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A House for My Family: The impacts of down payment rate on marriage and fertility[1]

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Abstract

Homeownership and childbearing decisions are closely linked for many couples. As buying a home often requires substantial loan amounts, consumer credit conditions may influence fertility. We examine how down payment rate (DPR) policies affect marriage and fertility, exploiting city-by-year variation in DPRs across China from 2008 to 2020. The results show that, while housing prices show no direct effect, higher DPRs significantly reduce the likelihood of first births, particularly among those who are likely to be credit-constrained. We find no effect on first marriage. These findings highlight how housing market policies can shape demographic behavior, especially in the context of high housing prices.

Keywords: Down payment rate; housing; fertility; marriage; China
JEL classification: J12, J13, R21, R31

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1 Introduction

Owning a home can have a profound impact on fertility. For individuals planning to have children, homeownership can provide a secure place to live and raise a child, satisfy a marriage prerequisite,[1] signal one's social status in a marriage market, be a commitment device in marriage, and provide a vehicle of investment in developing countries with limited alternative investment options. Given falling fertility rates and rising housing prices in many parts of the world, housing access and housing policies would have important consequences on demographic outcomes. Housing price increases have been shown to lower the fertility rates of those who do not own homes in countries such as the US, Australia, and China (Atalay et al., 2021; Dettling and Kearney, 2014; Liu et al., 2020). In contrast, housing price increases did not lower fertility rates of homeowners (Atalay et al., 2021; Daysal et al., 2021; Dettling and Kearney, 2014; Lovenheim and Mumford, 2013).

Housing price variations do not fully capture how housing market affects fertility, however, because houses are large purchases that typically require credit access. In addition, much less is known about the demographic consequences of housing policies that affect the credit constraints of potential buyers. An important determinant of housing purchase in this regard is the down payment rate (DPR). The DPR is the proportion of the housing price that must be paid out of pocket, whereas the rest can be financed by credit. The DPR, therefore, imposes liquidity constraints on potential buyers, and adjusting the DPR can be a powerful credit market and housing policy tool to shape housing demand. Despite the potential importance of the DPR, its implications on demographic outcomes such as fertility have not been empirically investigated.

To advance the understanding of the demographic consequences of housing policies such as the DPR, it is necessary to account for both housing prices and the DPR in the same framework. They have distinct effects. Increasing housing prices impose a negative price effect on potential buyers, reducing their demand for children (Atalay et al., 2021; Dettling and Kearney, 2014; Liu et al., 2020). But it may also bring a large wealth effect to homeowners if, for example, they have access to bigger home equity loans.[2] The DPR, in contrast, does not affect housing wealth. A higher DPR can lower fertility by discouraging marriage and fertility, or by delaying fertility timing as couples save for the down payment. Studies have shown that the DPR or credit conditions can affect homeownership (Acolin et al., 2016; Fuster and Zafar, 2016), the housing market boom (Favilukis et al., 2017), or even marriage (Ricks, 2021), but its impact on fertility remains unknown.

In this paper, we study the causal effects of the DPRs and housing prices on first marriage, first birth, and higher-order births. We estimate a linear probability model with fixed effects using 6 waves of the China Family Panel Study (CFPS), covering the years from 2010 to 2020. Our sample consists of urban women aged 16–45, living in the 20 first- and second-tier cities covered by the CFPS. We use

[1] The norm of homeownership as a prerequisite for family formation is observed in many countries including East Asian countries such as China and South Korea (Hu, 2012; Raymo et al., 2015) and European countries such as Italy (Dalla Zuanna, 2001).

[2] In 2014, the Chinese government piloted "reverse mortgage" schemes that allowed the elderly to receive fixed monthly payments. But it is offered as a retirement plan, and the demand remains "minuscule" (Hanewald et al., 2020).

the Housing Price Index (HPI) and the DPR data at the city-year level. The HPI data is obtained from China's National Bureau of Statistics whereas the DPR data is hand-collected for this study. We exploit the full marriage and birth histories available in the CFPS to construct three flow panel samples, one for each outcome variable including first marriage, first birth, and higher-order birth. Specifically, a woman who fulfills one of the initial requirements of the three outcome variables (i.e., requirements of being unmarried, having no previous birth, and having only one previous birth for the outcomes of first marriage, first birth, and higher-order birth, respectively) would enter the appropriate flow panel, and exit when the outcome event occurs. We include both the DPR and HPI in the regression analysis to disentangle the causal effects of these two related but distinct housing market indices on marriage and fertility outcomes. The causal effect of interest is identified based on variations across cities and years in the DPR and the HPI using two-way fixed effects models.

China offers a suitable setting to identify the causal parameters by exploiting temporal and geographic variation in the policy variable in the tradition of program evaluation literature. First, in China, policy targets of setting the DPRs are openly stated and adhered to by the policy makers. The DPR is determined by a top-down process, with an explicit goal to control the local real estate market. Specifically, the DPR is lowered to boost housing demand and raised to curb it, responding to local market environments (Chen, 2020). Given the governments' use of the DPR as a housing market policy, we control for the contemporaneous and lagged housing price indices and other local macroeconomic variables that may be related to the DPR through the housing market and the economic environment. The residual variation in the DPR is assumed to be exogenous with respect to each household's marriage and fertility outcomes.

Second, homeownership is widely expected before marriage and fertility as a norm in China, similar to many other countries such as South Korea and Italy (Dalla Zuanna, 2001; Raymo et al., 2015). China is distinguished from other countries with its exceptionally high homeownership rate (80% nationwide in 2017) and the widespread expectation of owning a home before marriage (Clark et al., 2021; Cole, 2020). Therefore, housing market environments such as the DPRs and housing prices would affect most households on the margin of family formation.

Third, China is undergoing a rapid increase in housing prices and a steep decline in fertility rates. May other countries face these issues with different levels of severity (Li, 2024). Findings from China can provide broadly applicable insights on the interactions of these two issues.

Our study fills a gap in the literature on the effects of housing policies by investigating fertility as an outcome. There is a growing body of literature about the effect of the DPR or credit conditions for housing purchase on various outcomes including homeownership, mortgage expansion, housing market boom, and economic growth (Acolin et al., 2016; Favilukis et al., 2017; Fuster and Zafar, 2016, 2021; Greenwald and Guren, 2021; Mian et al., 2017). To our knowledge, only one paper is related to the effect of liquidity constraint on marriage. Ricks (2021) use eligibility to the US Veterans Affairs loan program (which helps veterans with making down payments) as an instrument for changes in housing prices and finds a negative effect on marriage formation. We contribute by focusing on fertility as a

novel outcome. In addition, ours is related to a large literature on the determinants of fertility related to housing. Studies have shown that fertility can be increased by decreasing housing prices for non-homeonwners, improving housing availability (Atalay et al., 2021; Dettling and Kearney, 2014; Liu et al., 2020), and by increasing housing wealth (Atalay et al., 2021; Daysal et al., 2021; Lovenheim and Mumford, 2013). We contribute to this literature by highlighting credit market conditions such as the DPR as a potential determinant of fertility. Finally, we add to the studies focusing on the effects of the DPR in China. Sun and Zhang (2020) studies the effect of down payments on marriage matching, and Chen et al. (2020) studies the effect of the DPR on mortgage credit demand. However, both use the DPRs determined at the national level and define outcomes as stock measures. We achieve more precise causal identification by using the DPR variations across cities over the years and defining outcomes as flow measures.

We have three main findings. First, tighter credit constraints on housing as measured by the higher DPRs lower fertility on the extensive margin (first birth). We find a 0.455 percentage point decrease in the probability of first-birth when the average DPR increases by 1% in the previous three years and a 0.13 percentage point decrease when the DPR increases by 1% in the previous year. In contrast, housing price has an insignificant impact on the probability of first birth. The negative response to the DPR is driven by women with less education, aged above 25 and with a rural *hukou* at age 12. Women with these characteristics are associated with lower income and wealth, and the effects of DPR changes on their credit constraint may have a greater impact on their housing purchase and fertility decisions.

Second, higher housing prices *increase* fertility on the intensive margin (higher-order birth). Specifically, we find that a housing price increase of 1% in the current year leads to a 0.157 percentage point increase in the probability of higher-order births, whereas the first-purchase DPR does not have significant effects. This result is consistent with the positive wealth effect on fertility, given that relatively more couples considering a high-order birth are already homeowners. According to the 2017 wave of China Household Finance Survey (CHFS), 82.61% of women aged 22–45 who have at least one child live in family-owned houses. The interpretation requires caution, however, because housing prices are determined in the market whereas the DPRs are determined by the local governments, providing clearer sources of variation of the treatment variable.

Third, we find that neither the DPR nor housing price has a significant effect on marriage. This finding seemingly contradicts the results in other studies showing that housing wealth improves one's chance of success in the marriage market (Bhaskar et al., 2023; Lafortune and Low, 2023; Wei and Zhang, 2011). Their findings, however, are based on differences in wealth across individuals in the same marriage market. Our findings are based on variations across cities and time periods, so that participants in the same marriage market (in the same city) likely face the same DPR and housing prices. It is then reasonable to expect no impact on marriage outcomes if the effects apply similarly to all marriage market participants.

Our study offers useful policy implications in light of the various pro-natalist policies enacted in the

past. Previous policies have focused on measures such as extended maternity leave and tax concessions for families with dependent children. We provide evidence on how different fertility margins are affected by different factors in the housing market. Specifically, the DPRs affect first-birth decisions, and housing prices affect the high-order-birth decisions. To slow down the decline in fertility in different types of households, policy measures must be adapted to the needs of different households. Mortgage subsidies for families with no children may be effective in promoting the birth of first children whereas home equity loans may be appropriate in encouraging higher-order births for families with children.

2 Institutional background

2.1 Housing policies in China

2.1.1 Housing market privatization

The first type of China's housing policy promotes homeownership through market privatization. Before 1978, housing policy was characterized by the state provision of public welfare housing based on the socialist model. From 1978 to 1992, housing provision underwent market-oriented reforms, although housing was heavily regulated. During this time, houses were purchased primarily by employers and local governments to provide housing units to employees at a rent substantially below the market rate. Because most urban residents lived in government-provided housing units, they had weak incentives to purchase housing units (Garriga et al., 2023). To promote homeownership, housing market privatization started in 1998, forming a market-based housing sector (State Council of China, 1998). In 2003, the government decreed that, instead of employers purchasing houses for employees at subsidized rates, employees would purchase their own housing from the market as a primary form of housing provision (State Council of China, 2003).

2.1.2 Housing Provident Fund (HPF)

The second type of China's housing policy improves housing affordability, addressed through the introduction of the Housing Provident Fund (HPF) in 1994. Initiated by the State Council, the HPF is a nationwide mandatory savings program for home purchases, mortgage payments, and home improvement projects. Since 1999, the HPF loans have been available to the employees of state-owned enterprises, joint ventures, and collectively owned and private firms. The HPF requires employers and employees to contribute a fraction of their wages to a pool that later provides mortgage loans to participants (Tang and Coulson, 2017). Provincial governments impose regulations on contribution rates, the DPRs, the maximum HPF loan amount, and subsidized interest rates. However, in cities with high housing prices, the role of HPF loans is limited because the maximum amount of HPF loan that can be taken out is not enough to cover the part of housing value that needs financing. For example, in 2014, the average HPF loan accounted for 34% of the housing price in Beijing and 24% in Shanghai. In 2017, HPF home loans only accounted for 17% of the total residential mortgage lending

(Deng et al., 2021).

2.1.3 Credit policies

The third type of China's housing policy regulates the housing market, achieved through credit policies. Since 2005, the government has introduced a series of housing policies to control the overheating or sluggish housing market. These include regulating minimum DPR requirements, interest rate adjustments, the payment-to-income ratio, housing purchase restrictions, and tax rates (e.g., transaction taxes, capital gain taxes, sales tax exemption, and property taxes). The DPR policy, which dictates the minimum proportion of a home's price to be paid up front, serves as a key regulatory tool to influence market behavior and ensure stability. For example, the DPR for first purchase is generally lower than for subsequent purchases, reflecting the policy's intent to prioritize primary housing needs over speculative investments. Further, because of housing purchase restrictions, resident households cannot buy more than two housing units, and nonresident households cannot buy more than one (Du and Zhang, 2015) in the restricted cities. These credit policies play a pivotal role in shaping housing demand. We discuss the DPR policy with more detail in Section 2.3.

2.2 Commercial housing purchase in China

Commercial housing became available to urban residents following the housing market privatization initiated in 1998. To facilitate commercial housing purchase with home financing, urban homebuyers have access to up to three kinds of mortgages: a commercial loan, the HPF loan, and a combined loan of HPF and commercial loans.

First, homebuyers can obtain a loan provided by commercial banks, which approve loans to credit users based on the borrower's ability to repay, indicated by one's occupation and income (Cui et al., 2023). Commercial banks adhere to credit policies imposed by the central bank, which regulates loan terms including interest rates, minimum DPRs, payment-to-income ratios, and tax rates. Based on the commercial bank's assessment of a borrower's repayment ability, the actual applied down payment requirement could be higher than the policy rate (to reduce default risks). For example, borrowers from the low-income group are subject to a higher DPR than borrowers from the middle-income group are (Fang et al., 2016).

Second, urban employees can participate in the HPF program and obtain an HPF loan. The HPF is managed by the local housing fund management centers (one in each city), which collect monthly contributions from participating employers and employees to a pool, examine a participant's eligibility to take out an HPF loan, and provide HPF loans to participants. HPF loans offer preferential loan terms including lower minimum DPRs and subsidized interest rates, but are subject to government regulations. For instance, the maximum loan amount is capped, and eligibility depends on factors such as contribution rates and years of participation in the HPF program. Despite these benefits, HPF loans are less common, accounting for less than 10% of all housing purchases (Cui et al., 2023).

The amount of HPF home loans accounted for about 17% of the total residential mortgage lending in 2017 (Deng et al., 2021).

Third, urban borrowers can obtain a combined loan of commercial and HPF loans. These are used when HPF loans alone cannot meet the buyer's financing needs. A commercial loan can be used to finance the rest. Combined loans are much less prevalent because they require the cooperation of the housing fund management centers and commercial banks. According to the 2017 CHFS, combined loans accounted for only 6.7% of home mortgages, HPF loans made up 22.2%, and commercial loans dominated with 68.6%.

2.3 An overview of the DPR policy

In this paper, we focus on the commercial loan's DPR policy for the first purchase of a housing unit, which is highly relevant for young adults with marriage and fertility considerations for two reasons.[3] First, young adults who have never married are likely to be first-time homebuyers, to whom the first purchase DPR policies apply. Second, young adults are more likely to be financially constrained with low income, implying that their home purchase decisions are more sensitive to the down payment requirements.

The policy requirement of minimum DPR for commercial loans is determined by a top-down process. For example, on January 1, 2024, the minimum DPR for the first purchase in Beijing decreased from 35% to 30%. This policy change was initially discussed by the central government in the meeting of the Political Bureau of the CPC Central Committee on July 24, 2023. During the discussion of the housing market, it was suggested that "in response to the significant changes in the supply and demand relationship in the real estate market, timely adjustments of the housing policy are needed to better meet the housing needs of residents". Then, on August 31, 2023, a national policy was issued which specified that the minimum DPR for the first commercial housing purchase shall be set at 20% but cities may independently determine the minimum DPR based on the situation of the real estate market and local government regulatory requirements (PBC and CBIRC, 2023). Following the national policy, five local government agencies in Beijing worked together and issued a local policy, adjusting the minimum DPR for the first purchase to 30% in Beijing.[4]

The earliest public record of a DPR policy dates back to November 2001, in which the central bank

[3] An HPF loan is a potential choice that young adults do not frequently use for several reasons. First, HPF works as a compulsory saving program and it takes time to take out HPF loan at its maximum amount. For example, in Beijing, it takes 12 years of contribution to the HPF to borrow to the limit of 1,200,000 yuan (see https://www.beijing.gov.cn/zhengce/zcjd/zcwd/zfgjj/index.html?eqid=e0abeebc000319330000000264367696 "Policy Q & A: Provident Fund Loans"). Second, even for those eligible for an HPF loan, the loan amount is usually not enough to cover housing price. A commercial loan is the most convenient choice for such homebuyers. Deng et al. (2021) find that HPF loans are less likely to be taken out by newly enrolled participants than earlier participants.

