Housing and Fertility

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Abstract

This paper examines the impact of access to housing on fertility rates using random variation from housing credit lotteries in Brazil. We find that obtaining housing increases the average probability of having a child by 3.8% and the number of children by 3.2%. For 20-25-year-olds, the corresponding effects are 32% and 33%, with no increase in fertility for people above age 40. The lifetime fertility increase for a 20-year old is twice as large from obtaining housing immediately relative to obtaining it at age 30. The increase in fertility is stronger for households in areas with lower quality housing, greater rental expenses relative to income, and those with lower household income and lower female income share. These results suggest that alleviating housing credit and physical space constraints can significantly increase fertility.

JEL Codes: D14, G23, J62, R20, R23.
Keywords: access to credit, mortgages, housing, fertility, household finance.

1 Introduction

The world is aging. Fertility rates have fallen to historic lows globally (Figure 1). The replacement level—the fertility rate at which a population is stable, not counting immigration—is 2.1 children per woman, and in 2021, countries comprising 73% of the world's population were beneath this threshold, compared to just 4.3% in 1960 (United Nations, 2022; GBD 2021 Fertility and Forecasting Collaborators, 2024; OECD, 2024). This trend has significant implications for economic growth, labor markets, and the design of social welfare systems in both developed and developing economies (Barro and Becker, 1989; Bloom, Canning, and Fink, 2010). Governments worldwide have implemented various policies to address the issue, with varying degrees of success.[1] Despite these efforts, however, the downward trend in the fertility rate continues. Understanding the factors that influence fertility decisions is therefore a first-order concern for both policy and research.

A factor that has received relatively limited attention is how housing—typically the largest household asset (Gomes, Haliassos, and Ramadorai, 2021; Goetzmann, Spaenjers, and Van Nieuwerburgh, 2021)—shapes fertility choices. Housing costs have risen around the world, and access to mortgage credit—typically the largest household liability—has not kept pace, making it increasingly difficult for many households to achieve their desired housing outcomes. Commentators have suggested that access to adequate and affordable housing could provide families with the necessary space and financial security to have children,[2] but rigorous empirical evidence on this relationship is scarce.

We study the impact of access to mortgages and housing on fertility rates, exploiting random variation in access to housing credit through a lottery system used by housing consortia (known as "consórcios") in Brazil. Consórcios pool household contributions, and run lotteries to randomly allocate lump-sums to participants to finance house purchases. To identify the causal effect on fertility, we compare the fertility outcomes of lottery winners to those of non-winners. Our main finding is that

[1] According to Olivetti and Petrongolo (2017), direct financial incentives for child-bearing have shown limited effectiveness in boosting fertility rates. Policies improving work-family balance, like affordable childcare, have been more promising, though effects remain modest. See for example, "Putting a price on them" *The Economist*, May 25th, 2024, which discusses the persistent challenge of boosting fertility through policy.

[2] See, for example, "Birth rates in rich countries halve to hit record low", *Financial Times*, June 20, 2024.

randomly obtaining a mortgage to finance a housing purchase through consórcios increases the unconditional probability of having a child by 1.15 percentage points and the number of children by 0.0164, economically relevant numbers that translate into increases of 3 and 4 percent of the unconditional base rates of these outcomes. More importantly, we find that the effects of housing credit are far stronger for 20 to 25 year-olds in their peak child-bearing years, who exhibit a 32 percent increase in the probability of child-bearing and a 33 percent increase in the number of children relative to the base-rate; we find no increase in fertility for those above age 40. Consistent with simple theory that we develop, we find that the fertility response is stronger for households that initially reside in areas with lower-quality housing or higher rental expenses relative to income, for lower-income households, and for households where female income comprises a lower fraction of total household income.

To better understand the forces through which access to housing can impact fertility, we work out a theoretical model that extends the classical quantity-quality trade-off framework (Becker and Lewis, 1973; Becker and Tomes, 1976; Doepke et al., 2023) to incorporate housing. In the model, households derive utility from consumption, housing, and the number of children, and make investments in the quality of children's human capital via costly education. We introduce a space constraint into the model, as a way to capture utility costs suffered by households for having a larger number of children in a smaller physical space.

The model yields several useful predictions. Most obviously, improved housing conditions (increased space per person) leads to an increase in the optimal number of children. Second, the effects differ across the household income distribution. The effect of housing on the fertility rate is lower for high-income households because of the higher opportunity cost of their time, whereas the effect is higher for low-income households as they are closer to the binding space constraint. Third, assuming that women bear the larger part of child-rearing costs, the model predicts that gaining access to housing is less beneficial for households with a higher female income share—capturing the relatively higher opportunity cost of women's time in such households. These insights into the factors driving household decision-making guide our empirical analysis and aid interpretation of our results.

Identifying the causal effect of access to housing credit on fertility decisions is challenging, as accessing credit is usually the result of endogenous selection that can depend on characteristics correlated with fertility outcomes. For example, households with better income prospects during their peak years for both fertility and income generation might have easier access to credit markets, as well as an easier time bearing the costs of child-rearing. Our empirical research design therefore tracks participants in a group-lending mechanism in Brazil, i.e., consórcios, which use credit lotteries that generate random variation in the timing of access to credit to finance a house purchase. An advantage of studying variation in timing of access is that it enables sharp inferences about fertility, given the natural variation in child-bearing ability across the life-cycle.

