.0009
			(0.0063)	(0.0063)	(0.0070)	(0.0070)
Real female wage			0.0023	0.0025	0.0089	0.0093
			(0.0049)	(0.0049)	(0.0061)	(0.0062)
Prefecture-specific time trends	No	No	No	No	Yes	Yes
R-Squared	0.0871	0.0882	0.0884	0.0896	0.0953	0.0966
N	5751	5751	5274	5274	5274	5274

Notes: Robust standard errors in parentheses are clustered at the prefecture level. Reference group for employment status is Not employed. All regressions include sets of dummies for prefecture and city size, linear and quadratic time trends, and a constant term, but they are not reported here. Each column represents a different regression for each model.

*, **, and *** denote that the estimated coefficients are statistically significant at the 10%, 5%, and 1% levels, respectively.

Table III: Effects of Housing Wealth on Birth Probability for Homeowners

	Dependent Variable: Birth (Dummy = 1 if Childbirth Occurred in the Previous Year)					
	(A) Homeowners with housing loans			(B) Homeowners without housing loans		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Two-year home value change	0.0083**	0.0088*	0.0093*	−0.0059	−0.0068	−0.0076
	(0.0039)	(0.0046)	(0.0047)	(0.0044)	(0.0059)	(0.0058)
ln(Real annual household income)	0.0010	0.0014	0.0006	−0.0046	0.0009	0.0014
	(0.0030)	(0.0026)	(0.0028)	(0.0034)	(0.0038)	(0.0044)
Age	−0.0513***	−0.0455***	−0.0419***	−0.0741***	−0.0885***	−0.0774***
	(0.0146)	(0.0122)	(0.0119)	(0.0211)	(0.0239)	(0.0242)
Age^2	0.0006***	0.0005***	0.0005***	0.0009***	0.0011***	0.0009***
	(0.0002)	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0003)
Number of preexisting children	−0.0321***	−0.0321***	−0.0320***	−0.0391***	−0.0365***	−0.0391***
	(0.0042)	(0.0037)	(0.0038)	(0.0071)	(0.0061)	(0.0064)
Years of education	0.0045*	0.0043*	0.0040*	0.0082*	0.0075**	0.0084**
	(0.0024)	(0.0023)	(0.0023)	(0.0042)	(0.0037)	(0.0038)
Employment status						
Self-employed	−0.0288**	−0.0283**	−0.0272**	−0.0330**	−0.0258	−0.0158
	(0.0121)	(0.0115)	(0.0119)	(0.0139)	(0.0156)	(0.0163)
Non-regular employment	−0.0270***	−0.0286***	−0.0287***	−0.0207*	−0.0108	−0.0100
	(0.0062)	(0.0062)	(0.0063)	(0.0114)	(0.0111)	(0.0115)
Regular employment	−0.0001	−0.0053	−0.0056	0.0006	0.0054	0.0066
	(0.0096)	(0.0100)	(0.0103)	(0.0168)	(0.0164)	(0.0163)
Prefecture characteristics:						
Unemployment rate		0.0011	−0.0014		−0.0058	−0.0115*
		(0.0047)	(0.0049)		(0.0064)	(0.0061)
Real male wage		0.0068	0.0069		−0.0127	−0.0112
		(0.0068)	(0.0081)		(0.0082)	(0.0085)
Real female wage		−0.0076	−0.0037		0.0253**	0.0365***
		(0.0055)	(0.0062)		(0.0100)	(0.0118)
Prefecture-specific time trends	No	No	Yes	No	No	Yes
R-Squared	0.0836	0.0819	0.0910	0.1294	0.1437	0.1805
N	3892	3603	3603	1859	1671	1671

Notes: Robust standard errors in parentheses are clustered at the prefecture level. Reference group for employment status is Not employed. All regressions include sets of dummies for prefecture and city size, linear and quadratic time trends, and a constant term, but they are not reported here. Each column represents a different regression for each model.

*, **, and *** denote that the estimated coefficients are statistically significant at the 10%, 5%, and 1% levels, respectively.