[4] Specifically, five city-level government agencies (the Beijing Municipal Commission of Housing and Urban-Rural Development, the Beijing Municipal Taxation Bureau of the State Administration of Taxation, the Beijing Branch of the People's Bank of China, the Beijing Regulatory Bureau of the China Banking and Insurance Regulatory Commission, and the Beijing Housing Provident Fund Management Center) jointly issued the "Notice on Adjusting and Optimizing the Standards for Ordinary Housing and Personal Housing Loan Policies in Beijing." See news (in Chinese) https://www.beijing.gov.cn/zhengce/zcjd/202312/t20231215_3500950.html "Beijing adjusts and optimizes home purchase policies, reducing the down payment ratio for the first home to 30%" and policy document (in Chinese) https://www.beijing.gov.cn/zhengce/zhengcefagui/202312/t20231214_3500672.html

set a minimum DPR at 20% nationwide and maintained it until 2005 (PBC, 2001, 2003). In March 2005, to control housing price growth, the central bank raised the minimum DPR from 20% to 30% in the major cities that experienced housing price surges. This was soon adjusted to 20% for units with floor space of 90 square meters or less and 30% for larger units (State Council of China, 2006). In 2008, to respond to the sluggish housing market amid the global financial crisis, the central bank lowered the minimum DPR to 20% nationwide (PBC, 2008).[5] In 2010, the minimum DPR was set at 30% for first purchases and even higher for second purchases to discourage speculative demand, along with restrictions on second and higher-order housing purchases (PBC and CBIRC, 2010; State Council of China, 2010). In 2014 and 2015, minimum DPR was lowered again to promote economic growth, with the rate at 25% for cities without prior housing purchase restrictions.

Beginning in 2015, the DPR was determined at the local level. Cities with prior housing purchase restrictions (mostly major cities) were allowed to set the minimum DPRs higher than the national rate to cool the overheating housing market (PBC and CBIRC, 2015). In the following year, the nonrestricted cities were allowed to set the minimum DPR to 20% for first purchases to promote housing demand (PBC and CBIRC, 2016). From 2017 onward, minimum DPR was set by city governments according to local conditions, guided by central government principles declared in December 2016 that called for steady and healthy development of the real estate market and the suppression of housing speculation (State Council of China, 2020).[6] DPRs have ranged from 20 to 35% in major cities since then. We choose the period from 2008 to 2020 as our study period to compare outcomes across cities with different DPRs.

2.4 The role of homeownership in marriage and fertility norms in China

In urban China, owning a home is considered a prerequisite for marriage and marriage is a precondition for procreation.[7] Surveys report that up to 80% of respondents believe homeownership to be a prerequisite for marriage (Cole, 2020). This belief is likely reinforced by one of the highest rates of homeownership in China: 80% of mainland Chinese are homeowners; even among aged 17 to 27, the homeownership rate is 34.5%, one of the highest in the world (Clark et al., 2021).

Housing can serve multiple purposes in China. In addition to providing a stable living space, housing also serves as a status good that improves the chance of success in the marriage market (Wei et al., 2017) and a vehicle for financial investment, which is difficult because of tight capital controls and underdeveloped financial markets in China (Chen, 2020). Given that less than 5% of births occur out of wedlock in China and significant social stigma is attached to single-mother status (Li, 2022; Myong

[5]The central bank also introduced a series of other policy instruments such as a discount on the interest rate and reduction of transaction taxes for housing purchases (PBC, 2008).

[6]News December 2016: https://www.gov.cn/zhengce/2016-12/16/content_5149066.htm "The Central Economic Work Conference clarified the development direction of the property market: Houses are for living in, not for speculation." In Chinese. Accessed December 5, 2023.

[7]Although men were traditionally expected to provide for housing before marriage (Li and Wu, 2014), rapidly rising housing prices made it more common for the families of both spouses to contribute to the newlywed couple's housing (Liu and Xiong, 2018). Judicial interpretation in 2011 that allocated homeownership upon divorce based on financial contribution, instead of considering it a joint property of married spouses, added to the incentive for both spouses to contribute (Zang, 2020).

et al., 2021), homeownership as a prerequisite for marriage would also be a condition for childbirth for most couples.

Although homeowners tend to have higher fertility than renters do regardless of the Chinese context (Mulder, 2006), homeownership can be particularly salient to Chinese couples because they tend to have children soon after marriage.[8] Furthermore, homeowners in urban areas have better access to public resources such as public schools (Feng and Lu, 2013). Indeed, Hu et al. (2022) find that homeowners with full property ownership have a stronger desire to have future children than renters do, and such homeownership effect on fertility is mainly observed among households without children.

Taken together, homeownership facilitates marriage, which usually precedes fertility by social norm, and directly promotes fertility by providing benefits unique to the urban Chinese context.

3 Data and variables

3.1 CFPS and the construction of flow data

Our main sample is drawn from the CFPS, a nationally representative biennial longitudinal survey of individuals' social and economic status. Launched in 2010 by the Institute of Social Science Survey of Peking University, CFPS interviews all sampled household members older than 9 years. CFPS tracks all members related to the household by blood, marriage, or adoption at the baseline and their newly born or adopted children in subsequent surveys ("CFPS gene members").[9]

We use six waves of CFPS (2010, 2012, 2014, 2016, 2018, and 2020). In each wave, the survey collects birth province, city of current residence, and full marital and fertility histories that enable us to identify the timing of the first marriage and each birth for women who are CFPS gene members.

Our goal is to quantify the DPR's short-run effect on marriage and fertility behaviors, which are represented most accurately by an annual flow measure indicating the transition into the outcomes of interest. We construct marriage flow outcome (transition into first marriage) and fertility flows at each parity in each calendar year for women aged 16 and older.[10] Specifically, we construct the first-marriage indicator for never-married women with no prior births in the corresponding year. A woman exits the sample after she gets married. Our key measurement of marriage flow is a dummy variable indicating whether a woman married for the first time in the current calendar year, conditioning on never being married before. The variable equals zero if the woman does not marry during the year, equals one if she does, and is coded as missing afterwards. Women who gave birth before their first

[8] 50% of families have children within two years of first marriage (Kleven et al., 2023), and according to the 2010–2020 CFPS, an urban woman gives first birth 1.5 years after she gets married.

[9] Gene members include family members at baseline and their newly born and adopted children in subsequent waves. Gene member children (themselves gene members) are biological and adopted children of gene members. Unfortunately, we are unable to distinguish them from children who appeared after 2010, the first wave of CFPS. Additionally, if a male gene member gets married in subsequent waves, his wife is considered non-gene. We exclude this type of women from our sample because we cannot verify whether their children are biological or adopted.

[10] To determine the timing of the first marriage, we use all relevant information in CFPS, including marriage and cohabitation status in each wave, and indicators for whether the current marriage (or the last marriage if divorced or widowed) was her first marriage. We also use information in the confirmation modules that were asked in later waves to recheck marital history information collected in earlier waves.

marriage (less than 5% of the sample) are excluded from the analysis of the first marriage.

In the annual flow data for fertility at parity n, each observation is a woman in each calendar year who has $n-1$ prior births with no birth in year $t-1$.[11] A woman exits the sample after she gives the n^{th} birth. Our key measurement of fertility flow is a dummy variable indicating whether a woman gives the n^{th} birth in the next calendar year, conditioning on having $n-1$ prior births and no birth in the current year. The variable equals zero if there is no birth in the next year, equals one if there is, and is coded as missing afterwards.

Other CFPS variables used as control variables in the regression analysis include: age, ethnicity, beauty, intelligence, own education level, and the education level of the father and the mother. *Age* indicators are defined for each yearly age up to age 39, with age 16 being the reference group. We combine ages 40–43 as one age group and ages 44 and 45 as another group. Ethnicity is measured by a dummy variable *Minority* (1 if the respondent belongs to a minority group and 0 otherwise). *Beauty* and *Intelligence* are time-invariant variables, normalized to be mean 0 and standard deviation 1 within three-year age groups of women in the dataset (before applying sample restrictions).[12] Beauty is recognized as an important determinant of labor market outcomes (Hamermesh and Biddle, 1994), and its role in the marriage market outcomes in China are examined using the CFPS dataset (Liu et al., 2024). Beauty and intelligence (another important aspect of human capital) proxy women's competitiveness in the marriage market. Women with high values in these scores may have better chances of matching with more desirable spouses who are less affected by the DPR when making housing and fertility decisions. *Education* is measured by three indicator variables, respectively, for completing high school, an associate degree, and a bachelor's degree or above, with the category "middle school or below" being the reference group. *Father's education level* and *mother's education level* are measured by indicator variables for completing less than primary school, primary school, middle school, high school, associate degree, and bachelor's degree or above. We explore heterogeneity in effects by the respondent's age, education level, and the *hukou* status at age 12. Finally, as a robustness analysis, we include city-level macroeconomic characteristics (GDP, population, area of residential land, employment in the primary, secondary, and tertiary Industries) drawn from statistical yearbooks as control variables.

3.2 Constructing the DPR and housing price variables

We use four different methods to collect the DPR data. First, we extract the DPR values from policy documents released by the governments of first- and second-tier cities in China. The locations of the four first-tier cities and 31 second-tier cities are shown in Figure 1 (Rogoff and Yang, 2024). The policy

[11] We argue that fertility in the next year of birth is rare and should follow a different model than fertility in other years. To confirm the biological relationship between mothers and children, we use the indicator in the 2010 wave for existing births and count only gene-member children in each following wave.

[12] In CFPS, beauty is measured by interviewer ratings of respondents' physical appearance on a scale of 1–7 (1 = very unattractive and 7 = very attractive); intelligence is also measured by interviewer ratings on a scale of 1–7 (1 = very unintelligent and 7 = very intelligent). Beauty and intelligence scores are constructed by (1) taking the within-individual modes of the raw score on a scale of 1–7 across observed waves, (2) normalizing within the sample by age group of three years, and (3) imputing zeros for missing values and generating an indicator flagging the imputation.

documents detail the official implementations of the city-specific DPR policies.[13]

The second method involves reviewing the DPR-related news published on the web, sourced from reputable local traditional media outlets (such as *China Daily*, *Xiamen Daily*, and *Hefei Evening News*), major online news platforms (such as *Sina News*, *Sohu News*, and *Bendibao*,[14]) and WeChat (the most popular mobile platform for communication, social media, and daily services in China) local news.[15] The third method entails sourcing information from financial and housing-related self-media platforms (such as zhihu.com, business.sohu.com, and finance.sina.com) and reports or articles published by real estate institutions (such as Anjuke, Fangtianxia, Lianjia, Loupan, and Qizhuang).[16] Finally, if different sources of information provided conflicting information on the DPRs, we consulted with local branches of the People's Bank of China via phone calls. The DPR data were then compiled based on the information obtained through these responses. Missing information of the DPR is imputed when possible as detailed in Appendix B.

We set July 1 as the policy cutoff date: if a policy change occurs between January 1 and June 30, the year is considered *treated* by the new policy. We use the changed DPR value as the DPR value for that calendar year. If the policy change takes place between July 1 and December 31, we apply the changed DPR value for the following calendar year. For example, consider hypothetical cities A and B, which changed the DPR from 20% to 30% in 2015. The date of change is April 25 for city A and October 25 for city B. In this case, we assign 30% as the DPR value for city A in 2015, but retain 20% as the DPR value for city B in the same year. The value of 30% is assigned as the DPR value for city B in 2016. Figure 2 shows the DPRs imputed this way for the years 2008–2019 in four cities with the largest numbers of observations in the sample: Shanghai, Guangzhou (first-tier cities), Shenyang, and Lanzhou (second-tier cities). Before 2014, all cities followed the national DPR. After 2014, the rates began to diverge as cities received the discretion to set the DPR higher than the national rate to accommodate the overheated local housing market.

Our HPIs are based on the prices of new commercial and second-hand housing units under 90 square meters obtained from the National Bureau of Statistics. The HPIs are published monthly for 70 large and medium-sized cities. We collect data from the July release to match the policy cutoff date of July 1.[17] We also choose units under 90 square meters because these units are most likely purchased by credit-constrained couples for whom variations in DPR are relevant. Because the National Bureau of Statistics changed the method of computing the HPI in January 2011, the comparable HPI data is available only for 2011–2020, where the year 2010 is used as the base year (HPI = 100). The HPIs are calculated separately for new commercial and second-hand housing units under 90 square meters. For

[13] For example, the DPR policies in Tianjin are collected from the local government website. See https://www.tj.gov.cn/zwgk/szfwj/tjsrmzf/202005/t20200519_2365373.html "Notice on further implementing the spirit of the State Council's real estate macro-control and promoting the sustainable and healthy development of our city's real estate market." (in Chinese).

[14] *Bendibao* is a Chinese online platform that provides local news and information.

[15] For example, local news related to the DPR on Tianjin Net-Urban Express can be found in http://news.dichan.sina.com.cn/2012/10/26/586926.html "Policy Interpretation: How to pay the down payment." (in Chinese).

[16] An example of news related to DPR in news.fang.com is https://news.fang.com/2014-09-02/13676142.htm "Real estate knowledge: What is the down payment ratio for a first purchase in Tianjin?" (in Chinese).

[17] For example, the July 2014 index is found at https://www.stats.gov.cn/sj/zxfb/202302/t20230203_1898574.html (in Chinese). Accessed December 18, 2023.

2008 and 2009, we set the value of the index to one, effectively fitting the HPI's changes between 2008 and 2010 to the city-specific linear time trend and year fixed effects in the regression analysis.

Figure 2 also shows the DPR and housing price trends for the same four cities. HPIs increased steadily in all the cities from 2010 to 2019, with substantially higher increases in first-tier cities (Shanghai and Guangzhou). The DPRs, however, show different trends during the same period, highlighting qualitatively different variations of the DPRs and housing prices.

3.3 Sample restrictions and summary statistics

Throughout the paper, we restrict our sample to women who were between the ages of 16 and 45 at the time of the survey and did not give birth or get married before 16.[18] In the analysis of first marriage, we exclude a woman if she gives birth in the calendar year before the year of her first marriage.[19] The sample is also restricted to the 20 cities covered by the CFPS (see Figure 1) and calendar years for which the HPIs, DPRs, and their lagged values are available. Our final samples consists of, respectively, 4,145 observations from 902 women for the first-birth analysis, 7,354 observations from 1,471 women for the higher-order birth analysis, and 3,829 observations from 802 women for the first marriage analysis.

Figure 3 shows the age distribution of women at first marriage and women at first and second births. We see that most women who ever married in the sample married for the first time in their 20s. On average, first birth took place 1.5 years after the first marriage, indicating that first marriage and first birth decisions are strongly connected and the couples considering housing purchase before marriage likely took account of their plans to have a child soon after marriage. This indicates that the effective DPR for first marriage and first birth decisions may be identical. For the couples who had more than one child, the second birth occurred 4–6 years after the first, potentially giving them time to move to a larger house for the extra space needed to raise the second child.

Table 1 shows the summary statistics of the main variables for the first-birth, higher-order-birth, and first-marriage samples. The average DPR in the current year (the year the data is observed) is 29%, which represents a sizable cash requirement and a financial burden for a potential buyer. We provide a simple example to illustrate the size of this financial burden. In 2014, the city-average housing price in Shanghai was CNY 30,779 per square meter, suggesting a minimum down payment amount of CNY $831,003 = 30\% \times 90 \times 30,779$ for a typical 90 square meters apartment, which is 12.7 times the average annual wage (CNY 65,417) in Shanghai.[20] Across all samples, at least 96% of women are of Han ethnicity. Given that first birth takes place on average 1.5 years after first marriage, a woman in the first-birth sample should exit the sample in year $t+1$ if she exits the first-marriage sample in

[18] We further restrict the sample to women who were born during 1971–1995. This restriction excludes a few outlying observations that belong to earlier cohorts who went through peak fertility period during the extremely turbulent period such as the Cultural Revolution years (1966–1976) and the economic reform period that came soon after.

[19] This sample restriction further reduces the sample size by 4.5%.