Consórcios are a widespread group-lending mechanism to finance durable goods in Brazil, with more than 6.7 million participants in any given year. We focus on real estate groups, which comprise individuals that wish to finance housing purchases. Every month, participants in a consórcio group make identical contributions, which are then allocated to a subset of participants as credit to finance housing purchases. Recipients of credit are determined through both lotteries and via auctions. When allocating credit through lotteries, consórcios use a contractually specified algorithm to translate the outcome of the national lottery (*Loteria Federal*) into ticket numbers that have been assigned to all participants beforehand. All participants continue their contributions from the inception of the group until all participants have been awarded credit.

Our empirical design builds on Doornik et al. (2024b), who also exploit time-series variation in access to credit lotteries in vehicle-purchase consórcios. In our setup, we exploit the random timing of access to housing credit through a staggered difference-in-differences (DID) methodology in which we compare outcomes for participants who receive credit through a lottery with participants who have not yet received credit within the same group (using group-time fixed effects).[3] This design controls for selection by and into a particular group. Moreover, the fact that participants in a consórcio group do not share social ties and are not geographically proximate mitigates concerns about multiplier or other general equilibrium effects that may differentially affect treated and untreated individuals (Cai and Szeidl, 2019; Breza

[3]We ensure that our results are not affected by heterogeneous treatment effects across units over time (Callaway and Sant'Anna, 2021; Sun and Abraham, 2021; Borusyak, Jaravel, and Spiess, forthcoming; de Chaisemartin and D'Haultfoeuille, 2020; Goldsmith-Pinkham, Hull, and Kolesar, 2022).

and Kinnan, 2020).

Most groups allocate credit through both lotteries and auctions. The choice to participate in a consórcio through an auction rather than a lottery could be related to other variables that affect fertility. To resolve potential endogeneity concerns related to auctions, we therefore implement an instrumental variables (IV) strategy. The contractual design of consórcios, combined with our data, allows us to simulate all groups *as if* all credit were allocated through lotteries. Specifically, since we know the algorithm that a group employs to translate the national lottery number into the winning ticket number, we can identify who would have obtained credit through a lottery if the group held no auctions. We use these simulated lottery winners as an instrument to predict the actual lottery winners (see Section 4 for details). Since the instrument is based on the outcomes of random lotteries, it is orthogonal to other characteristics and satisfies the exclusion restriction.

We begin with reduced-form analysis, comparing outcomes for participants that are predicted to win a housing credit lottery with outcomes for participants who have not yet been predicted to win a housing credit lottery within the same group. Our reduced-form results show that being predicted to be a lottery winner is associated with increased fertility rates. To recover the treatment effect for individuals who win a credit lottery and receive credit to purchase a home, we instrument the actual lottery winners with the simulated outcomes in our IV analysis. We find that the unconditional probability of having a child increases by 1.15 percentage points (3.8% relative to the mean), and the number of children increases by 0.016 (3.2% relative to the mean) in the years following credit access.

We next investigate how the treatment effect changes across the life-cycle. Medical literature suggests that child-bearing for the female reproductive system is most productive until about the age of 40 (Velde and Pearson, 2002; Jacobsson, Ladfors, and Milsom, 2004). After this age, the chances of successfully conceiving deteriorate rapidly, and child-bearing also involves significant health and mortality risks for both mother and child. We find that the largest increase in fertility is for individuals in the age group between 20 and 25 years. For this set of individuals, the treatment effect of random credit allocation increases the probability of having a child by 2 percentage points (32% relative to the mean for this group), and the number of children increases by 0.0261 (33% relative to the mean for this group). Consistent with the medical literature above, we find no effect for individuals above age 40.

To assess the long-term impact on fertility, we investigate individuals who are at least 40 years old at the end of the sample (beyond productive child-bearing years) and were aged less than 40 at the point of joining consórcio groups (within productive child-bearing years). By analyzing the random variation in wait times experienced by this set of individuals to obtain housing credit, we estimate the decline in total fertility for each year of waiting for housing. Our estimates reveal that for an individual who wishes to obtain housing between ages 20-24 but obtains it ten years later (30-34), total lifetime fertility is half that from receiving housing access immediately upon joining. These results highlight the substantial impact that housing accessibility can have on fertility decisions, and suggest that policies to improve access to housing could positively influence overall fertility rates. More specifically, a targeted approach to accelerate access to housing credit and higher-quality housing for those in their peak child-bearing years could be particularly effective at increasing fertility.

We find that the fertility response to home-ownership varies cross-sectionally in a manner consistent with the model. First, households that initially resided in lower quality and more congested housing experience a larger increase in fertility upon becoming homeowners. This suggests that alleviating space constraints is a key mechanism through which housing affects fertility decisions. Second, the positive impact on fertility is stronger for households living in areas with higher rental expenses relative to income. This finding indicates that reducing housing costs is another important channel for the effects of housing credit on fertility, as it potentially frees up resources that can be directed toward child-rearing expenses. That said, the reduction of rental expenses only partially explains our results, since the size of the rent-to-income ratio plateaus at higher levels, consistent with the "freeing up resources" channel being important only at lower rent-to-income levels.

Finally, we examine the cross-sectional variation in treatment effects with both household income and the female share in household income. As predicted by the model, the increase in fertility is larger for lower-income households. Under the assumption that credit constraints increase with declines in income, this result suggests that relaxing credit constraints can remove impediments to increased fertility. We also find that the increase in fertility is higher for households with a lower share of female income in total household income, i.e., households for which women's opportunity cost of child-rearing is likely lower. Overall, our empirical findings align closely with the predictions of our model.

The remainder of this paper is organized as follows. The introduction continues below with a brief review of related literature. Section 2 develops the theoretical framework that provides structure for our analysis. Section 3 provides a detailed discussion of consórcio institutions, mortgage credit, fertility trends in Brazil, and our data sources as background for the research design. Section 4 describes our research design and empirical analysis. Section 5 concludes.