Table IV: Effects of Housing Wealth on Birth Probability for Renters

	Dependent Variable: Birth (Dummy = 1 if Childbirth Occurred in the Previous Year)					
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Two-year rent change	−0.0030	−0.0030	−0.0029			
	(0.0037)	(0.0044)	(0.0044)			
Rent				0.0013	0.0013	0.0009
				(0.0017)	(0.0018)	(0.0018)
ln(Real annual household income)	0.0023	0.0027	0.0036	0.0021	0.0025	0.0034
	(0.0029)	(0.0033)	(0.0035)	(0.0029)	(0.0034)	(0.0035)
Age	−0.0596***	−0.0566***	−0.0516***	−0.0603***	−0.0577***	−0.0526***
	(0.0157)	(0.0184)	(0.0192)	(0.0155)	(0.0182)	(0.0190)
Age^2	0.0007***	0.0006**	0.0006**	0.0007***	0.0007**	0.0006**
	(0.0002)	(0.0003)	(0.0003)	(0.0002)	(0.0003)	(0.0003)
Number of preexisting children	−0.0367***	−0.0320***	−0.0327***	−0.0365***	−0.0319***	−0.0326***
	(0.0106)	(0.0110)	(0.0116)	(0.0106)	(0.0110)	(0.0116)
Years of education	0.0076**	0.0070**	0.0073**	0.0074**	0.0068**	0.0071**
	(0.0031)	(0.0029)	(0.0030)	(0.0030)	(0.0029)	(0.0030)
Employment status						
Self-employed	−0.0406	−0.0319	−0.0296	−0.0411	−0.0321	−0.0296
	(0.0249)	(0.0225)	(0.0235)	(0.0247)	(0.0224)	(0.0234)
Non-regular employment	−0.0595***	−0.0501***	−0.0473***	−0.0597***	−0.0504***	−0.0476***
	(0.0105)	(0.0108)	(0.0116)	(0.0105)	(0.0107)	(0.0115)
Regular employment	−0.0255	−0.0115	−0.0096	−0.0264	−0.0124	−0.0102
	(0.0171)	(0.0182)	(0.0182)	(0.0169)	(0.0179)	(0.0179)
Prefecture characteristics:						
Unemployment rate		−0.0114	−0.0085		−0.0115	−0.0085
		(0.0078)	(0.0090)		(0.0078)	(0.0090)
Real male wage		0.0012	0.0085		0.0009	0.0081
		(0.0076)	(0.0085)		(0.0075)	(0.0086)
Real female wage		0.0223*	0.0166		0.0223*	0.0167
		(0.0118)	(0.0157)		(0.0117)	(0.0156)
Prefecture-specific time trends	No	No	Yes	No	No	Yes
R-Squared	0.0934	0.0936	0.1098	0.0932	0.0935	0.1095
N	3115	2686	2686	3115	2686	2686

Notes: Robust standard errors in parentheses are clustered at the prefecture level. Reference group for employment status is Not employed. Prefecture fixed effects, city size dummies, linear and quadratic time trends, and a constant term are controlled for, but they are not reported here. Each column represents a different regression for each model.

*, **, and *** denote that the estimated coefficients are statistically significant at the 10%, 5%, and 1% levels, respectively.

Table V: Heterogeneous Effects

	(1)	(2)
Two-year home value change	0.0001	0.0058
	(0.0056)	(0.0043)
Two-year home value change×Age24–29	0.0435*	
	(0.0238)	
Two-year home value change×Age30–34	0.0217	
	(0.0142)	
Two-year home value change×Age40–44	0.0009	
	(0.0057)	
Two-year home value change×Younger Cohort		0.0126
		(0.0220)
Prefecture characteristics	Yes	Yes
Prefecture-specific time trends	No	No
R-Squared	0.0845	0.0823
N	3603	3603

Notes: This table reports the estimates of the effects of housing wealth and its interactions with indicators for respondents' specific characteristic group (age category dummies (column (1)) and an indicator for the younger cohort (column (2))) on birth probability for homeowners with housing loans. Reference group for age category is Age35–39. Younger Cohort is an indicator for a respondent born in or after 1970. The other explanatory variables are the same as those in column (2) of Table III. The dependent variable is the Birth dummy. Each column represents a different regression for each model. Robust standard errors in parentheses are clustered at the prefecture level.
*, **, and *** denote that the estimated coefficients are statistically significant at the 10%, 5%, and 1% levels, respectively.

Table VI: Estimates Based on Alternative Measures of Housing Wealth: Home Value and Shock

	(1)	(2)	(3)
Two-year home value change	0.0088*		
	(0.0046)		
Home Value		0.0006	
		(0.0035)	
Shock			0.0002
			(0.0007)
Prefecture characteristics	Yes	Yes	Yes
Prefecture-specific time trends	No	No	No
R-Squared	0.0819	0.0807	0.0729
N	3603	3603	1849

Notes: This table reports the estimates of the effects of housing wealth on birth probability for homeowners with housing loans. Robust standard errors in parentheses are clustered at the prefecture level. Column (1) is equivalent to column (2) of Table III. Housing wealth is measured by Home value in column (2) and Shock in column (3) instead of the two-year home value change. Shock is calculated as the sum of the past three years of residuals from an AR(2) process of home value. The other explanatory variables are the same as those in column (2) of Table III. The dependent variable is the Birth dummy. Each column represents a different regression for each model.
*, **, and *** denote that the estimated coefficients are statistically significant at the 10%, 5%, and 1% levels, respectively.