[20] See https://www.anjuke.com/xinfang/fj-sh/2014/ for housing prices in Shanghai (in Chinese). See https://www.chinajob.gov.cn/c/2015-04-30/32321.shtml for average annual wage in Shanghai (in Chinese).

year t. The similar summary statistics of the first-birth and first-marriage samples support this. In columns (1) and (3), we see that women are on average 26 years old and highly educated (over 70% have above high school diploma). In the higher-order-birth sample, women are on average 36 years old with relatively lower educational attainments (only 25% have more than high school diploma).[21]

Figure 4 presents the scatterplot of the DPR and the outcome variables in the upper panel, and the HPI and the outcome variables in the lower panel, averaged across time for each city. They show that the DPR is negatively associated with the outcome variables, with the largest magnitude of association for the probability of first birth. Unlike the DPR, the HPI shows relatively small associations with the outcome variables. In addition, the DPR scatterpoints are more tightly scattered around the linearly fitted line than the HPI scatterpoints.

4 Empirical Methods

4.1 Baseline Estimation Model

Our baseline model is a linear probability model (LPM):

$$\begin{aligned} y_{ict} = \alpha &+ \beta_1 \ \ln \mathrm{DPR}_{ct} + \beta_2 \ \overline{\ln \mathrm{DPR}_c^{t-1,\ t-2,\ t-3}} \\ &+ \gamma_1 \ \ln \mathrm{Price}_{ct} + \ \gamma_2 \ \overline{\ln \mathrm{Price}_c^{t-1,\ t-2,\ t-3}} \\ &+ \boldsymbol{x}_{ict}'\boldsymbol{\theta} + \rho_{\text{age}} + \lambda_t + \phi_c + \pi_c t + \epsilon_{ict}, \end{aligned} \tag{1}$$

for woman i in calendar year t living in city c. In the first-marriage analysis, y_{it} is one if a woman i completes the transition from never-married state to first marriage in year t and zero otherwise. Alternatively, in the first-birth analysis, y_{it} is one if a woman i completes the transition from having no child to having one child in the year $t+1$ and zero otherwise; and in the higher-order-birth analysis, y_{it} is one if a woman i completes the transition from $n \geq 1$ children to $n+1$ children in the year $t+1$ and zero otherwise. We define birth outcomes as transitions in the next year rather than current year to allow for one-year delay between the fertility decision and birth outcome.

$\ln \mathrm{DPR}_{ct}$ is the natural log of DPR in city c in year t. $\overline{\ln \mathrm{DPR}_c^{t-1,\ t-2,\ t-3}}$ is the average of $\ln \mathrm{DPR}$ over the past three years in city c. $\ln \mathrm{Price}_{ct}$ is the natural log of HPI in city c in year t. $\overline{\ln \mathrm{Price}_c^{t-1,\ t-2,\ t-3}}$ is the average of $\ln \mathrm{Price}$ over the past three years in city c. The parameters of interest are β_1 and β_2 that identify the effects of DPR, holding the local housing price constant. β_1 identifies any "immediate" impact of DPR and β_2 identifies delayed impact of DPR. Similarly, γ_1 and γ_2 identify the effects of housing prices.

We use the DPR and HPI in logs rather than levels based on the assumption that the interaction effects between the DPR and property price are multiplicative rather than additive. That is, the actual cash requirement at the housing purchase depends on the product of the DPR and housing price. As a robustness check, we replace the three-year moving average lags with one-year lags for

[21] We report summary statistics with more details in Table A2 in Appendix Section C.

$\ln \text{DPR}$ and $\ln \text{Price}$. Specifically, we use $\ln \text{DPR}_c^{t-1}$ and $\ln \text{Price}_c^{t-1}$ instead of $\overline{\ln \text{DPR}_c^{t-1,\ t-2,\ t-3}}$ and $\overline{\ln \text{Price}_c^{t-1,\ t-2,\ t-3}}$ and we report both sets of results.

$\boldsymbol{x}_{it}$ is a vector of control variables for woman i in year t, described in detail in Section 3, including dummies for the education level of the respondent and the education level of the respondent's father and the mother; ethnicity, beauty, and intelligence scores, dummies indicating whether each score was imputed; and a dummy for nonmigrant status ("local") defined as not changing the province of residence throughout the survey waves and not changing the city of residence during the survey period. We include ρ_{age}, the integer-age fixed effects, to account for age-specific marriage and fertility rates common to all cities. Year fixed effects, λ_t, are included to control for any unobserved year-specific factors common to all cities. City-specific fixed effects, ϕ_c, are included to control for time-invariant city-level characteristics. City-specific linear time trends, $\pi_c t$, control for any variables correlated with marriage and fertility outcomes that might trend linearly over time within each city regardless of housing prices and the DPR. This variable accounts for the possibility that new couples with fertility plans choose to settle in cities with upward trending housing prices. The error term ϵ_{it} is clustered at the city level, consisting of unobserved individual and city-level factors that contribute to the outcome.

4.2 Identification Assumptions

We use the LPM model with two-way fixed effects shown in Eq.(1) to estimate the treatment effect on the treated. The treatments are the city-specific DPR and HPI that vary across cities and over time. Whereas the HPI has this variation throughout the sample period, all sample cities have the same value of the DPR during 2008–2014 when it is set at the national level. After 2015, DPRs began to diverge as cities with housing restrictions were allowed to set the DPR higher than the national rate to curb local housing price growth.

The identification of the causal effects of the DPR relies on the assumption that the changes in the DPR are conditionally uncorrelated to unobserved characteristics that correlate with marriage and fertility outcomes. This assumption would be challenged if the government endogenously set the DPR in response to local economic situations.

Given that changing the city-level DPR is a top-down process, individual households can hardly influence it. Furthermore, we include the local HPI in the regression model, which represents local housing market conditions. In Section 5, we present the results from a robustness analysis showing that the estimates of the DPR effects are robust to leaving out the HPI in the regression model, supporting the assumption that the DPR is plausibly exogenous in our model. In addition, in Appendix Section D, we regress macroeconomic indicators and the HPI on the DPR. The results in Table A3 show that whereas the coefficient estimate of the HPI is positive, as expected from how local governments determine the DPR, none of the macroeconomic indicators shows a large or significant association with the DPR.

The identification of housing price effects relies on the assumption that housing price changes are

conditionally uncorrelated with the marriage and fertility decisions. Because an individual household should not influence the local housing market, variation in city-level housing prices is plausibly exogenous to an individual's marriage and fertility choices (Atalay et al., 2021; Daysal et al., 2021; Lovenheim and Mumford, 2013).

There are potential threats to this assumption. The first is a positive correlation between housing prices and local macroeconomic conditions. If marriage and fertility respond directly to local macroeconomic conditions, the effects of housing prices may pick up this correlation rather than identify a causal effect. As a robustness analysis, we control for the city-level unemployment rate and real income per capita, direct measures of state-level macroeconomic conditions (see Section 5.2). The second threat is selective migration. If women with fertility plans prefer locations that have a greater potential for future housing price increases, our estimate will be biased upward. Our main analysis sample includes migrants defined as those who changed province of residence since birth. We control for the migrant status in the empirical model. In the robustness section, we exclude migrants from the sample and repeat the main analysis.

5 Results

5.1 Baseline results

Table 2 presents the baseline results of the current and past DPR on women's fertility and marriage decisions based on the first birth next year, higher-order birth next year, and the first marriage this year. The outcome dummy variables are multiplied by 100 before estimation, so the coefficient estimates can be interpreted as the percentage-point effects of a 1% increase in the value of the treatment variable.

For the fertility outcome, the effects of the lagged DPR are negative and significant. In Column (2), the estimate of -0.455 shows that a 1% increase in the lagged DPR, averaged over the past three years, lowers the chance of childbirth next year by about 0.45 percentage point. This is larger in magnitude than the effect of the DPR lagged by only one year, which is -0.130 in Column (1), suggesting that the DPR changes affect fertility decisions with a delay. The effects of the DPR in the same year as the conception (the year before childbirth) are small in magnitude and insignificant for the one-year-lag DPR and borderline significant for the three-year-lag DPR. Housing prices do not significantly affect the first birth outcomes.

For the higher-order births, shown in Columns (3) and (4), the DPR effects are small and insignificant. The effects are found for the same-year HPI, which are small but surprisingly positive (0.176 and 0.157). One possible interpretation is that the housing price increase had a positive wealth effect on those considering having multiple children in urban China (recall that the analysis sample consists entirely of urban residents). Given the high costs of living and child-related goods and services in urban China, couples considering having multiple children would be older and more likely to be homeowners compared to an average newlywed couple. According to the 2017 wave of the CHFS, 82.61% of women

aged 22–45 with at least one child live in family-owned housing units. This rate is substantially higher than the global homeownership rate of 63% and the rates in the US (65%) and Japan (60%) in 2017, supporting the presence of a potential wealth effect in our sample. Unfortunately, the dataset does not contain information about homeownership status, so we cannot directly confirm this possibility. Further, collateralizing one's own house is not allowed in China (reverse mortgage is possible for the elderly, although rarely used. See Section 2.), suggesting that any wealth effect from an increase in the housing price would be indirect. Our estimates of housing price effects should therefore be interpreted with caution.

Columns (5) and (6) show that the DPR does not significantly affect the probability of first marriage. Three-year-averaged lag of housing price has a negative but borderline significant effect, but one-year lag effect is small and insignificant. The lack of effect is somewhat surprising, given that the Chinese had strong marital norms in which couples were expected to own their homes before marriage. Investigating the extent to which marital norms changed in China may be an interesting topic for a future study.

Coefficient estimates of control variables also generate useful insights. Women with a college-level education (bachelor's degree or above) are less likely to have first children or get married by approximately 10 to 12 percentage points compared to women without a high school degree. The probability of higher-order birth is also much lower, but only by about 0.32 percentage points, and the estimate is not significant. Beauty score estimates suggest that those with high values in this score have higher chances of getting married and having a first child, whereas those with high values of intelligence scores have lower chances of getting married. Additionally, high scores in beauty and intelligence both predict lower chances of having multiple children. However, the coefficient estimates for beauty and intelligence scores are not statistically significant.

5.2 Robustness checks

We test the robustness of our results in this section. First, we examine the role of husbands' characteristics in determining fertility outcomes and the effects of the DPR and housing prices. With this analysis, we aim to see whether it may be more important to consider the husband's characteristics than the wife's when considering a couple's fertility outcomes. In addition, the sample is restricted to those who were married at least once at the time the outcome is observed, a natural consequence of considering the husband's characteristics.[22] Table 3 shows that, despite additional sample restrictions, the qualitative results remain the same. The lagged DPR lowers the probability of first birth. An increase in housing price raises the probability of higher-order birth, although the effects are smaller and borderline significant. Women having high levels of education lower the probability of first birth. Evidence is inconclusive on the effects of beauty and intelligence scores. These results align with those in the baseline analysis.

[22]The restricted sample is smaller in size mainly because it excludes those who never married, and many who never had children during the sample period also never married. If a woman has had multiple husbands, information of the most recent husband is used.

The coefficients for husbands' education level mostly have positive signs, opposite to those for the education level of the respondents (who are women). Given that men tend not to face trade-off between work and family in China with almost no career cost of having children, the positive coefficients imply a positive income effect on the outcomes of interest. However, husbands' coefficients are not significant conditional on wive's characteristics. The beauty and intelligence scores of husbands are likewise insignificant. These results suggest that the husbands' characteristics are not necessarily more important than the wive's when considering fertility outcomes of a couple.

Second, we alternatively exclude the DPR and the HPI in our models. Local governments choose the DPR in response to housing market conditions, and the DPR may also affect subsequent housing demand, implying that the DPR and HPI are correlated in the population. Table A3 in the appendix shows that they are positively correlated in the sample. The results in Table 4 show that the effect of the lag of DPR on first birth is robust to excluding the HPI from the model, as shown in Column (1). As shown in Column (2), omitting the DPR variable biases the lag of housing price effect downward, making it negative and significant. This result shows the importance of accounting for both the DPR and HPI in our analysis. Similarly, examining the higher-order birth outcome, omitting the HPI introduces downward bias on the effect of the lag of DPR, making it negative and significant. Excluding the DPR does not meaningfully affect the positive effect of the same-period housing price on the probability of higher-order births. Finally, for the first-birth outcome, omitting the HPI variables makes the effect of the lag of DPR negative and significant, and omitting the DPR variables increases the magnitude of the negative effect of the lag of HPI. Altogether, the results send two messages: the main results are robust to omitting one of the treatment variables, but the potential for error in judgment can be significant if the DPR and HPI are not both accounted for in our study, because the omitted variables bias can make some estimates appear significantly different from zero.

Third, we account for the possibility that the results are driven by only some of the cities. For this purpose, we alternatively reweight the observations using the city-level CFPS sampling weight, exclude the first-tier cities from the sample which are unusually large in size and population density, and exclude the cities in the northeastern rust belt region from the sample, which have relatively slower economic growth (Chan, 2019). The first four columns of Table 5 show that the effects of the lag of DPR on the first birth outcome are robust to all three specifications. The effects of the same-period DPR become slightly larger in magnitude, although they remain smaller than the lagged effects. The positive effects of the same-period HPI on higher-order births are robust across the three specifications as well. The effects become larger and more significant in Column (7), with the first-tier cities removed, implying that the effects are not confined to extremely large cities such as Beijing and Shanghai.

Columns (6) and (7) show that, with reweighting and sample adjustment, the effects of the lag of HPI are negative and borderline significant on the probability of higher order birth. These results do not align with the others results we show. One possibility is that some parents may be recent homeowners, so that past increases in housing prices have a negative price effect.

The last three columns of Table 5 show that the null effect of DPR and the marginally significant

negative effects of the lag of HPI on first marriage are robust to the three specifications.

Fourth, we control for the city-year housing purchase restrictions (HPR), in which city governments placed restrictions on housing purchases to residents. The DPR at the city level initially depended on whether the HPR was in place. Because the DPR and the HPR both aim to regulate the housing market (see Section 2), including the HPR variable in the model may affect the estimated effects of the DPR or the housing price. Table A4 shows that the coefficient on the HPR dummy (1 for any restrictions placed) is negative for the first birth, higher-order birth, and first marriage outcomes, but the estimates are not significant and the estimates of the DPR and housing price effects are barely affected. Joint F-tests for the purchase limit variable and its lag do not reject the null for all three outcomes. One possible reason is that the HPR mainly target second housing purchases or purchases of large housing units to curb housing market speculation, so that individuals considering first marriage or having their first child are unlikely to be affected.

Fifth, we account for the lags of DPR and HPI for each year of lag separately for up to three years instead of taking the average of the lags as in the baseline model. Consistent with the baseline results, Table A5 shows negative effects of lagged DPR on the first birth outcome, positive effects of the same-year housing price, and negative but marginally significant effects of lagged DPR and housing prices on first marriages.

Sixth, we estimate the baseline model with alternative control variables and show the results in Table A6. For the first birth outcome, Column (1) shows results with only treatment variables, year FE, and the city-specific linear trend variable. Column (2) adds education variables, age dummies, and parity by sex composition of prior births. Column (3) adds ethnicity, local residence, parents' education, and beauty and intelligence variables, recovering the baseline model. Column (4) adds macroeconomic variables at city-year level that somewhat reduces the sample size. The same analysis is repeated for higher-order birth (Columns (5) through (8) and first marriage (Columns (9) through (12)). Negative effects of DPR on first birth and positive effects of housing price on higher-order births are consistent with the baseline results. The negative coefficients of higher education for first birth and marriage, and the null effects of beauty score and intelligence score for marriage and fertility decision are also consistent with the baseline results.

Seventh, whereas we use July 1 as the cutoff date to define policy changes for the main analysis, as a robustness check we repeat the analysis with December 31 as the cutoff date instead. Table A7 shows that, consistent with the baseline results, the lagged DPR has a negative effect on first births, same-year housing prices exhibit a positive effect, and both the DPR and housing prices have no significant impact on first marriages.

Eighth, we exclude from the sample observations of migrants, defined as those who change the province of residence during the sample period. Their migration may be endogenous to housing access, introducing bias to the effects of DPI and HPI. The sample used for the main analysis includes both the migrants and the nonmigrants, with a dummy variable indicating their status included in the baseline model as a control variable. Table A8 shows that first birth and higher-order birth results are

robust to excluding migrant observations. However, the negative effects of current-year housing prices and lagged housing prices on first marriages are significant at the 1% level once migrants are excluded from the sample.