Related Literature

Fertility We contribute to the literature on fertility choice and the determinants of fertility.[4] The canonical models of quantity-quality trade-offs (Becker, 1960; Becker and Tomes, 1976) suggest that a larger number of children (quantity) tends to lower investment in each individual child (quality). More recent studies examine the role of factors such as income, education, and labor market conditions (e.g., De La Croix and Doepke (2003); Manuelli and Seshadri (2009); Aaronson, Lange, and Mazumder (2014); Kim, Tertilt, and Yum (2024)); land use regulation (Shoag and Russell, 2018); preferences and priorities (Kearney, Levine, and Pardue, 2022); and financial incentives via maternal leave (Lalive and Zweimüller, 2009; Raute, 2019) in shaping fertility patterns. Others have explored how housing-related factors relate to fertility, such as house prices and housing wealth (Yi and Zhang, 2010; Clark, 2012; Dettling and Kearney, 2014; Ang et al., 2024) and financial deregulation (Hacamo, 2020). Recently, Cumming and Dettling (2024) find that fertility increases following a decline in monetary policy rates via reduced mortgage payments. Our paper complements this work by uncovering the significant effects of access to housing on fertility outcomes using a large-scale natural experiment and studying the economic mechanisms through which these effects occur.

Our paper is also related to the literature on the role of intra-household bargaining in fertility decisions. Doepke and Kindermann (2019) propose a theoretical framework to understand how power dynamics within households can influence fertility choices. By examining the link between female bargaining power and fertility rates, their research underscores the significance of intra-household negotiations in shaping

[4] Doepke et al. (2023) provide an excellent survey of the literature.

reproductive behavior. Similarly, Ashraf, Field, and Lee (2014) provide evidence on the importance of household bargaining in fertility decisions through an experimental study in Zambia. They document that when women have greater bargaining power, they are better able to achieve their desired fertility outcomes, even in the face of opposition from their husbands. We provide empirical evidence that the fertility response to improved housing conditions is weaker for households with higher female income shares, suggesting that women with greater bargaining power may prioritize other goals over having additional children. These results shed light on the effects of housing and mortgage credit on intra-household dynamics and fertility choices.

Housing We contribute to the literature on the effects of home-ownership. The literature in this area has studied how home-ownership affects property maintenance and community involvement (Rossi-Hansberg, Sarte, and Owens III, 2010; Rossi and Weber, 1996; DiPasquale and Glaeser, 1999; Di Tella, Galiant, and Schargrodsky, 2007); children's lives (Green and White, 1997; Haurin, Parcel, and Haurin, 2002);[5] portfolio choice (Lustig and Van Nieuwerburgh, 2005; Sinai and Souleles, 2005; Chetty, Sándor, and Szeidl, 2017); consumption (Case, Quigley, and Shiller, 2005; Campbell and Cocco, 2007; Carroll, Otsuka, and Slacalek, 2011; Mian, Rao, and Sufi, 2013; Berger et al., 2018; Paiella and Pistaferri, 2017; Aladangady, 2017; Browning, Gørtz, and Leth-Petersen, 2013; Guren et al., 2021); and labor market outcomes (Belchior, Gonzaga, and Ulyssea, 2023).[6]

More recently, Sodini et al. (2023) cleverly investigate the effect of home-ownership on wealth accumulation and consumption using a quasi-experimental research design studying privatization policies that were initially rolled out to a group of renters, and then abruptly stopped. Apart from the differences in setting and research design, our paper specifically focuses on how access to home-ownership affects fertility decisions. Dovetailing with the conclusions of Sodini et al. (2023), our work provides justification for housing subsidies to incentivize child-bearing, a key policy target in recent years.[7]

[5]This includes interesting work on the impacts of neighborhood quality on children's welfare and future life outcomes (Bayer, Ferreira, and McMillan, 2007; Kling, Liebman, and Katz, 2007; Jacob, Kapustin, and Ludwig, 2015; Chetty, Hendren, and Katz, 2016; Chyn, 2018; Agostinelli et al., 2024).

[6]In contrast to examining the effects of access to housing, others examine the effects of housing wealth conditional on owning a home (Lovenheim and Mumford, 2013a; Daysal et al., 2021; Tan et al., 2023).

[7]See, for instance, Poterba and Sinai (2008); Jeske, Krueger, and Mitman (2013); Elenev, Landvoigt, and Van Nieuwerburgh (2016); Diamond and McQuade (2019); Kuhn, Schularick, and Steins

Access to Credit Our work also relates to the literature on access to credit, where there is an active debate on the effects of extending credit to low-income households (Karlan and Zinman, 2011; Angelucci, Karlan, and Zinman, 2015; Attanasio et al., 2015; Augsburg et al., 2015; Banerjee et al., 2015; Crepon et al., 2015; Tarozzi, Desai, and Johnson, 2015; Meager, 2019; Gertler, Green, and Wolfram, 2024; Bari et al., 2024). Relatedly, Doornik et al. (2024a) argue that consórcios expand access to credit, and recipients of credit in consórcios improve labor mobility (Doornik et al., 2024b) and reduce female mortality (Doornik, Schoenherr, and Skrastins, 2024). Our work adds to this debate, showing that randomized access to housing credit affects the important household decision of child-bearing.

2 Theoretical Framework

This section provides a simple theoretical framework to illustrate the main effects of access to housing on the fertility rate. The model builds on Doepke et al. (2023), extending this setup to incorporate housing. The model predictions are used to inform our empirical hypothesis tests.

2.1 Model

Households derive utility from consumption (c), housing (h), the number of children (n), and children's human capital through education (e). Household preferences are represented by a log-linear utility function:

$$u(c, h, n, e) = log(c) + \beta \cdot log(h) + \delta \cdot log(n) + \delta \cdot \gamma \cdot log(e + \theta) \tag{1}$$

where $\beta, \delta > 0$ are parameters that represent the marginal value to the household of housing and children, respectively. Parental investments in education raise children's human capital according to the investment technology $q = (\theta + e)^\gamma$, where γ captures the return on educational investments, and θ represents intrinsic human capital without parental investment.

Parents earn a market wage w, and raising each child takes a fixed amount of

(2020); Bach, Calvet, and Sodini (2020); Favilukis, Mabille, and Van Nieuwerburgh (2023), including the effects of rent controls (Diamond, McQuade, and Qian, 2019).

time, ϕ. The price of educational investment is p per unit of e, which can also be thought of as school fees. The price per unit of housing is p_h, capturing rental flows, the cost of utilities, maintenance, and all other housing-related expenses.

The household faces a budget constraint determined by their wage (w), the time cost of raising children (ϕ), the cost of education investment (p), and the price of housing p_h:

$$c + p_h \cdot h + p \cdot e \cdot n \leq (1 - \phi \cdot n) \cdot w \tag{2}$$

We normalize the time endowment to one, meaning that ϕ represents the fraction of time per child necessary for child-rearing.[8]

Additionally, we introduce a space constraint, which limits the number of children based on available housing space.[9] The space constraint is written as:

$$\frac{n}{h} \leq s \tag{3}$$

where s represents housing quality, which we mainly interpret as the spaciousness of the housing unit. The parameter s can be interpreted as the maximum number of children that can be comfortably accommodated per unit of housing. For instance, a higher s might represent a home with more bedrooms, larger living areas, or better layout efficiency, allowing for more children to be raised comfortably within the same amount of overall housing space h. Conversely, a lower s would indicate a less spacious or less efficiently designed living space, limiting the number of children that can be comfortably housed.

Solving the model yields the optimal number of children ($n^\star$):

$$n^\star = \frac{\delta}{1 + \delta + \beta} \cdot \frac{(1 - \gamma + \frac{\beta}{\delta})}{\left(\phi - \frac{p}{w} \cdot \theta + \frac{1}{w} \cdot \frac{p_h}{s}\right)} \tag{4}$$

[8]We can interpret w more broadly as any income source that requires significant time investment. This includes traditional labor income (i.e. wages), but also entrepreneurship, and any other time-intensive income activity, all of which would be affected by the time demands of child-rearing. In Internet Appendix B, we also augment the model by including other sources of income that do not require significant time investment, such as financial income.

[9]We could also introduce a continuous cost associated with child-rearing as physical space becomes progressively more limited, but use this simple constraint formulation here in the interests of brevity.

The derivation of this solution is explained in Online Appendix A. The optimal number of children ($n^\star$) depends on several factors. There is a clear negative effect of raising the opportunity cost of child-rearing (ϕ)—a higher time cost of raising each child directly reduces the incentive to have more children. There is also a negative effect from increases in the price of housing per unit of housing quality (p_h/s): as house prices rise relative to housing quality, this tightens the space constraint, thus reducing the optimal level of fertility.

Other factors, such as the returns to education (γ) and the price of education relative to wages (p/w), also influence $n^\star$, with parents substituting quantity for quality when education investments yield greater returns, or choosing to have more children but investing less in each child's education when education becomes more expensive relative to income. The model highlights the key trade-offs parents face when deciding on their optimal number of children in the presence of housing and education considerations.[10]

2.2 The Effect of Access to Housing on Fertility

In the setting that we study, randomly provided access to housing credit from the consórcio has two effects which can be mapped directly to the model. The first is that the per-period housing cost p_h reduces. This is because a winning household pre-win pays both the periodic consórcio mortgage payment, as well as per-period rental costs to access housing services. Post-win, rental expenses no longer need to be paid, so there is a decline in the per-period housing cost. The second is that there are differences in the both quality and floor-space area of rental and purchase housing stock. Random access to credit thus permits an increase in housing quality s in the model.[11]

Proposition 1 discusses the effects of access to housing (which we model, given the discussion above, as a decline in p_h/s) on fertility.

[10]In Online Appendix B.3, we extend our theoretical model to compare the effects of housing policies on fertility with other potential interventions such as paid childcare, childcare subsidies, and education costs. These extensions provide insights for future research.

[11]Mortgage payments, being a fixed and mandatory commitment for homeowners in the consórcio program, effectively reduce disposable income. Therefore, without loss of generality, we consider w (wages) to be net of mortgage payments in our model. This allows us to focus on the effects of other housing-related costs and factors on fertility decisions.

Proposition 1. Homeownership increases the optimal number of children n^* of the household, that is $\frac{dn^*}{d(p_h/s)} < 0$.

Proof: From the solution of the optimal number of children $n^\star$ given in equation (4), it is easy to see that:

$$\frac{\partial n^\star}{\partial \left(\frac{p_h}{s}\right)} = -\frac{1}{w} \cdot \frac{\delta}{1+\beta+\delta\gamma} \cdot \frac{(1-\gamma+\frac{\beta}{\delta})}{(\phi - \frac{p}{w}\cdot\theta + \frac{1}{w}\cdot\frac{p_h}{s})^2} < 0$$

□

Therefore, with lower p_h and/or higher s, $n^\star$ rises. Intuitively, lower housing costs and more spacious housing make it easier for households to accommodate a larger family size.