Ninth, we change the age restriction for the sample. The main analysis sample consists of women aged 16 to 45 years. We alternatively set the lower bound of age at 19, 22, and 25. Table A9 shows that the main results are robust to these specifications. Although the negative signs of the coefficients align with the baseline results, the magnitudes for first births and first marriages increase with higher age cutoffs. However, no significant variation is observed for higher-order births across the different age cutoffs.

5.3 Heterogeneity analysis

We conduct heterogeneity analysis based on women's characteristics that could interact with the effects of the DPR or housing prices on fertility and marriage outcomes. Table 6 reports the heterogeneity analysis of the effects of the DPR on first birth. As seen in Columns (2) and (3), the negative impacts of the lag of DPR are similar in magnitude between women with less than 16 years of schooling and women with 16 years or more, but the estimate is significant only for women with less education. The next two columns show that the coefficient estimate for women older than 25 is -1.385, almost three times as large as the estimate for younger women (-0.454). The estimate for the older women is significant at the 1% level, whereas the estimate for the younger women is borderline significant at the conventional level. The last two columns show results for women with rural or urban *hukou*. The results are primarily driven by those with rural *hukou*. The estimate for the women with urban *hukou* is close to zero and insignificant. These results align with the interpretation that the DPR affects demographic outcomes through credit constraint in housing purchase, given that the effects are greater among those who are more likely to face binding constraints. Weak effects among women younger than 26 may be because not many Chinese women in their early twenties consider childbirth.

The same heterogeneity analysis on higher-order birth is shown in Table A10 in the appendix. Positive effects of housing price on higher-order birth are greater in magnitude among women with higher education (12 years or more), older than 30 (sample median age), and with urban *hukou*. The estimates are significant for these groups of women, and tend to be insignificant for the other groups. Because high education, older age, and and urban *hukou* all predict homeownership in the cities, the results support the interpretation that housing price encourages higher-order birth through a wealth effect.

Table A11 shows heterogeneity for the first marriage outcome. Housing price in the year of marriage has a negative and significant effect on women with less than 12 years of education, but a small and insignificant effect among women with higher education. The negative effects are greater for older women and women with rural *hukou*, but the differences in effects are unlikely to be significant. These estimates are generally insignificant but align with the results for the first birth outcome. Other estimates are not consistent across different subgroups and mostly not significantly different from zero.

Taken together, the heterogeneity analysis shows that raising the DPR lowers the probability of first birth of women of low socioeconomic status. This result is consistent with the interpretation that the DPR affects the credit constraint of women trying to purchase housing to raise children. The credit constraint would affect women of low socioeconomic status much more than women in better circumstances. Similar results are found for the first marriage outcome, although the strength of evidence is weaker. Some of the results on higher-order births suggest that housing price may have a wealth effect on those more likely to own housing, such as older women and those with high levels of education.

6 Conclusion

In this study, we show that a woman's access to housing and changes in housing wealth as measured by the DPR and housing prices can have significant impacts on subsequent fertility. Using the CFPS and a unique dataset on city-level variation in the DPRs, we show that an increase in the DPR has a negative impact on fertility among women who never had children before (first birth), whereas an increase in housing price has a positive effect on fertility among those who already have children (higher order birth). The negative effects of the DPR on the probability of first birth are stronger among women who are more likely to be credit-constrained, such as those with low levels of education and with rural *hukou*. The positive effects of housing prices on the probability of higher-order birth are stronger among women with higher levels of education and with urban *hukou*, who are more likely to be homeowners. The DPR and housing prices have generally negative but insignificant effects on the probability of first marriage.

Our study has some limitations. First, we only have information on the first-purchase DPR, which would apply to most newlywed couples considering first births. We do not have information on the second-purchase DPR, which is different from first-purchase DPR and would apply to older or wealthier couples. Second, whereas the DPR is determined by city administrators, housing price is endogenously determined in the market. It is possible that family formation can affect housing demand, changing the price of housing as a consequence. The effects of the DPR are unlikely to suffer from similar reverse-causality concerns. The estimates of housing price effects should be interpreted with caution.

Our results are consistent with the explanation that the DPR impacts fertility choices of credit-constrained households by obstructing their access to housing, whereas housing price impacts higher-order births of homeowners by increasing their housing wealth. Given Chinese social norms demanding that a house be purchased before having children, combined with a rapid increase in housing prices in recent years, we interpret our results as evidence that the difficulty of housing access offers an explanation for the rapidly declining fertility rates in China. The total number of children within each household continued to decline over the past decades because of economic and social changes in recent decades that facilitated a quantity-quality trade-off. The impact of rising housing prices on higher-order births is therefore likely to be small compared to the overall decline in the total fertility

rate. Further, our results have broader implications in explaining the low fertility rates in East Asian countries, including Japan and South Korea, that share similar cultural characteristics, and in countries outside East Asia that are experiencing low fertility and rising housing prices. Providing easier access to housing for credit-constrained newlyweds can be a policy option for these countries to raise their low fertility rates.

References

Acolin, A., Bricker, J., Calem, P., and Wachter, S. (2016). Borrowing constraints and homeownership. *American Economic Review*, 106(5):625–629.

Atalay, K., Li, A., and Whelan, S. (2021). Housing wealth, fertility intentions and fertility. *Journal of Housing Economics*, 54:101787.

Bhaskar, V., Li, W., and Yi, J. (2023). Multidimensional premarital investments with imperfect commitment. *Journal of Political Economy*, 131(10):2893–2919.

Chan, E. (2019). China's northeastern rust belt was once 'eldest son', now struggling as runt of the litter. *South China Morning Post*. Accessed: 2024-11-29.

Chen, K. (2020). China's housing policy and housing boom and their macroeconomic impacts. In *Oxford Research Encyclopedia of Economics and Finance*.

Chen, K., Wang, Q., Xu, T., and Zha, T. (2020). Aggregate and distributional impacts of ltv policy: Evidence from china's micro data. Working Paper 28092, National Bureau of Economic Research.

Clark, W. A., Huang, Y., and Yi, D. (2021). Can millennials access homeownership in urban china? *Journal of Housing and the Built Environment*, 36(1):69–87.

Cole, M. (2020). China's couples marry later as home ownership customs delay weddings. *Mingtiandi*. Based on Anjuke property website survey.

Cui, C., Yu, S., Chen, J., and Li, J. (2023). How home buyers finance their homeownership in post-reform urban china? changing dynamics of variegated financial pathways. *International Journal of Housing Policy*, pages 1–29.

Dalla Zuanna, G. (2001). The banquet of Aeolus: A familistic interpretation of Italy's lowest low fertility. *Demographic Research*, 4(5):133–162.

Daysal, N. M., Lovenheim, M., Siersbæk, N., and Wasser, D. N. (2021). Home prices, fertility, and early-life health outcomes. *Journal of public Economics*, 198:104366.

Deng, L., Yan, X., and Chen, J. (2021). Housing affordability, subsidized lending and cross-city variation in the performance of china's housing provident fund program. *Housing Studies*, 36(4):455–478.

Dettling, L. J. and Kearney, M. S. (2014). House prices and birth rates: The impact of the real estate market on the decision to have a baby. *Journal of Public Economics*, 110:82–100.

Du, Z. and Zhang, L. (2015). Home-purchase restriction, property tax and housing price in china: A counterfactual analysis. *Journal of Econometrics*, 188(2):558–568.

Fang, H., Gu, Q., Xiong, W., and Zhou, L.-A. (2016). Demystifying the chinese housing boom. *NBER macroeconomics annual*, 30(1):105–166.

Favilukis, J., Ludvigson, S. C., and Van Nieuwerburgh, S. (2017). The macroeconomic effects of housing wealth, housing finance, and limited risk sharing in general equilibrium. *Journal of Political Economy*, 125(1):140–223.

Feng, H. and Lu, M. (2013). School quality and housing prices: Empirical evidence from a natural experiment in shanghai, china. *Journal of Housing Economics*, 22(4):291–307.

Fuster, A. and Zafar, B. (2016). To buy or not to buy: Consumer constraints in the housing market. *American Economic Review*, 106(5):636–640.

Fuster, A. and Zafar, B. (2021). The sensitivity of housing demand to financing conditions: evidence from a survey. *American Economic Journal: Economic Policy*, 13(1):231–265.

Garriga, C., Hedlund, A., Tang, Y., and Wang, P. (2023). Rural-urban migration, structural transformation, and housing markets in china. *American Economic Journal: Macroeconomics*, 15(2):413–440.

Greenwald, D. L. and Guren, A. (2021). Do credit conditions move house prices? Working Paper 29391, National Bureau of Economic Research.

Hamermesh, D. S. and Biddle, J. E. (1994). Beauty and the labor market. *American Economic Review*, 84(5):1174–1194.

Hanewald, K., Bateman, H., Fang, H., and Wu, S. (2020). Is there a demand for reverse mortgages in china? evidence from two online surveys. *Journal of Economic Behavior & Organization*, 169:19–37.

Hu, M., Su, Y., and Yu, X. (2022). Homeownership and fertility intentions among migrant population in urban china. *Housing Studies*, pages 1–23.

Hu, Y. (2012). Two-thirds buy homes before marriage. *China Daily*.

Kleven, H., Landais, C., and Leite-Mariante, G. (2023). The child penalty atlas. Working Paper 31649, National Bureau of Economic Research.

Lafortune, J. and Low, C. (2023). Collateralized marriage. *American Economic Journal: Applied Economics*, 15(4):252–291.

Li, L. and Wu, X. (2014). Housing price and entrepreneurship in china. *Journal of Comparative Economics*, 42(2):436–449.

Li, W. (2022). Trends in premarital pregnancy among chinese women. *China Population and Development Studies*, 6(4):461–480.

Li, W. (2024). Do surging house prices discourage fertility? global evidence, 1870–2012. *Labour Economics*, page 102572.

Liu, C. and Xiong, W. (2018). China's real estate market. Working Paper 25297, National Bureau of Economic Research.

Liu, J., Xing, C., and Zhang, Q. (2020). House price, fertility rates and reproductive intentions. *China Economic Review*, 62:101496.

Liu, W., Yu, J., and Xie, Y. (2024). Beauty–status exchange in mate selection in china. *Research in Social Stratification and Mobility*, 89:100872.

Lovenheim, M. F. and Mumford, K. J. (2013). Do family wealth shocks affect fertility choices? evidence from the housing market. *Review of Economics and Statistics*, 95(2):464–475.

Mian, A., Sufi, A., and Verner, E. (2017). Household debt and business cycles worldwide. *The Quarterly Journal of Economics*, 132(4):1755–1817.

Mulder, C. H. (2006). Population and housing: a two-sided relationship. *Demographic research*, 15:401–412.

Myong, S., Park, J., and Yi, J. (2021). Social norms and fertility. *Journal of the European Economic Association*, 19(5):2429–2466.

PBC (2001). Notice on regulating housing finance business. People's Bank of China. In Chinese. Accessed 11/29/2023.

PBC (2003). Notice on further strengthening the management of real estate credit business. People's Bank of China. In Chinese. Accessed 04/18/2024.

PBC (2008). Notice on expanding the downward floating range of commercial personal housing loan interest rates and other related issues. People's Bank of China. In Chinese. Accessed 04/18/2024.

PBC and CBIRC (2010). Notice on issues related to improving differentiated housing credit policies. People's Bank of China and China Banking and Insurance Regulatory Commission. In Chinese. Accessed 12/01/2023.

PBC and CBIRC (2015). Notice on issues related to further improving differentiated housing credit policies. People's Bank of China and China Banking and Insurance Regulatory Commission. In Chinese. Accessed 12/04/2023.

PBC and CBIRC (2016). Notice on issues related to further improving differentiated housing credit policies. People's Bank of China and China Banking and Insurance Regulatory Commission. In Chinese. Accessed 12/04/2023.

PBC and CBIRC (2023). Notice on adjusting and optimizing differentiated housing credit policies. People's Bank of China and China Banking and Insurance Regulatory Commission. In Chinese. Accessed 04/18/2024.

PBC and CBIRC (2024). Notice on adjusting the minimum down payment ratio policy for personal housing loans. People's Bank of China and China Banking and Insurance Regulatory Commission. In Chinese. Accessed 08/17/2024.

Raymo, J. M., Park, H., Xie, Y., and Yeung, W.-j. J. (2015). Marriage and family in east asia: Continuity and change. *Annual review of sociology*, 41(1):471–492.

Ricks, J. S. (2021). Mortgage subsidies, homeownership, and marriage: Effects of the va loan program. *Regional Science and Urban Economics*, 87:103650.

Rogoff, K. S. and Yang, Y. (2024). A tale of tier 3 cities. *Journal of International Economics*, 152:103989.

State Council of China (1998). Notice on furthering the urban housing system reform and accelerating housing construction. In Chinese. Accessed 04/18/2024.

State Council of China (2003). Notice on promoting a sustainable and healthy development of real estate market. In Chinese. Accessed 04/18/2024.

State Council of China (2006). Notice on adjustments to housing credit policies. In Chinese. Accessed 11/29/2023.

State Council of China (2010). Notice on resolutely curbing the excessive rise in housing prices in some cities. In Chinese. Accessed 12/01/2023.

State Council of China (2020). Government work report. In Chinese. Accessed 12/04/2023.

Sun, A. and Zhang, Q. (2020). Who marries whom in a surging housing market? *Journal of Development Economics*, 146:102492.

Tang, M. and Coulson, N. E. (2017). The impact of china's housing provident fund on homeownership, housing consumption and housing investment. *Regional Science and Urban Economics*, 63:25–37.

Wei, S.-J. and Zhang, X. (2011). The competitive saving motive: Evidence from rising sex ratios and savings rates in china. *Journal of political Economy*, 119(3):511–564.

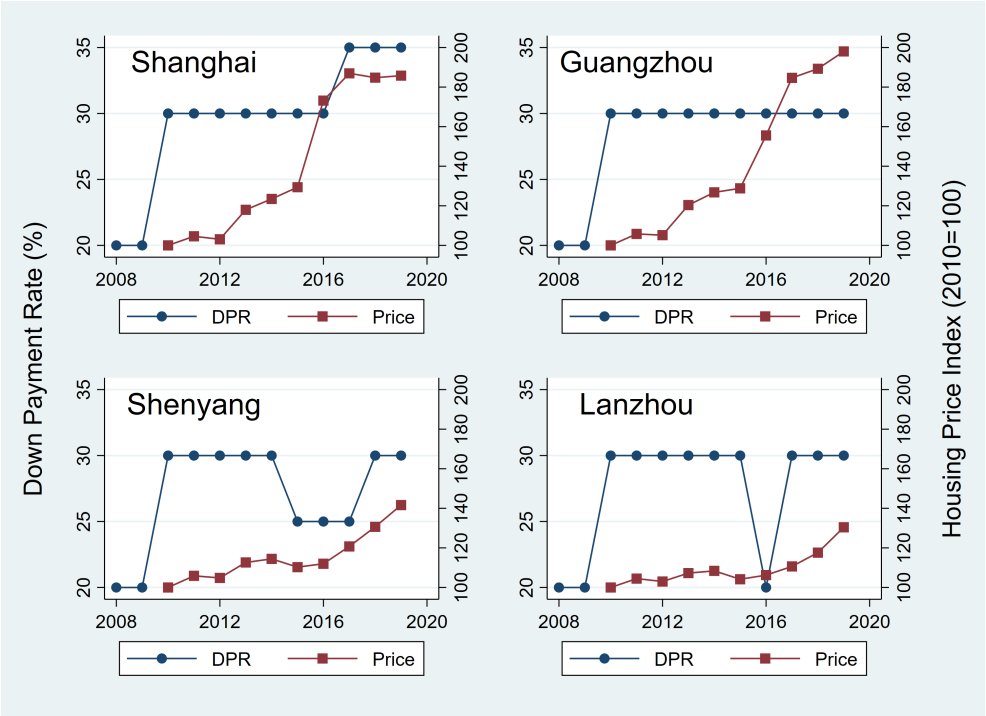
Wei, S.-J., Zhang, X., and Liu, Y. (2017). Home ownership as status competition: Some theory and evidence. *Journal of Development Economics*, 127:169–186.

Zang, E. (2020). When family property becomes individual property: Intrahousehold property ownership and women's well-being in china. *Journal of Marriage and Family*, 82(4):1213–1233.