Next, Proposition 2 explores potential heterogeneity based on household income on the effects of access to housing on fertility.

Proposition 2. The effects of home-ownership on fertility decrease with household income if $\frac{p_h}{s} < w\cdot\phi + p\cdot\theta$.

Proof: From Proposition 1, if we calculate the cross-partial derivative with respect to p_h/s and w, we have:

$$\frac{\partial^2 n^\star}{\partial \left(\frac{p_h}{s}\right)\partial w} = -\frac{\delta(1-\gamma+\frac{\beta}{\delta})}{1+\beta+\delta\gamma} \cdot \frac{(w\cdot\phi - p\cdot\theta + \frac{p_h}{s}) - 2\cdot w\cdot\phi}{(w\cdot\phi - p\cdot\theta + \frac{p_h}{s})^3}$$

The left-hand side of the equation above is positive if $\frac{p_h}{s} < w\cdot\phi + p\cdot\theta$. Thus, the effect of access to housing (lower p_h and/or higher s) on the optimal number of children is attenuated for higher levels of income w. □

The intuition behind Proposition 2 is that when housing is relatively affordable, lower-income households experience a greater positive impact on their fertility decisions. For higher-income households, the time and resources devoted to child-rearing come at a higher cost in terms of foregone income and career opportunities. Lower-income households, on the other hand, have lower opportunity costs, and may be more sensitive to changes in housing affordability, leading to a larger positive impact on their fertility decisions when housing becomes more accessible or less expensive.

Proposition 3. Assuming that only women do the child-rearing, and that women's contribution to total household wage income is a fraction $k \in [0, 1]$, the household's budget constraint is now given by $c+p_h \cdot h+p \cdot e \cdot n \leq (1 - \phi \cdot n \cdot k) \cdot w$.[12] In this case, an increase in the fraction of female income in the household k reduces the effect of home-ownership on the optimal number of children.

Proof: With the new budget constraint, the optimal number of children $n^\star$ is given by:

$$n^\star = \frac{\delta}{1 + \delta + \beta} \cdot \frac{1 - \gamma + \frac{\beta}{\delta}}{(k \cdot \phi - \frac{p}{w} \cdot \theta + \frac{1}{w} \cdot \frac{p_h}{s})}, \tag{5}$$

which makes the partial derivative of $n^\star$ with respect to p_h/s be:

$$\frac{\partial n^\star}{\partial \left(\frac{p_h}{s}\right)} = -\frac{1}{w} \cdot \frac{\delta}{1 + \delta + \beta} \cdot \frac{1 - \gamma + \frac{\beta}{\delta}}{(k\phi - \frac{p}{\theta} + \frac{1}{w}\frac{p_h}{s})^2}$$

Thus, to show that an increase in the fraction of female income in the household k reduces the effect of homeownership on the number of optimal children, we take second derivative with respect to k which is

$$\frac{\partial n^\star}{\partial \left(\frac{p_h}{s}\right) \partial k} = \frac{2 \cdot \phi}{w} \cdot \frac{\delta}{1 + \delta + \beta} \cdot \frac{1 - \gamma + \frac{\beta}{\delta}}{(k \cdot \phi - \frac{p}{w} \cdot \theta + \frac{1}{w} \cdot \frac{p_h}{s})^3} > 0$$

□

Proposition 3 suggests that when women bear a larger share of the opportunity cost of childrearing, the positive impact of homeownership on fertility is attenuated the higher the female income share in the household. A higher share implies a greater loss of earnings associated with having more children, even when the space constraint is relaxed.

[12] The right-hand side of this expression is now $w - n \cdot \phi \cdot k \cdot w$, which reflects the total household wage reduction associated with foregone female income under the maintained assumptions.

2.3 Testable Implications

The theoretical model presented above provides several testable implications that guide our empirical analysis:

TH1 Home-ownership increases fertility, with lower housing costs and/or more spacious/higher quality housing leading to a higher optimal number of children (Proposition 1).

TH2 The positive effect of homeownership on fertility is stronger for households with lower initial housing quality. These households have greater potential for improvement in s, while those in high-quality housing have less room for improvement, resulting in a weaker effect on fertility (Proposition 1).

TH3 The positive effect of home-ownership on fertility decreases with household income, as higher-income households face greater opportunity costs associated with child-rearing (Proposition 2).

TH4 The positive effect of homeownership on fertility is expected to be weaker for households with a higher share of female income, as women bear a larger share of the opportunity cost of child-rearing (Proposition 3).

These testable implications provide a benchmark for the empirical strategy explained in the next sections, which aims to estimate the causal effect of access to housing on fertility, and to investigate potential heterogeneity in this effect based on household characteristics.

3 Institutional Background and Data

This section provides institutional background and data about the principal variables that we study. We provide a description of consórcio groups, how they allocate credit designated for the purchase of real estate, and institutional details of processes surrounding default. We next discuss trends and summary statistics on fertility in Brazil, and then turn to a more detailed description of the data that we utilize in our empirical analysis.

3.1 Brazilian Real Estate Credit Market

We begin by discussing the broader context of the Brazilian real estate credit market, and the role of consórcios in this environment. Many Brazilian households live in cramped housing conditions with limited physical space per person, making access to adequate housing a particularly important constraint. For potential homeowners in Brazil who wish to acquire a home but lack the resources to do so, there are two main options: borrowing through the Brazilian institutional real estate credit market, or participating in real estate consórcios.