Figure 1: Thirty Five Cities with Down Payment Rate Data

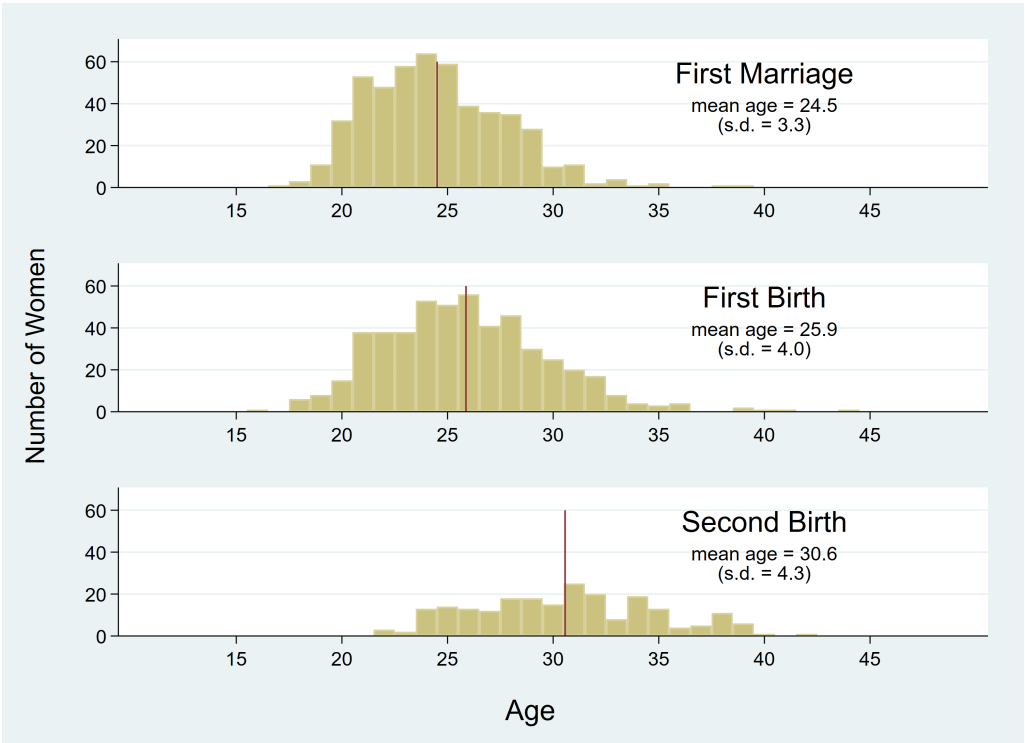
Notes: The DPR values are collected from 35 first-tier and second-tier cities, which are distinguished by different fonts, as shown in the legend. Among them, 20 cities are covered by the CFPS samples, while the remaining 15 cities are not.

Figure 2: Trends in DPRs and Housing Prices Index Over Time in Selected Cities



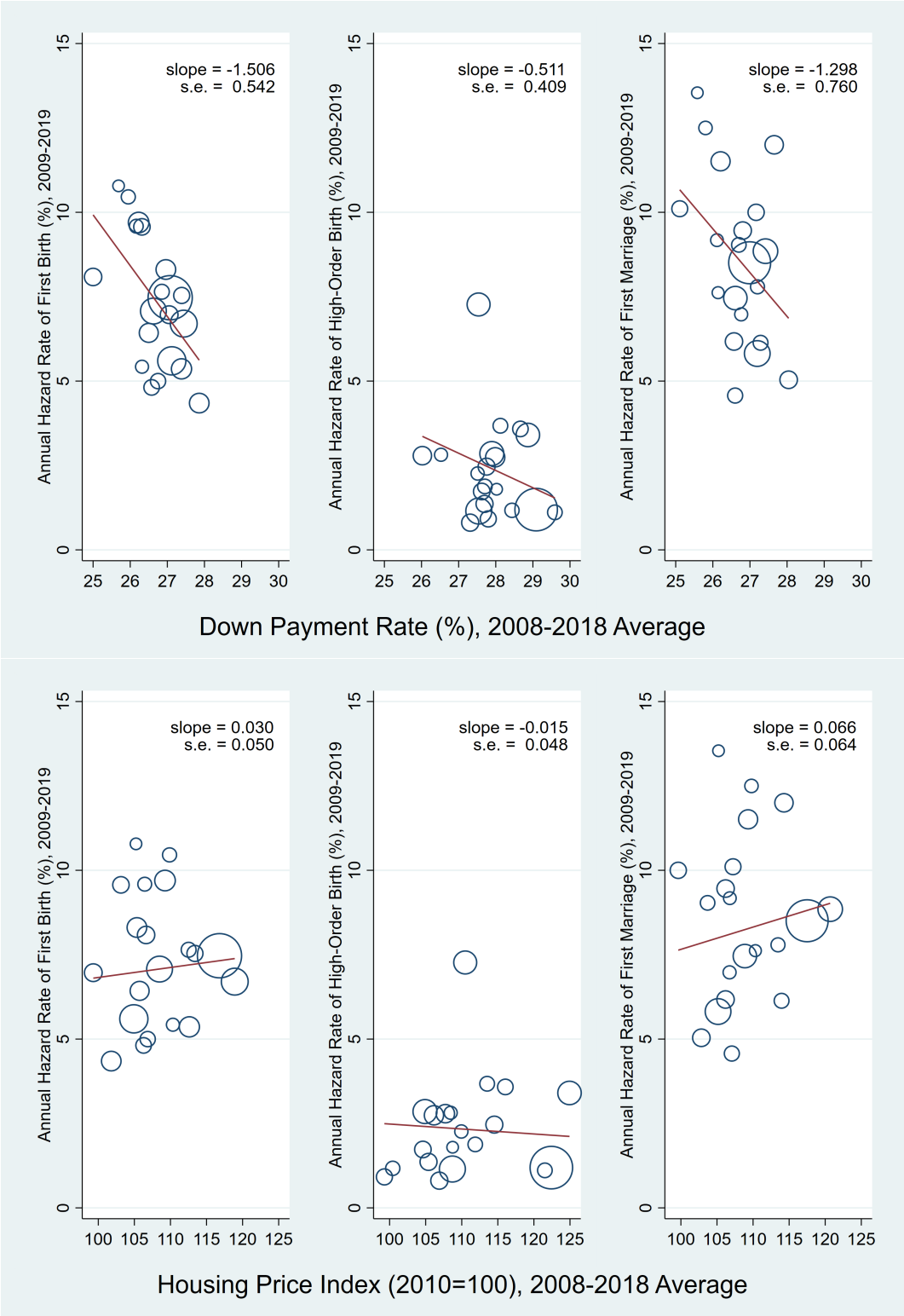
Notes: The Figure reports the sample means of imputed DPRs in four cities with the largest numbers of observations in our data. A policy change in the middle of a calendar year updates DPR of this year if the change occurred in the first half of the year, updates DPR of the next year if the change occurred in the second half of the year.

Figure 3: Age Distribution of First Marriage and First Two Births



Notes: Samples are restricted to the CFPS gene member (family members at baseline and their newly born and adopted children in subsequent waves) women aged 16-45. The red vertical lines indicate sample means.

Figure 4: Fertility and Marriage Decrease in DPR but Not in Housing Price Index



Notes: Each circle represents a city. The size of each circle represents the number of observations (woman-by-years) in our analysis sample. We present linearly fitted lines based on cross-sectional associations with observation weights. Slope and robust standard error estimates of the linearly fitted lines are shown at the top of each figure.

Table 1: Summary Statistics on Selected Variables

	First-Birth Sample (1)	Higher-Order-Birth Sample (2)	First Marriage Sample (3)
Annual Fertility or Marriage Rate	0.063 (0.242)	0.024 (0.154)	0.064 (0.245)
DPR, Current Year	29.285 (2.709)	29.300 (2.740)	29.408 (2.819)
ln(Housing Price Index), Current Year	4.745 (0.158)	4.753 (0.161)	4.773 (0.179)
Age	23.5 (5.4)	36.7 (5.8)	23.2 (5.4)
Calendar Year	2013.9 (2.2)	2012.9 (2.2)	2014.4 (2.5)
Minority	0.040 (0.196)	0.037 (0.189)	0.041 (0.199)
Local Resident	0.779 (0.415)	0.766 (0.423)	0.777 (0.416)
Beauty Score	0.212 (0.701)	0.227 (0.594)	0.214 (0.705)
Intelligence Score	0.212 (0.609)	0.172 (0.542)	0.217 (0.611)
Middle School or Below (Base)	0.248 (0.432)	0.582 (0.493)	0.257 (0.437)
High School	0.284 (0.451)	0.178 (0.383)	0.286 (0.452)
Associate Degree	0.190 (0.392)	0.131 (0.338)	0.191 (0.393)
Bachelor's Degree or Above	0.278 (0.448)	0.109 (0.312)	0.266 (0.442)
N (Woman-Year)	4,145	7,354	3,829
N (Unique Women)	902	1,471	802
N (Cities)	20	20	20

Notes: Sample means and standard deviations are presented. Variables that are in the analysis but are not shown in this table include: dummies for specific ethnic minority groups, dummies for father's and mother's education levels, dummies categorizing the sex composition by number of prior births, dummies indicating imputation for beauty and intelligence scores, and macro economic indicators at the city-year level.

Table 2: Effects of Current and Past Down Payment Rates on Marriage and Fertility

	Dependent Variable: $100 \times Y$					
	First Birth Next Year		Higher-Order Birth Next Year		First Marriage This Year	
	(1)	(2)	(3)	(4)	(5)	(6)
Sample Mean of $100 \times Y$	6.273	6.273	2.434	2.434	6.399	6.399
ln(DPR) × 100	-0.046	-0.095†	0.004	0.004	-0.017	-0.020
	(0.040)	(0.048)	(0.017)	(0.018)	(0.045)	(0.047)
Lag of ln(DPR) × 100	-0.130**	-0.455***	-0.004	-0.004	-0.099†	-0.131
	(0.036)	(0.093)	(0.028)	(0.082)	(0.056)	(0.095)
ln(Price) × 100	-0.032	-0.096	0.176*	0.157*	0.051	-0.056
	(0.077)	(0.085)	(0.067)	(0.060)	(0.058)	(0.064)
Lag of ln(Price) × 100	-0.039	0.030	-0.076	-0.099	-0.089	-0.204†
	(0.080)	(0.102)	(0.065)	(0.097)	(0.075)	(0.109)
High School	-5.493**	-5.472**	-0.488	-0.489	-7.059**	-7.035**
	(1.746)	(1.757)	(0.602)	(0.603)	(1.946)	(1.953)
Associate Degree	-7.046***	-7.043***	-0.127	-0.129	-9.319***	-9.285***
	(1.372)	(1.378)	(0.599)	(0.600)	(2.016)	(2.020)
Bachelor's Degree or Above	-10.767***	-10.742***	-0.320	-0.323	-12.069***	-12.056***
	(1.868)	(1.871)	(0.883)	(0.883)	(2.049)	(2.051)
Beauty Score	0.376	0.384	-0.322	-0.319	1.154	1.165
	(0.746)	(0.746)	(0.613)	(0.614)	(1.035)	(1.030)
Intelligence Score	0.262	0.248	-0.154	-0.155	-0.734	-0.742
	(0.877)	(0.878)	(0.523)	(0.523)	(0.870)	(0.869)
Lag Structure	1 year	3 years	1 year	3 years	1 year	3 years
Age Dummies and Year FE	yes	yes	yes	yes	yes	yes
Parity by Sex Composition FE if Applicable	yes	yes	yes	yes	yes	yes
Ethnicity, Local, Parents' Education	yes	yes	yes	yes	yes	yes
City-Specific Trends and Macro Variables	yes	yes	yes	yes	yes	yes
N (Woman-Year)	4,145	4,145	7,354	7,354	3,829	3,829
N (Unique Women)	902	902	1,471	1,471	802	802
N (Cities)	20	20	20	20	20	20

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in the parentheses are clustered at the city level. "DPR" refers to the down payment rate in each calendar year in each city. A change in policy in the middle of a calendar year updates DPR in the year if it occurred in the first half of the year, and updates DPR in the next year if it occurred in the second half of the year. "Price" refers to the property price index. Columns denoted "1 year" for the lag structure show effects of one-year lags of ln(DPR) and ln(Price). Columns denoted "3 years" for the lag structure show effects of averages of most recent three lags of ln(DPR) and ln(Price). For each city and year, we take the geometric average value in the index between new and second-hand homes. Each observation is a woman by calendar year during 2010-2019. Samples are restricted to (1) the CFPS gene member women aged 16-45; and (2) calendar years before or containing the transition in the corresponding dependent variable. We also control for dummy variables that indicating imputation of beauty scores and intelligence scores.

Table 3: Effects of Down Payment Rates on Fertility, Conditioning on Having Ever Been Married and Husbands' Characteristics

	Dependent Variable: $100 \times Y$			
	First Birth Next Year		Higher-Order Birth Next Year	
	(1)	(2)	(3)	(4)
Sample Mean of $100 \times Y$	27.596	27.596	2.363	2.363
ln(DPR) × 100	-0.142	-0.418*	0.020	0.016
	(0.177)	(0.182)	(0.022)	(0.020)
Lag of ln(DPR) × 100	-0.594**	-2.617***	0.000	-0.032
	(0.169)	(0.503)	(0.033)	(0.075)
ln(Price) × 100	0.203	-0.421	0.115†	0.092
	(0.453)	(0.509)	(0.062)	(0.056)
Lag of ln(Price) × 100	-0.984†	-0.212	-0.068	-0.077
	(0.502)	(0.488)	(0.064)	(0.094)
High School	-6.508	-6.334	-0.427	-0.429
	(6.194)	(6.188)	(0.666)	(0.666)
Associate Degree	-9.165	-8.611	-0.024	-0.024
	(6.327)	(6.528)	(0.564)	(0.565)
Bachelor's Degree or Above	-13.508*	-12.909*	-0.699	-0.699
	(5.219)	(5.414)	(1.196)	(1.196)
Beauty Score	-4.208	-4.119	-0.559	-0.558
	(3.603)	(3.609)	(0.689)	(0.689)
Intelligence Score	4.223	4.446	-0.312	-0.312
	(3.328)	(3.420)	(0.524)	(0.525)
High School, Husband	8.171	8.291	-0.984†	-0.983†
	(7.417)	(7.520)	(0.481)	(0.483)
Associate Degree, Husband	13.081	13.248	0.027	0.027
	(8.114)	(7.935)	(0.664)	(0.665)
Bachelor's Degree or Above, Husband	4.479	3.705	0.010	0.012
	(7.353)	(7.556)	(0.565)	(0.565)
Beauty Score, Husband	5.201	5.585	0.728†	0.730†
	(5.139)	(5.079)	(0.409)	(0.409)
Intelligence Score, Husband	-1.912	-2.143	-0.229	-0.230
	(3.153)	(3.200)	(0.479)	(0.480)
Lag Structure	1 year	3 years	1 year	3 years
Age and Husband's Age Dummies and Year FE	yes	yes	yes	yes
Parity by Sex Composition FE if Applicable	yes	yes	yes	yes
Ethnicity, Local, Parents' Education	yes	yes	yes	yes
City-Specific Trends and Macro Variables	yes	yes	yes	yes
N (Woman-Year)	732	732	6,898	6,898
N (Unique Women)	311	311	1,358	1,358
N (Cities)	20	20	20	20

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in the parentheses are clustered at the city level. "DPR" refers to the down payment rate in each calendar year in each city. A change in policy in the middle of a calendar year updates DPR in the year if it occurred in the first half of the year, and updates DPR in the next year if it occurred in the second half of the year. "Price" refers to the property price index. Columns denoted "1 year" for the lag structure show effects of one-year lags of ln(DPR) and ln(Price). Columns denoted "3 years" for the lag structure show effects of averages of most recent three lags of ln(DPR) and ln(Price). For each city and year, we take the geometric average value in the index between new and second-hand homes. Each observation is a woman by calendar year during 2010-2019. Samples are restricted to (1) the CFPS gene member women aged 16-45; (2) calendar years before or containing the transition in the corresponding dependent variable; and (3) having ever been married. We also control for dummy variables that indicating imputation of beauty scores, intelligence scores and husband's age, education level, beauty scores and intelligence scores.