The Brazilian institutional real estate credit market comprises two main systems: the Sistema Financeiro de Habitação (SFH) and the Sistema Financeiro Imobiliário (SFI). The SFH, created in the 1960s, focuses on providing subsidized long-term housing financing to lower-income individuals. On the other hand, the SFI, established in 1997, covers all other types of real estate loans not handled by the SFH. The main innovation of the SFI was the integration of real estate operations with the capital market, which allowed for the creation of mortgage-backed securities (CRIs) and the development of a secondary market for real estate credits.

Both SFH and SFI are primarily sourced from savings deposits by banks and other financial institutions that are part of the Sistema Brasileiro de Poupança e Empréstimo (SBPE). The Conselho Monetário Nacional (CMN) establishes the minimum percentages of resources that these entities must apply to real estate financing operations. In 2023, capital markets accounted for 38% of real estate financing, surpassing savings (accounting for 36%).

Real estate consórcios have emerged as a significant way to finance real estate purchases in Brazil, representing approximately 6% of total real estate credit in 2022—consórcios accounted for BRL 16 billion in real estate financing, while SFH and SFI combined for BRL 251 billion.[13,14] In 2023, the number of participants reached a historical high of 1.5 million, with the amount of credit outstanding nearly reaching BRL 150 billion.[15] These institutions are managed by authorized administrators,

[13] https://blog.abac.org.br/drops-de-mercado/credito-imobiliario-contratado-consÃ§rcio-2022

[14] https://homehub.com.br/blog/credito-imobiliario-em-maio-queda-de-418-em-relacao-a-2022-revela-desafios/

[15] https://blog.abac.org.br/drops-de-mercado/creditos-contratados-consÃ§rcio-de-imoveis-sobem-2023

and monitored by the Banco Central do Brasil (BCB). Participants in real estate consórcios contribute monthly installments to a shared pool of funds. They allocate funds to members through random lottery draws, or bidding processes; we describe the specific institutional details below.

3.2 Real Estate Consórcios

Basic Features

Real estate consórcios administer financial products where participants pool funds to save towards the purchase of a property. These groups are typically administered by the finance division of a real estate developer, a bank, or a specialty finance company. The administrator is responsible for marketing the consórcio, selecting participants, managing payments, and enforcing contracts. They are compensated through an administrative fee levied on all participants. Screening of applicants is minimal, and it is easy for anyone with a social security number in Brazil to participate.

Participants are informed about the identity of the administrator, the price of the property, the group's duration, and the target number of participants when selecting a group. All participants make equal pre-determined payments at regular intervals, typically monthly, which are adjusted for inflation. The monthly payments also cover the administrative fee, and establish a guarantee fund to cover losses from individual defaults. All participants must continue their contributions for the full term, including those who have received credit. The group continues until all participants have received credit for a property.

Due to the organization through a central administrator, personal connections between consórcio participants are uncommon. Enforcement against default relies on the purchased property serving as physical collateral.

Credit Allocation

All participants in a consórcio begin by making equal contributions into the communal pool. Each month, some participants receive credit to purchase a property, decided through either lotteries and auctions. At least one property must be allocated through a lottery each period by law.

Lotteries are based on the national lottery in Brazil (*Loteria Federal*), which is broadcast on TV. Each participant receives a ticket number at the beginning of the group. Based on an algorithm which is contract-specific, the national lottery number is translated into a ticket number, and the participant holding the respective ticket number is declared the winner of the lottery. Each algorithm is designed such that at the beginning of the group, all participants have the same unconditional probability of winning the lottery at any point in time. A detailed description of one such algorithm is provided in Online Appendix C.1.

In auctions, participants bid a fraction of the property's total value. Bids advance payments in time, similar to making a higher down-payment, and future contributions are adjusted accordingly. For example, if a property is worth $500,000 with monthly contributions of $10,000, a participant bidding 40 percent would pay $200,000 immediately, and cease payments 20 months before the group's end. Winners of bidding obtain housing credit once all documentation is completed, the same as for lottery winners, and the bid is paid.

When a participant is allocated the credit, they receive a lump sum equivalent to the value specified in their contract. This credit must be used for housing purposes within 3 to 6 months, depending on the contract with the administrator. The property is bought in the participant's name, but with a fiduciary lien in favor of the consórcio group until all payments are completed. This ensures the credit is used for housing purposes and cannot be diverted. While primarily used for property acquisition, the credit can also be applied to fund home remodeling, or purchase land for future construction, offering flexibility in improving one's housing situation, such as by alleviating space constraints.

Defaults

After an individual obtains credit and purchases a property, the property becomes the group's collateral which can be seized if payments are late. Participants cannot sell the property without the administrator's approval, to ensure that it is not transferred to a high credit risk individual.[16] This means that even after winning the lottery and

[16] Consorciós register all real estate and vehicle collateral under the fiduciary lien (*alienação fiduciária*) which allows for out-of-court settlement in the event of default. As a consequence, collateral can be recovered quickly upon default.

receiving the funds to purchase a home, participants do not have immediate access to their home equity, though they can purchase and consume housing services.

If a participant defaults before receiving credit, their past payments are retained until they win a lottery, at which point their paid-in funds are released, instead of the full amount of credit being allocated. Moreover, defaulted participants receive only a fraction of these previous payments, owing to a contractual penalty of roughly 16 percent on average.[17]

Defaults before receiving credit do not affect other participants' win-related payouts. While the set of participants gets smaller with pre-win defaults, the pool of funds available to these participants increases because of the penalty mentioned above. However, defaults after receiving credit can impose costs on the group if the collateral value is insufficient to recover the full credit amount. Losses are first covered by the guarantee fund, which is designed to make group collapse unlikely, and administrators usually absorb any excess losses. In practice, losses have historically rarely exceeded the guarantee fund's capacity. That said, in the event that this does occur, any remaining funds in the reserve fund are split equally among participants at the group's termination.

Aggregate Statistics

In 2015, housing consórcios had 1,028,326 active participants, which is equivalent to 0.7 percent of the working age population or 2.06 percent of all formally employed individuals in Brazil. The average house value across all groups is BRL 156,031 (roughly USD 87,000). Average monthly payments amount to about 0.4 percent of the value of the house. These payments cover the costs of the house, an administrative fee, and a guarantee fund to cover losses. The share of houses allocated through lotteries is 42.09 percent with the rest allocated through auctions. Consistent with consórcio groups not relying on social ties among participants, the average group comprises 934 participants from 248 different municipalities in 22 different states (out of a total of 27). Thus, social ties among participants are uncommon.

Not all participants obtain a house. 3.6 percent of participants exit the group before they obtain credit due to missed payments. Participants who exit before obtaining a house have their payments returned after a deduction of an average penalty

[17] Doornik et al. (2024a) explore the benefits of the penalty theoretically and empirically.

of 16 percent. An additional 6.2 percent of participants default after receiving credit, in which case the house may be seized by the group to cover outstanding payments. If the liquidation value of the house is higher than the outstanding payments, non-defaulting participants keep the difference.

3.3 Fertility in Brazil

Brazil has experienced a significant decline in its fertility rate over the past six decades, and the level of Brazil's fertility rate is relatively low compared to other Latin American countries. According to data from the Brazilian Institute for Geography and Statistics (IBGE), the country's fertility rate has fallen from 6.3 children per woman in 1960 to 1.9 in 2010, which is well below the population replacement rate of 2.1.[18] This trend is attributable to several factors, including housing costs, our topic of study in this paper, such as urbanization, advances in medicine, increased use of contraceptive methods, sex education, family planning, the substantial participation of women in the labor market, and the rising costs of raising and caring for children. Brazil's unique factors, such as its national health system (SUS), which provides wide access to contraceptive methods, and its comprehensive sex education in schools, may also have contributed to the country's relatively faster decline in fertility rates compared to other Latin American nations.

There are significant regional differences in fertility rates within the country. The Southeast region, which includes the four Brazilian cities with the highest GDP, has the lowest fertility rate at 1.67 children per woman. In contrast, the North and Northeast regions, which are the poorest in Brazil, have the highest fertility rates at 2.34 and 1.92, respectively.[19] These regional differences reflect cross-regional variation in urbanization, economic development, and access to education and healthcare. Despite these regional variations, Brazil's overall fertility rate remains below the critical threshold of 2.1, highlighting the concern with potential social and economic implications of a rapidly aging population.

[18] See data in `https://educa.ibge.gov.br/professores/educa-atividades/17658-fecundidade-no-brasil-1940-a-2010.html`.

[19] See more here: `http://tabnet.datasus.gov.br/cgi/idb2012/a05b.htm`.

3.4 Data

The data for this paper comes from two main sources. Data on consórcios is from the Sistema de Administração de Grupos/Cotas de Consórcio (SAG) database, which is maintained by the Banco Central do Brasil. Information on children per household is from the Population Registry at the Receita Federal. Data on labor market outcomes is from the Relação Anual de Informações Sociais (RAIS), an employer-employee matched database that includes employment information and wages for all formally employed workers in Brazil.

The database on consórcios provides information on the administrator, all participants, the good that is being allocated (e.g., real estate or vehicles), and the dates when credit is awarded to participants. The BCB has been collecting data on all consórcio groups since October 15, 2008, including consórcios that started earlier, but were still ongoing at that time. The earliest starting date of a consórcio group in our sample is 2002, and the sample ends in 2020.

For our empirical analysis, we also require information about the algorithms through which consórcio groups translate the national lottery draw into a number that matches the ticket number of a participant. This information is not readily available in the database, so we hand-collect these data from as many administrators as possible, and verify the algorithms in the data. The final sample for our analysis thus comprises all groups for which we can collect the algorithm used to translate the national lottery number into a number that matches the ticket number of a participant, and for which our algorithm correctly preat least one lottery winner. Our data track all lottery winners for each of these groups.[20]

Table I provides descriptive statistics for our sample. Panel A provides descriptive statistics at the level of consórcio groups, and Panel B at the participant level. The data contain 3,040 consórcio groups that allocate housing through auctions and random lotteries between 2002 and 2020. The sample of members of these groups who win a lottery leaves us with an average group size of 50 participants, with a median of 52 participants. Thus, the total number of participants in our sample is 153,155. The average group lasts for 154 months, with a median of 144 months.

22 percent of participants have a formal job with a monthly income of BRL 2,480.

[20]Table A.1 in the Internet Appendix provides a description of all variables in the paper.

This compares to an average formal employment share of 94 (37) percent and a monthly salary of BRL 2,098 (BRL 1,715) for mortgage applicants (Brazilian working-age population). In Brazil, a mortgage from a bank can be obtained only against formally verifiable income, which is why there is a high formalization rate. The average participant is 40.5 years old, and 67 percent of all participants are men. 26 percent of participants have a child and there are 0.44 children per participant.

4 Empirical Analysis

This section presents our empirical analysis to assess the effects of access to credit for investment in housing on the fertility rate.