Table 4: Robustness to the Inclusion of the DPR and Housing Price Index

	Dependent Variable: $100 \times Y$								
	First Birth Next Year			Higher-Order Birth Next Year			First Marriage		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln(DPR) × 100	-0.099*		-0.095†	0.005		0.004	-0.038		-0.020
	(0.040)		(0.048)	(0.021)		(0.018)	(0.046)		(0.047)
Lag of ln(DPR) × 100	-0.413***		-0.455***	-0.110*		-0.004	-0.207*		-0.131
	(0.084)		(0.093)	(0.044)		(0.082)	(0.090)		(0.095)
ln(Price) × 100		-0.070	-0.096		0.161**	0.157*		-0.040	-0.056
		(0.089)	(0.085)		(0.055)	(0.060)		(0.052)	(0.064)
Lag of ln(Price) × 100		-0.267**	0.030		-0.099	-0.099		-0.274*	-0.204†
		(0.092)	(0.102)		(0.074)	(0.097)		(0.109)	(0.109)
Lag Structure	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years
Baseline Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
N (Woman-Year)	4,145	4,145	4,145	7,354	7,354	7,354	3,829	3,829	3,829
N (Unique Women)	902	902	902	1,471	1,471	1,471	802	802	802
N (Cities)	20	20	20	20	20	20	20	20	20

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in the parentheses are clustered at the city level. "DPR" refers to the down payment rate in each calendar year in each city. A change in policy in the middle of a calendar year updates DPR in the year if it occurred in the first half of the year, and updates DPR in the next year if it occurred in the second half of the year. "Price" refers to the property price index. Columns denoted "3 years" for the lag structure show effects of averages of most recent three lags of ln(DPR) and ln(Price). For each city and year, we take the geometric average value in the index between new and second-hand homes. Each observation is a woman by calendar year during 2010-2019. Samples are restricted to (1) the CFPS gene member women aged 16-45; and (2) calendar years before or containing the transition in the corresponding dependent variable.

Table 5: Sensitivity of Baseline Results to Re-Weighting and Excluding Observations at the City Level

	Dependent Variable: $100 \times Y$											
	First Birth Next Year				Higher-Order Birth Next Year				First Marriage			
	Do Nothing (Baseline) (1)	Re-Weighted (2)	Exclude 1st-Tier (3)	Exclude Northeast (4)	Do Nothing (Baseline) (5)	Re-Weighted (6)	Exclude 1st-Tier (7)	Exclude Northeast (8)	Do Nothing (Baseline) (9)	Re-Weighted (10)	Exclude 1st-Tier (11)	Exclude Northeast (12)
Weighted Mean of $100 \times Y$	6.273	6.569	6.223	6.361	2.434	2.907	2.725	2.721	6.399	7.165	6.385	6.493
ln(DPR) $\times$ 100	-0.095†	-0.143**	-0.128*	-0.103†	0.004	0.009	-0.006	0.013	-0.020	-0.023	-0.026	0.006
	(0.048)	(0.048)	(0.046)	(0.049)	(0.018)	(0.020)	(0.021)	(0.021)	(0.047)	(0.064)	(0.056)	(0.051)
Lag of ln(DPR) $\times$ 100	-0.455***	-0.450***	-0.496***	-0.494***	-0.004	0.016	-0.062	0.012	-0.131	-0.117	-0.171	-0.118
	(0.093)	(0.091)	(0.099)	(0.075)	(0.082)	(0.089)	(0.072)	(0.093)	(0.095)	(0.118)	(0.103)	(0.107)
ln(Price) $\times$ 100	-0.096	-0.044	-0.091	-0.097	0.157*	0.263**	0.311***	0.177†	-0.056	-0.005	-0.037	-0.108†
	(0.085)	(0.126)	(0.141)	(0.094)	(0.060)	(0.079)	(0.062)	(0.087)	(0.064)	(0.099)	(0.110)	(0.060)
Lag of ln(Price) $\times$ 100	0.030	0.124	0.122	0.057	-0.099	-0.236†	-0.344*	-0.048	-0.204†	-0.321*	-0.229	-0.317†
	(0.102)	(0.099)	(0.161)	(0.102)	(0.097)	(0.136)	(0.139)	(0.110)	(0.109)	(0.138)	(0.134)	(0.153)
Lag Structure	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years
Baseline Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
N (Woman-Year)	4,145	4,145	2,764	3,490	7,354	7,354	4,918	6,175	3,829	3,829	2,600	3,219
N (Unique Women)	902	902	592	759	1,471	1,471	977	1,235	802	802	526	675
N (Cities)	20	20	17	17	20	20	17	17	20	20	17	17

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in the parentheses are clustered at the city level. In columns 2, 6 and 10, we adjust sample weights at the city-level by dividing the oversampling rate in the the CFPS sample (Shanghai by 10.28, Lanzhou by 7.30, Dalian by 4.45, Shenyang by 4.45, Zhengzhou by 2.04, and Guangzhou by 2.02). Columns 3, 7, and 11 exclude Beijing, Shanghai, and Guangzhou from the analysis. Column 4, 8 and 12 excludes the three cities in the Northeast region: Dalian, Shenyang and Harbin. "DPR" refers to the down payment rate in each calendar year in each city. "Price" refers to the property price index. Columns denoted "3 years" for the lag structure show effects of averages of most recent three lags of ln(DPR) and ln(Price). For each city and year, we take the geometric average value in the index between new and second-hand homes. Each observation is a woman by calendar year during 2010-2019. Samples are restricted to (1) the CFPS gene member women aged 16-45; and (2) calendar years before or containing the transition in the corresponding dependent variable.

Table 6: Subgroup Heterogeneity Effects of Down Payment Rates on the First Birth

Y = First Birth Next Year ×100	All	Education		Age		Hukou at Age 12	
		0-15	16+	16-25	26-45	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample Mean of 100 × Y	6.273	5.782	7.546	6.250	13.016	7.640	4.222
ln(DPR) × 100	-0.095†	-0.118	-0.063	-0.005	-0.192	-0.166*	0.064
	(0.048)	(0.075)	(0.111)	(0.087)	(0.117)	(0.072)	(0.045)
Lag of ln(DPR) × 100	-0.455***	-0.484**	-0.448	-0.454†	-1.385**	-0.725***	0.095
	(0.093)	(0.141)	(0.372)	(0.220)	(0.467)	(0.141)	(0.198)
ln(Price) × 100	-0.096	-0.199*	0.196	-0.283†	0.025	-0.097	-0.053
	(0.085)	(0.072)	(0.218)	(0.157)	(0.267)	(0.138)	(0.095)
Lag of ln(Price) × 100	0.030	0.208	-0.263	0.101	0.299	0.128	-0.355†
	(0.102)	(0.175)	(0.358)	(0.191)	(0.449)	(0.169)	(0.182)
Lag Structure	3 years	3 years	3 years	3 years	3 years	3 years	3 years
Baseline Controls	yes	yes	yes	yes	yes	yes	yes
N (Woman-Year)	4,145	2,992	1,153	1,168	1,283	2,487	1,658
N (Unique Women)	902	738	257	462	389	520	382
N (Cities)	20	20	20	20	20	20	20

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in the parentheses are clustered at the city level. "DPR" refers to the down payment rate in each calendar year in each city. "Price" refers to the property price index. Columns denoted "3 years" for the lag structure show effects of averages of most recent three lags of ln(DPR) and ln(Price). For each city and year, we take the geometric average value in the index between new and second-hand homes. Each observation is a woman by calendar year during 2010-2019. Samples are restricted to (1) the CFPS gene member women aged 16-45; and (2) calendar years before or containing the transition in the corresponding dependent variable. Beauty and intelligence scores are time-invariant measures constructed in the following steps: (1) taking the within-individual modes of the raw score in a scale of 1-7 across observed waves; (2) normalizing within sample women by age group of three years; and (3) imputing zeros for missing values and generating an indicator flagging the imputation. In Columns (8) and (9), the age groups are divided around the mean age of first birth shown in Figure 3.

Appendices

A National v.s. city DPR

Figure A1 shows the changes of national DPR over time. Before 2016, each city followed the national DPR policy and local commercial banks implemented the minimum down payment ratio for commercial personal housing loans. Since 2000, the national DPR was changed in years 2005, 2008, 2010, and 2015 to either tighten or loosen the housing markets as illustrated in Table A1.

In September 2015, in the "Notice on issues related to further improving differentiated housing credit policies" (PBC and CBIRC, 2015), it was mentioned that "The local offices of PBC and CBIRC should strengthen communication with local governments in accordance with the principle of **'categorized guidance and local implementation of policies'**, ... independently determine the minimum down payment ratio for commercial personal housing loans within its jurisdiction based on local conditions". As a result, the national policy clearly stated a minimum DPR of 25% for cities without housing purchase restrictions. For cities with housing purchase restrictions, the setting and implementation of local DPR was left to local governments. We review the changes of housing purchase restrctions with more details in Section Appendix D.

The most recent change of DPR at the national level is announced in May 2024 in the "Notice on Adjusting the Minimum Down Payment Ratio Policy for Personal Housing Loans" (PBC and CBIRC, 2024). The minimum DPR is set at 15%, which aims at stimulating the housing market.

B Imputation of DPR data

There are two reasons for missingness of the DPR of a certain city, and we impute the two types of missing values using different approaches.

The first reason is the lack of online public records because the policy was announced very early. Typically, more recent policy announcements are usually released on the government websites, but earlier documents are not available online. As a result, city-level policy documents that contains DPR information during 2008-2010 were missing. However, during this period, in principle all the cities must follow the national policy rate, so we impute the missing city DPRs with the value of national DPR.

The second reason is the lack of policy changes in a certain year, especially the years between two policy announcements. For such missing values, we first try to search for supporting information from other valid sources (news from reputable media, financial and housing-related self-media platforms, or communication with the local branches of PBC) to fill in the missing information. If the missingness remains, we imputed them with forward imputation approach. Specifically, we assume that until a new policy announcement is made, a city carries on with the most recent record of DPR or, in the case of a missing previous announcement, a most recent imputed value of DPR.

C Summary statistics of all variables

Table A2 show the summary statistics over the full list of variables in the baseline regressions. Specifically, we report additional information on levels of father's education, levels of mother's education, and the sex composition of prior births in the case of a higher-order birth.

D Exogeneity of DPR policy

In Table A3, we use (log of) DPR as the dependent variable and regress it on (log of) housing price index in Column (1), adding city-level macroeconomic controls such as (logs of) GDP, population, and area of residential land in Column (2), and adding (log of) employment ratios in the Primary, Secondary and Tertiary Industries in Column (3). Additionally, we also control the lags of DPR and housing price index in Columns (4)-(6). We make two observations from the results. First, the coefficients on city-year level macroeconomic characteristics are all statistically insignificant, and all the macroeconomic characteristics are jointly insignificant in explaining the variation in DPR. Second, the coefficient on housing price is positive and statistically significant, in line with the goal that DPR policies are made to control the housing price levels. Furthermore, the coefficient on housing price index remain highly similar with and without controlling for macroeconomic characteristics, indicating that the association between housing price level and DPR is not confounded with other city-year level macroeconomic characteristics. Taken together, we believe that DPR variations are plausibly exogenous after controlling for housing prices.

E Robustness checks

E.1 Housing purchase restrictions

As reviewed in Section 2.1, one group of housing policies aimed at controlling the overheating housing market, which includes interest rates, DPRs, tax rates, housing purchase restrictions (HPRs). Among them, interest rates and tax rates are very closely related to the determination of housing prices and are accounted for by controlling for housing price index in the regressions. However, HPRs are different for two reasons. First, they do not give any price benefits to a home buyer, so they do not affect home buyer's decision through a price effect. Second, HPRs are a set of rules to regulate the eligibility to obtain commercial housing unit, which is a type of "hard constraint" that must be met at the time of housing purchase (in a sense similar to DPR, which is also a "hard constraint" that requires a certain amount of cash for obtaining a mortgage.) HPRs could put restriction on the eligibility for housing purchase based on the location of the housing unit, the total units of housing the buyer currently owns, the current place of residency of the buyer, whether the unit is second-handed, or the size of the housing unit. HPRs are implemented to regulate the housing market: they are on during policy tightening periods and off during policy loosening periods. Therefore, HPRs, carrying similar policy goals with DPR policies, are a potential confounder to the effect of DPR. To check the robustness of

our main results, we collect the list of cities that had any type of HPRs during 2008-2020 and use such city-year information as controls in the regressions.

The city-year HPR policy data is collected from related policy documents, research papers and government news (available upon request). Specifically, there were two rounds of HPRs, during 2010-2014 and 2016-2018, respectively. During the first round (2010-2014), a total of 46 cities implemented at least one type of HPR. Among them, 16 cities started in 2010[23] and the rest started in 2011[24]. In 2014, due to the cooling down of the housing market, 40 out of 46 cities revoked the HPRs. In 2015, Foshan cancelled and only 5 cities remained to have effective HPRs.[25] During the second round (2016-2018), a total of 36 cities implemented HPRs. Among them, 19 cities had HPRs on in 2016[26], 13 more in 2017[27], and 4 more in 2018[28]. The second round of HPRs were in effect until 2022, when cities started to loosen the HPRs to stimulate the housing market.

Table A4 shows the results with the city-year HPRs policy information added as an additional control. We report the baseline results (without HPR controlled) in Columns (1), (3) and (5) for each of the outcome variables and report the results with HPR controlled in Columns (2), (4), and (6). As a whole, we find that our baseline results are robust to controlling for HPRs. The coefficients of interest (estimated effect of DPR and housing price) obtained similar size. For significance levels, some estimates were somewhat less significant, but the main takeaways remain unchanged. Additionally, we find that the implementation of HPRs decrease the rate of first birth, higher order birth, and marriage in the same year, as expected. However, none of the estimates is statistically significant. A potential reason is that HPRs feature many types of restrictions and each city may implement a combination of different rules for different purposes, which does not necessarily affect females' fertility decisions. For example, some HPR is about the second purchase, or purchase of housing unit exceeding 144 or 180 square meters, which aimed at curbing the speculation in the housing market. In contrast, a first purchase of commercial housing is more relevant for the decision of marriage and fertility, which explains our finding of the strong effect of first-purchase DPR on first births.

E.2 Different number of lags

Table A5 report the robustness check results where we vary the number of lags of DPR and housing price index as regressors for three dependent variables, with first birth in Columns (1)-(4), higher-order birth in Columns (5)-(8), and first marriage in Columns (9)-(12), respectively. The results strongly support the main findings from baseline results. For first births, there is no effect from current-year

[23] Beijing, Shanghai, Tianjin, Nanjing, Dalian, Hangzhou, Ningbo, Fuzhou, Xiamen, Guangzhou, Shenzhen, Haikou, Sanya, Zhoushan, Wenzhou, and Suzhou

[24] Changchun, Taiyuan, Jinan, Qiangdao, Zhengzhou, Hefei, Wuhan, Nanchang, Kunming, Urumqi, Yinchuan, Harbin, Xi'an, Wuxi, Shijiazhuang, Xining, Chengdu, Guiyang, Lanzhou, Jinhua, Shenyang, Changsha, Nanning, Foshan, Hohhot, Shaoxing, Xuzhou, Taizhou, Quzhou, and Zhuhai

[25] Beijing, Shanghai, Guangzhou, Shenzhen, and Sanya

[26] Beijing, Hangzhou, Tianjin, Nanjing, Shanghai, Fuzhou, Xiamen, Guangzhou, Shenzhen, Jinan, Zhengzhou, Wuxi, Hefei, Chengdu, Wuhan, Nanchang, Suzhou, Foshan, and Zhuhai

[27] Xi'an, Shijiazhuang, Qingdao, Changsha, Ganzhou, Ningbo, Haikou, Lanzhou, Tangshan, Qinhuangdao, Sanya, Nanning, and Jiujiang

[28] Dalian, Shenyang, Taiyuan, and Kunming

DPR, but a negative effect from lags of DPR, statistically significant mostly on the one-year lag. For higher-order births, there is a positive effect from the current-year housing price index. For first marriages, no significant effects from DPR or housing price index.

E.3 Alternative control variables

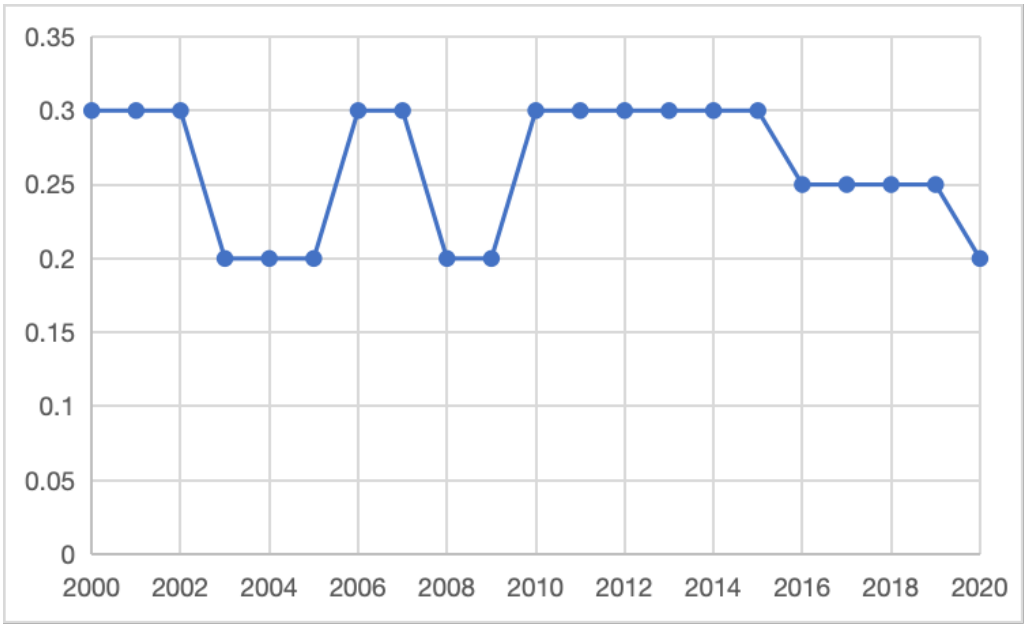
In Table A6, we further control for city-year level macroeconomic characteristics. The results are highly similar to the baseline results reported in Table 2, which indicates that the DPR effects are not confounded with other city macroeconomic characteristics that might affect both the fertility decisions and the DPR policy.

F Heterogeneity analysis on higher-order births and first marriages

In Table A10 we report the results of heterogeneous analysis for higher-order births by education, beauty, intelligence, age, and hukou at age 12. In Column (1) we report the baseline estimates for comparison. Recall in the baseline analysis, DPR does not have any significant effect on higher-order births, but housing prices positively and significantly increase higher-order births. Similarly, we do not find strong DPR effect heterogeneity. One exception is the by age group analysis. DPR has a positively significant effect for age group 31-45 and no effect for age group 16-30. As for the effect of housing price, we find that women with more than 12 years of education, below-average intelligent scores, 16-30 years of age, and urban hukou at age 12 are positively and significantly affected. This finding indicates that the baseline findings are driven by women with these characteristics.

In Table A11, we report the results of heterogeneous analysis for first marriages by education, beauty, intelligence, age, and hukou at age 12. In Column (1) we report the baseline estimates for comparison. Compared to the insignificant effect of DPR and housing prices on first marriages, we find a wide range of effect heterogeneity. For the effect of DPR, women with low education (less than 11 years), below-average intelligent scores, and rural hukou at age 12 increase first marriage rates when DPR increases. As women with these characteristics are more likely to have lower socioeconomic status, a potential explanation is that facing a higher liquidity constraint, these women are more likely to seek the support of a spouse for a home purchase. For the effect of housing price, women with low education and rural hukou at age 12 decrease first marriage rates when housing price increases. This suggests that when housing price is high, chances of first marriage for these women are lower, possibly explained by a high financial burden of housing purchase.

Figure A1: National Down Payment Rate



Notes: The national DPR values are collected from policy documents issued by PBC and CBIRC.

Figure A2: Sample coverage

Cities with DPR data: · ***Covered by CFPS*** · Not covered by CFPS

Notes: The figure list the 35 cities from which the DPR values are collected. Cities covered by the CFPS samples are highlighted in bold, italic, and serif fonts.

Table A1: Changes of DPR policies over time

	Year	Month	Policy Type	Specifics
DPR as a National Policy	2001	November	Earliest record	DPR set at 20% nationally
	2005	March	Tightening	DPR raised to 30% in the major cities
	2008	October	Loosening	DPR lowered to a national 20%
	2010	April	Tightening	30% DPR for housing units over 90 sqms
	2010	September	Tightening	30% for all first purchases
	2015	September	Loosening	25% in cities without housing purchase restrictions
DPR localized in the major cities since 2015				
City-specific	2016	December	Tightening	DPR 20%-35% in major cities
	2023	August	Loosening	Minimum DPR 20% with local adjustments
	2024	May	Loosening	Minimum DPR 15% with local adjustments

Table A2: Summary Statistics over the Full List of Variables in the Baseline Regressions

	First-Birth Sample (1)	Higher-Order-Birth Sample (2)	First Marriage Sample (3)
Annual Fertility or Marriage Rate	0.063 (0.242)	0.024 (0.154)	0.064 (0.245)
DPR, Current Year	29.285 (2.709)	29.300 (2.740)	29.408 (2.819)
ln(Housing Price Index), Current Year	4.745 (0.158)	4.753 (0.161)	4.773 (0.179)
Age	23.5 (5.4)	36.7 (5.8)	23.2 (5.4)
Calendar Year	2013.9 (2.2)	2012.9 (2.2)	2014.4 (2.5)
Minority	0.040 (0.196)	0.037 (0.189)	0.041 (0.199)
Local Resident	0.779 (0.415)	0.766 (0.423)	0.777 (0.416)
Beauty Score	0.212 (0.701)	0.227 (0.594)	0.214 (0.705)
Intelligence Score	0.212 (0.609)	0.172 (0.542)	0.217 (0.611)
Middle School or Below (Base)	0.248 (0.432)	0.582 (0.493)	0.257 (0.437)
High School	0.284 (0.451)	0.178 (0.383)	0.286 (0.452)
Associate Degree	0.190 (0.392)	0.131 (0.338)	0.191 (0.393)
Bachelor's Degree or Above	0.278 (0.448)	0.109 (0.312)	0.266 (0.442)
Father: Less than Primary School	0.081 (0.273)	0.196 (0.397)	0.077 (0.267)
Father: Primary School	0.193 (0.395)	0.320 (0.466)	0.190 (0.392)
Father: Middle School	0.419 (0.493)	0.247 (0.432)	0.420 (0.494)
Father: High School	0.201 (0.401)	0.134 (0.341)	0.203 (0.402)
Father: Associate Degree	0.037 (0.188)	0.015 (0.120)	0.040 (0.197)
Father: Bachelor's Degree or Above	0.048 (0.213)	0.014 (0.118)	0.049 (0.216)
Father: Education Level Unknown	0.022 (0.148)	0.074 (0.262)	0.020 (0.141)
Mother: Less than Primary School	0.163 (0.369)	0.377 (0.485)	0.153 (0.360)
Mother: Primary School	0.235 (0.424)	0.292 (0.455)	0.235 (0.424)
Mother: Middle School	0.357 (0.479)	0.185 (0.389)	0.359 (0.480)
Mother: High School	0.148 (0.356)	0.072 (0.259)	0.153 (0.360)
Mother: Associate Degree	0.054 (0.227)	0.007 (0.082)	0.057 (0.232)
Mother: Bachelor's Degree or Above	0.021 (0.144)	0.004 (0.065)	0.023 (0.149)
Mother: Education Level Unknown	0.021 (0.145)	0.062 (0.240)	0.020 (0.141)
No Prior Birth	1.000 (0.000)	0.000 (0.000)	1.000 (0.000)
One Boy	0.000 (0.000)	0.385 (0.487)	0.000 (0.000)
One Girl	0.000 (0.000)	0.327 (0.469)	0.000 (0.000)
Two Boys	0.000 (0.000)	0.055 (0.228)	0.000 (0.000)
One Boy and One Girl	0.000 (0.000)	0.132 (0.338)	0.000 (0.000)
Two Girls	0.000 (0.000)	0.081 (0.273)	0.000 (0.000)
Three or More Prior Births	0.000 (0.000)	0.020 (0.141)	0.000 (0.000)
N (Woman-Year)	4,145	7,354	3,829
N (Unique Women)	902	1,471	802
N (Cities)	20	20	20

Notes: Sample means and standard deviations are presented.

Table A3: Correlation between DPR and Housing Price and Macroeconomic Variables

	Dependent = ln(DPR)					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Price)	0.554***	0.561***	0.512***	0.612**	0.627**	0.588*
	(0.122)	(0.119)	(0.127)	(0.200)	(0.203)	(0.222)
Lag of ln(DPR)				-0.386†	-0.390†	-0.402†
				(0.216)	(0.213)	(0.218)
Lag of ln(Price)				0.065	0.061	0.041
				(0.341)	(0.334)	(0.327)
ln(GDP)		0.009	-0.009		-0.010	-0.021
		(0.085)	(0.069)		(0.096)	(0.087)
ln(Population)		-0.305	-0.365		-0.307	-0.342
		(0.276)	(0.276)		(0.266)	(0.258)
ln(Area of Residential Land)		0.114	0.093		0.134	0.115
		(0.110)	(0.120)		(0.128)	(0.133)
ln(Employment in the Primary Industry)			0.024			0.020
			(0.022)			(0.023)
ln(Employment in the Secondary Industry)			0.010			-0.029
			(0.070)			(0.066)
ln(Employment in the Tertiary Industry)			0.016			0.065
			(0.071)			(0.090)
P-Value for Joint F-Test of Macro Variables		[0.521]	[0.629]		[0.438]	[0.420]
Lag Structure	3 years	3 years	3 years	3 years	3 years	3 years
Year FE and City FE	yes	yes	yes	yes	yes	yes
N (Cities)	20	20	20	20	20	20
N (City-by-Years)	165	165	165	165	165	165

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in the parentheses are clustered at the city level. "DPR" refers to the down payment rate in each calendar year in each city. A change in policy in the middle of a calendar year updates DPR in the year if it occurred in the first half of the year, and updates DPR in the next year if it occurred in the second half of the year. "Price" refers to the property price index. For each city and year, we take the geometric average value in the index between new and second-hand homes. Each observation is a city-by-year.

Table A4: Robustness to Adding Controls for Indicators of Purchase Limit

	Dependent Variable: $100 \times Y$					
	First Birth Next Year		Higher-Order Birth Next Year		First Marriage This Year	
	(1)	(2)	(3)	(4)	(5)	(6)
ln(DPR) × 100	-0.095†	-0.086	0.004	0.007	-0.020	0.015
	(0.048)	(0.053)	(0.018)	(0.018)	(0.047)	(0.047)
Lag of ln(DPR) × 100	-0.455***	-0.436***	-0.004	-0.023	-0.131	-0.126
	(0.093)	(0.099)	(0.082)	(0.077)	(0.095)	(0.090)
ln(Price) × 100	-0.096	-0.063	0.157*	0.145*	-0.056	0.007
	(0.085)	(0.093)	(0.060)	(0.066)	(0.064)	(0.105)
Lag of ln(Price) × 100	0.030	0.099	-0.099	-0.164	-0.204†	-0.213
	(0.102)	(0.146)	(0.097)	(0.113)	(0.109)	(0.125)
Purchase Limit Indicator		-0.716		-0.418		-3.238
		(1.888)		(1.259)		(2.902)
Lag of Purchase Limit		-3.941		2.448		-3.798
		(4.280)		(2.604)		(6.715)
High School	-5.472**	-5.475**	-0.489	-0.489	-7.035**	-7.031**
	(1.757)	(1.759)	(0.603)	(0.604)	(1.953)	(1.955)
Associate Degree	-7.043***	-7.059***	-0.129	-0.134	-9.285***	-9.286***
	(1.378)	(1.384)	(0.600)	(0.600)	(2.020)	(2.017)
Bachelor's Degree or Above	-10.742***	-10.747***	-0.323	-0.324	-12.056***	-12.074***
	(1.871)	(1.877)	(0.883)	(0.885)	(2.051)	(2.055)
Beauty Score	0.384	0.380	-0.319	-0.327	1.165	1.176
	(0.746)	(0.746)	(0.614)	(0.615)	(1.030)	(1.021)
Intelligence Score	0.248	0.255	-0.155	-0.151	-0.742	-0.746
	(0.878)	(0.877)	(0.523)	(0.524)	(0.869)	(0.866)
p values for Joint Test on Limit and Its Lag		[0.643]		[0.301]		[0.512]
Lag Structure	3 years	3 years	3 years	3 years	3 years	3 years
Baseline Controls	yes	yes	yes	yes	yes	yes
N (Woman-Year)	4,145	4,145	7,354	7,354	3,829	3,829
N (Unique Women)	902	902	1,471	1,471	802	802
N (Cities)	20	20	20	20	20	20

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in the parentheses are clustered at the city level. "DPR" refers to the down payment rate in each calendar year in each city. A change in policy in the middle of a calendar year updates DPR in the year if it occurred in the first half of the year, and updates DPR in the next year if it occurred in the second half of the year. "Price" refers to the property price index. "Purchase limit indicator" is a dummy variable indicating whether there is any restriction that prevent people without local hukou from purchasing properties in the urban area. Columns denoted "3 years" for the lag structure show effects of averages of most recent three lags of ln(DPR), ln(Price), and the "Purchase Limit." For each city and year, we take the geometric average value in the index between new and second-hand homes. Each observation is a woman by calendar year during 2010-2019. Samples are restricted to (1) the CFPS gene member women aged 16-45; and (2) calendar years before or containing the transition in the corresponding dependent variable. We also control for dummy variables that indicating imputation of beauty scores and intelligence scores.

Table A5: Robustness Checks Using Different Number of Lags in Down Payment Rates and Housing Price

	Dependent Variable: $100 \times Y$											
	First Birth Next Year				Higher-Order Birth Next Year				First Marriage			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
100 × ln(DPR), Current Year	-0.034	-0.046	-0.048	-0.082†	0.001	0.004	-0.006	0.000	-0.009	-0.017	-0.013	0.001
	(0.048)	(0.040)	(0.047)	(0.046)	(0.020)	(0.017)	(0.022)	(0.021)	(0.048)	(0.045)	(0.047)	(0.048)
100 × ln(DPR), 1 Year Ago		-0.130**	-0.133*	-0.177***		-0.004	-0.017	-0.008		-0.099†	-0.096†	-0.088†
		(0.036)	(0.057)	(0.045)		(0.028)	(0.035)	(0.035)		(0.056)	(0.052)	(0.049)
100 × ln(DPR), 2 Years Ago			-0.024	-0.071			-0.041	-0.033			0.023	0.044
			(0.094)	(0.077)			(0.062)	(0.056)			(0.066)	(0.050)
100 × ln(DPR), 3 Years Ago				-0.161*				0.036				0.023
				(0.076)				(0.045)				(0.088)
100 × ln(Price), Current Year	-0.033	-0.032	-0.095	-0.096	0.170**	0.176*	0.156*	0.157†	0.015	0.051	0.051	-0.028
	(0.099)	(0.077)	(0.077)	(0.077)	(0.054)	(0.067)	(0.073)	(0.076)	(0.066)	(0.058)	(0.106)	(0.101)
100 × ln(Price), 1 Year Ago		-0.039	0.050	0.052		-0.076	-0.059	-0.058		-0.089	-0.086	-0.160
		(0.080)	(0.114)	(0.107)		(0.065)	(0.084)	(0.085)		(0.075)	(0.146)	(0.147)
100 × ln(Price), 2 Years Ago			-0.129	-0.062			0.011	-0.016			-0.024	0.196
			(0.145)	(0.123)			(0.055)	(0.065)			(0.185)	(0.177)
100 × ln(Price), 3 Years Ago				0.006				0.040				-0.417*
				(0.189)				(0.146)				(0.148)
Baseline Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
N (Woman-Year)	4,145	4,145	4,145	4,145	7,354	7,354	7,354	7,354	3,829	3,829	3,829	3,829
N (Unique Women)	902	902	902	902	1,471	1,471	1,471	1,471	802	802	802	802
N (Cities)	20	20	20	20	20	20	20	20	20	20	20	20

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in the parentheses are clustered at the city level. "DPR" refers to the down payment rate in each calendar year in each city. A change in policy in the middle of a calendar year updates DPR in the year if it occurred in the first half of the year, and updates DPR in the next year if it occurred in the second half of the year. "Price" refers to the property price index. For each city and year, we take the geometric average value in the index between new and second-hand homes. Each observation is a woman by calendar year during 2010-2019. Samples are restricted to (1) the CFPS gene member women aged 16-45; and (2) calendar years before or containing the transition in the corresponding dependent variable.

Table A6: Robustness Checks Using Alternative Control Variables

	Dependent Variable: $100 \times Y$											
	First Birth Next Year				Higher-Order Birth Next Year				First Marriage			
	(1)	(2)	(3)	Baseline (4)	(5)	(6)	(7)	Baseline (8)	(9)	(10)	(11)	Baseline (12)
ln(DPR) × 100	-0.080	-0.070	-0.075	-0.095†	0.004	0.006	0.009	0.004	-0.044	-0.017	-0.018	-0.020
	(0.050)	(0.046)	(0.045)	(0.048)	(0.019)	(0.019)	(0.018)	(0.018)	(0.044)	(0.042)	(0.044)	(0.047)
Lag of ln(DPR) × 100	-0.382**	-0.401**	-0.411**	-0.455***	-0.030	-0.027	-0.027	-0.004	-0.018	-0.050	-0.057	-0.131
	(0.120)	(0.115)	(0.118)	(0.093)	(0.072)	(0.074)	(0.073)	(0.082)	(0.124)	(0.107)	(0.111)	(0.095)
ln(Price) × 100	-0.054	-0.056	-0.051	-0.096	0.119†	0.125*	0.130*	0.157*	0.045	0.007	0.005	-0.056
	(0.072)	(0.067)	(0.066)	(0.085)	(0.058)	(0.057)	(0.058)	(0.060)	(0.066)	(0.064)	(0.065)	(0.064)
Lag of ln(Price) × 100	0.119	0.131	0.141	0.030	-0.092	-0.081	-0.085	-0.099	-0.166	-0.151	-0.144	-0.204†
	(0.113)	(0.119)	(0.115)	(0.102)	(0.088)	(0.087)	(0.089)	(0.097)	(0.183)	(0.163)	(0.157)	(0.109)
High School		-5.182**	-5.472**	-5.472**		-0.815	-0.499	-0.489		-6.849**	-7.056**	-7.035**
		(1.659)	(1.749)	(1.757)		(0.519)	(0.604)	(0.603)		(2.080)	(1.940)	(1.953)
Associate Degree		-7.138***	-7.064***	-7.043***		-0.371	-0.132	-0.129		-9.154***	-9.291***	-9.285***
		(1.553)	(1.367)	(1.378)		(0.645)	(0.600)	(0.600)		(2.194)	(2.014)	(2.020)
Bachelor's Degree or Above		-10.952***	-10.769***	-10.742***		-0.620	-0.324	-0.323		-12.275***	-12.119***	-12.056***
		(1.984)	(1.863)	(1.871)		(0.748)	(0.881)	(0.883)		(1.963)	(2.054)	(2.051)
Beauty Score			0.333	0.384			-0.321	-0.319			1.138	1.165
			(0.740)	(0.746)			(0.616)	(0.614)			(1.019)	(1.030)
Intelligence Score			0.322	0.248			-0.155	-0.155			-0.723	-0.742
			(0.881)	(0.878)			(0.519)	(0.523)			(0.866)	(0.869)
Lag Structure	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years
Year FE, City-Specific Linear Trend	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Age Dummies, Parity by Sex Composition		yes	yes	yes		yes	yes	yes		yes	yes	yes
Ethnicity, Local, Parents' Education			yes	yes			yes	yes			yes	yes
Macro Variables at City-Year Level				yes				yes				yes
N (Woman-Year)	4,145	4,145	4,145	4,145	7,354	7,354	7,354	7,354	3,829	3,829	3,829	3,829
N (Unique Women)	902	902	902	902	1,471	1,471	1,471	1,471	802	802	802	802
N (Cities)	20	20	20	20	20	20	20	20	20	20	20	20

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in the parentheses are clustered at the city level. "DPR" refers to the down payment rate in each calendar year in each city. A change in policy in the middle of a calendar year updates DPR in the year if it occurred in the first half of the year, and updates DPR in the next year if it occurred in the second half of the year. "Price" refers to the property price index. Columns denoted "3 years" for the lag structure show effects of averages of most recent three lags of ln(DPR) and ln(Price). "Macro variables at city-year level" in columns 4, 8, and 12 include the following six variables: log GDP, log population, log area of residential land, log of employment in the first, second, and third industry, respectively. For each city and year, we take the geometric average value in the index between new and second-hand homes. Each observation is a woman by calendar year during 2010-2019. Samples are restricted to (1) the CFPS gene member women aged 16-45; and (2) calendar years before or containing the transition in the corresponding dependent variable. In columns 5-8, we additionally control a set of dummy variables categorizing the sex composition by total number of prior births. In columns 3, 7 and 11, we also control for dummy variables that indicating imputation of beauty scores and intelligence scores.

Table A7: Robustness Checks Using Alternative Cutoff Dates for Policy Changes

	Dependent Variable: $100 \times Y$					
	First Birth Next Year		Higher-Order Birth Next Year		First Marriage	
Policy Date Cutoff $\longrightarrow$	July 1 (1)	Dec 31 (2)	July 1 (3)	Dec 31 (4)	July 1 (5)	Dec 31 (6)
Sample Mean of $100 \times Y$	6.273	6.273	2.434	2.434	6.399	6.399
ln(DPR) $\times$ 100	-0.095†	-0.038	0.004	0.021	-0.020	-0.028
	(0.048)	(0.044)	(0.018)	(0.019)	(0.047)	(0.039)
Lag of ln(DPR) $\times$ 100	-0.455***	-0.351*	-0.004	0.069	-0.131	-0.033
	(0.093)	(0.148)	(0.082)	(0.099)	(0.095)	(0.105)
ln(Price) $\times$ 100	-0.096	-0.091	0.157*	0.160*	-0.056	-0.025
	(0.085)	(0.084)	(0.060)	(0.059)	(0.064)	(0.059)
Lag of ln(Price) $\times$ 100	0.030	0.004	-0.099	-0.148	-0.204†	-0.269†
	(0.102)	(0.128)	(0.097)	(0.121)	(0.109)	(0.133)
Lag Structure	3 years	3 years	3 years	3 years	3 years	3 years
Baseline Controls	yes	yes	yes	yes	yes	yes
N (Woman-Year)	4,145	4,145	7,354	7,354	3,829	3,829
N (Unique Women)	902	902	1,471	1,471	802	802
N (Cities)	20	20	20	20	20	20

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in the parentheses are clustered at the city level. "DPR" refers to the down payment rate in each calendar year in each city. "Policy date cutoff" denotes the date by which a change in policy in the middle of a calendar year is counted as an update in DPR in the same year. "Price" refers to the property price index. Each observation is a woman by calendar year during 2010-2019. Samples are restricted to (1) the CFPS gene member women aged 16-45; (2) calendar years before or containing the transition in the corresponding dependent variable.

Table A8: Robustness Check to Relaxing the Sample Restriction by Excluding Migrants

	Dependent Variable: $100 \times Y$					
	First Birth Next Year		Higher-Order Birth Next Year		First Marriage	
Including Migrants $\longrightarrow$	Yes (1)	No (2)	Yes (3)	No (4)	Yes (5)	No (6)
Sample Mean of $100 \times Y$	6.273	6.384	2.434	2.520	6.399	6.582
ln(DPR) $\times$ 100	-0.095†	-0.134†	0.004	0.017	-0.020	0.019
	(0.048)	(0.071)	(0.018)	(0.020)	(0.047)	(0.057)
Lag of ln(DPR) $\times$ 100	-0.455***	-0.412*	-0.004	0.047	-0.131	-0.055
	(0.093)	(0.155)	(0.082)	(0.086)	(0.095)	(0.108)
ln(Price) $\times$ 100	-0.096	-0.101	0.157*	0.180*	-0.056	-0.140†
	(0.085)	(0.087)	(0.060)	(0.068)	(0.064)	(0.078)
Lag of ln(Price) $\times$ 100	0.030	-0.049	-0.099	-0.181	-0.204†	-0.444**
	(0.102)	(0.194)	(0.097)	(0.113)	(0.109)	(0.134)
Lag Structure	3 years	3 years	3 years	3 years	3 years	3 years
Baseline Controls	yes	yes	yes	yes	yes	yes
N (Woman-Year)	4,145	3,227	7,354	5,634	3,829	2,978
N (Unique Women)	902	731	1,471	1,128	802	654
N (Cities)	20	20	20	20	20	20

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in the parentheses are clustered at the city level. "DPR" refers to the down payment rate in each calendar year in each city. "Price" refers to the property price index. Each observation is a woman by calendar year during 2010-2019. Samples are restricted to (1) the CFPS gene member women aged 16-45; (2) calendar years before or containing the transition in the corresponding dependent variable.

Table A9: Robustness Check to Using Alternative Age Cutoffs

	Dependent Variable: $100 \times Y$											
	First Birth Next Year				Higher-Order Birth Next Year				First Marriage			
Starting Age $\longrightarrow$	16	19	22	25	16	19	22	25	16	19	22	25
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Sample Mean of $100 \times Y$	6.273	7.621	9.792	12.267	2.434	2.434	2.438	2.351	6.399	8.290	11.076	14.706
ln(DPR) $\times$ 100	-0.095†	-0.094	-0.092	-0.194	0.004	0.004	0.004	0.006	-0.020	-0.012	0.044	0.001
	(0.048)	(0.061)	(0.081)	(0.128)	(0.018)	(0.018)	(0.018)	(0.018)	(0.047)	(0.061)	(0.103)	(0.138)
Lag of ln(DPR) $\times$ 100	-0.455***	-0.565***	-0.857***	-1.306**	-0.004	-0.004	-0.005	0.014	-0.131	-0.137	-0.249	-0.427
	(0.093)	(0.134)	(0.215)	(0.364)	(0.082)	(0.082)	(0.081)	(0.085)	(0.095)	(0.129)	(0.251)	(0.479)
ln(Price) $\times$ 100	-0.096	-0.114	-0.143	-0.077	0.157*	0.157*	0.158*	0.175**	-0.056	-0.079	-0.118	-0.305
	(0.085)	(0.110)	(0.148)	(0.230)	(0.060)	(0.060)	(0.060)	(0.059)	(0.064)	(0.080)	(0.143)	(0.218)
Lag of ln(Price) $\times$ 100	0.030	-0.004	0.059	0.018	-0.099	-0.099	-0.098	-0.109	-0.204†	-0.282†	-0.420†	-0.685†
	(0.102)	(0.129)	(0.202)	(0.347)	(0.097)	(0.097)	(0.097)	(0.096)	(0.109)	(0.144)	(0.206)	(0.358)
Lag Structure	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years	3 years
Baseline Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
N (Woman-Year)	4,145	3,346	2,451	1,557	7,354	7,353	7,342	7,231	3,829	2,907	1,914	1,020
N (Unique Women)	902	797	645	457	1,471	1,471	1,470	1,456	802	690	514	324
N (Cities)	20	20	20	20	20	20	20	20	20	20	20	20

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in the parentheses are clustered at the city level. "DPR" refers to the down payment rate in each calendar year in each city. "Price" refers to the property price index. Each observation is a woman by calendar year during 2010-2019. Samples are restricted to (1) the CFPS gene member women; (2) calendar years before or containing the transition in the corresponding dependent variable.

Table A10: Subgroup Heterogeneity Effects of Down Payment Rates on Higher-Order Births

Y = Higher-Order Births Next Year ×100	All	Education		Age		Hukou at Age 12	
		0-11	12+	16-30	31-45	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample Mean of 100 × Y	2.434	2.128	2.860	7.171	1.462	2.537	1.997
ln(DPR) × 100	0.004	0.051*	-0.074*	-0.007	0.010	0.010	-0.046
	(0.018)	(0.018)	(0.033)	(0.105)	(0.025)	(0.021)	(0.072)
Lag of ln(DPR) × 100	-0.004	0.082	-0.134	-0.419	0.046	0.001	-0.040
	(0.082)	(0.109)	(0.182)	(0.460)	(0.093)	(0.085)	(0.293)
ln(Price) × 100	0.157*	0.055	0.327**	0.102	0.170**	0.138†	0.253*
	(0.060)	(0.094)	(0.098)	(0.233)	(0.058)	(0.069)	(0.107)
Lag of ln(Price) × 100	-0.099	-0.290†	0.207	-0.081	-0.072	-0.132	-0.050
	(0.097)	(0.148)	(0.121)	(0.447)	(0.099)	(0.126)	(0.251)
Lag Structure	3 years	3 years	3 years	3 years	3 years	3 years	3 years
Baseline Controls	yes	yes	yes	yes	yes	yes	yes
N (Woman-Year)	7,354	4,277	3,077	1,255	6,087	5,952	1,402
N (Unique Women)	1,471	851	620	421	1,317	1,173	298
N (Cities)	20	20	20	20	20	20	19

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in the parentheses are clustered at the city level. "DPR" refers to the down payment rate in each calendar year in each city. "Price" refers to the property price index. Columns denoted "3 years" for the lag structure show effects of averages of most recent three lags of ln(DPR) and ln(Price). For each city and year, we take the geometric average value in the index between new and second-hand homes. Each observation is a woman by calendar year during 2010-2019. Samples are restricted to (1) the CFPS gene member women aged 16-45; and (2) calendar years before the year of nth birth but after the year of n-1th birth. Beauty and intelligence scores are time-invariant measures constructed in the following steps: (1) taking the within-individual modes of the raw score in a scale of 1-7 across observed waves; (2) normalizing within sample women by age group of three years; and (3) imputing zeros for missing values and generating an indicator flagging the imputation. In Columns (8) and (9), the age groups are divided around the mean age of second birth as shown in Figure 3.

Table A11: Subgroup Heterogeneity Effects of Down Payment Rates on the First Marriage

Y = First Marriage ×100	All	Education		Age		Hukou at Age 12	
		0-11	16+	16-24	25-45	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample Mean of 100 × Y	6.399	5.471	9.036	6.935	14.706	7.529	4.677
ln(DPR) × 100	-0.020	-0.024	-0.007	0.012	0.001	-0.008	-0.043
	(0.047)	(0.047)	(0.145)	(0.158)	(0.138)	(0.069)	(0.075)
Lag of ln(DPR) × 100	-0.131	-0.229†	-0.036	-0.401	-0.427	-0.051	-0.156
	(0.095)	(0.118)	(0.478)	(0.446)	(0.479)	(0.156)	(0.226)
ln(Price) × 100	-0.056	-0.146*	0.084	0.026	-0.305	-0.113	-0.039
	(0.064)	(0.058)	(0.210)	(0.184)	(0.218)	(0.086)	(0.209)
Lag of ln(Price) × 100	-0.204†	0.012	-0.552	0.264	-0.685†	-0.143	-0.390†
	(0.109)	(0.135)	(0.372)	(0.372)	(0.358)	(0.194)	(0.188)
Lag Structure	3 years	3 years	3 years	3 years	3 years	3 years	3 years
Baseline Controls	yes	yes	yes	yes	yes	yes	yes
N (Woman-Year)	3,829	2,833	996	894	1,020	2,311	1,518
N (Unique Women)	802	683	227	401	324	455	347
N (Cities)	20	20	20	20	20	20	20

Notes: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in the parentheses are clustered at the city level. "DPR" refers to the down payment rate in each calendar year in each city. "Price" refers to the property price index. Columns denoted "3 years" for the lag structure show effects of averages of most recent three lags of ln(DPR) and ln(Price). For each city and year, we take the geometric average value in the index between new and second-hand homes. Each observation is a woman by calendar year during 2010-2019. Samples are restricted to (1) the CFPS gene member women aged 16-45; and (2) calendar years before or containing the year of first marriage. Beauty and intelligence scores are time-invariant measures constructed in the following steps: (1) taking the within-individual modes of the raw score in a scale of 1-7 across observed waves; (2) normalizing within sample women by age group of three years; and (3) imputing zeros for missing values and generating an indicator flagging the imputation. In Columns (8) and (9), the age groups are divided around the mean age of first marriage as shown in Figure 3.