4.1 Baseline Specification

To exploit time-series variation in credit allocation in consórcios, we estimate the following specification to assess the relationship between access to mortgage and fertility outcomes:

$$Fertility_{it} = \alpha_i + \alpha_{gt} + \beta \cdot win_{it} + e_{it} \tag{6}$$

where i denotes individuals, g denotes consórcio groups, and t denotes time. $Fertility_{it}$ is the outcome of interest and win_{it} is a dummy variable that takes the value of one for individuals who win a real estate credit lottery in year t or earlier, and zero otherwise. Employing a difference-in-differences methodology with individual fixed effects (α_i) tracks changes for the same individual and controls for sample composition effects. Group-time fixed effects (α_{gt}) control for selection by and into a specific group. [21]

As described in Section 3.2, groups allocate credit through a combination of auctions and lotteries. While we restrict the sample to participants who obtain credit through lotteries, the presence of auctions generates an endogeneity problem with respect to changes in the pool of lottery participants over time. Specifically, individuals who remain in the lottery pool over time are more likely to not have obtained credit through auctions, which may reflect characteristics correlated with the deci-

[21] These are called “risk group” fixed effects in the language of Angrist and Pischke (2009) and ensure that we are comparing winning and losing participants within specific consórcio groups.

sion to have a child. For example, individuals may not bid in auctions because of limited funds as a result of tighter financial constraints. In this case, staying in the lottery pool may be correlated with a lower ability to have children. Alternatively, individuals may not bid in auctions because they do not feel like they urgently need access to housing since their space constraint is not binding. In this case, staying in the lottery pool may be correlated with a higher ability to have children. As a result, endogenous selection into the lottery pool over time could bias the estimate of β in equation (6) upwards or downwards.

4.2 Instrumental Variable Approach

To overcome this selection challenge, we apply the instrumental variable approach in Doornik et al. (2024b). Our data on participants' ticket numbers and historical national lottery numbers enable us to simulate credit lotteries as if there were no auctions. This allows us to identify which participants would have won a lottery in a given month if a group allocated all credit through lotteries and there was no selection into the lottery pool over time.

We implement this procedure for each group, translating national lottery numbers into ticket numbers based on the group's algorithm. By doing so, period by period, we obtain the schedule of lottery winners as if all credit were allocated through lotteries. For example, consider a group with 150 participants that runs for 50 months and allocates credit to three individuals each period, two based on auctions and one based on a lottery. By applying the algorithm to the national lottery number each month and behaving as if all participants entered the lottery, we can replicate an "as-if" allocation, i.e., as if one lottery was held each month for all 150 participants, with no auction option, one winner, and no attrition from the pool of participants. This procedure provides us with a group of 50 predicted lottery winners, determined by the outcomes of the national lottery. Because of the presence of auctions in real-world groups, the instrument is not perfectly correlated with winning a lottery.[22]

We begin our analysis by documenting that the simulated lotteries are a strong

[22]For instance, an individual predicted to win the lottery in our simulation might have already received credit in a different period because the originally predicted winner had already received credit through an auction, thus making the individual next in line.

predictor of winning an actual lottery by estimating

$$win_{it} = \alpha_i + \alpha_{gt} + \beta \cdot win\ sim_{it} + e_{it} \tag{7}$$

where $win\ sim_{it}$ is a dummy variable that takes the value of one from the year an individual is predicted to win a simulated credit lottery and zero before. Since $win\ sim_{it}$ is based on simulated random lotteries, it is orthogonal to e_{it}, conditional on group membership. Unlike win_{it} in equation (6), which represents actual lottery wins potentially influenced by auctions, $win\ sim_{it}$ provides an exogenous instrument for credit allocation, addressing potential endogeneity concerns.

Panel A of Table II presents the first-stage estimation results from equation (7). The results show that being predicted a lottery winner in simulated lotteries is associated with a 31.3 percentage point higher probability of winning an actual lottery. The instrument is strong, with an F-statistic ranging from 90.92 to 132.27.

Having established that winning a simulated lottery is a strong predictor of winning an actual lottery, we examine the reduced-form relationship between simulated lottery wins and the fertility rate by estimating:

$$Fertility_{it} = \alpha_i + \alpha_{gt} + \beta \cdot win\ sim_{it} + e_{it}. \tag{8}$$

Panel B of Table II shows the reduced-form results. Column I displays the effects of getting access to housing credit on the probability of having children, while Column II shows the effects on the number of children. Both columns demonstrate that our instrument positively predicts a higher fertility rate in families predicted to win the lottery. Being predicted to win the lottery increases the probability of having a child by 0.36 percentage point and the number of children by 0.0051.[23] Overall, these results reinforce the validity of the instrument since it is related to our outcome variables.

The reduced form estimates in Panel B of Table II can be interpreted as the fertility effects of winning a credit lottery with the probability given in the respective first stage. To obtain estimates for the fertility effects of an individual winning a

[23]Since some participants could already own a home before participation, these are likely lower-bound estimates of the effect of housing.

credit lottery, we estimate a two-stage least squares (2SLS) specification

$$Fertility_{it} = \alpha_i + \alpha_{gt} + \beta \cdot win_{it} + e_{it} \tag{9}$$

where the variables win_{it} are dummy variables taking the value of one from the year an individual wins a lottery, and are instrumented with the simulated lottery outcomes ($win\ sim_{it}$).[24]

The results from estimating equation (9) are reported in Panel C of Table II. The results in column I imply that the probability of having a child increases by 1.15 percentage points in the years after individuals obtain credit. This effect corresponds to an increase of about 3.8 percent of the unconditional mean of the outcome variable. The results in column II imply that the number of children increases by 0.0164 in the years after the individuals obtain the credit. This effect represents an increase of 3.2 percent of the unconditional mean. Altogether, these results suggest that access to credit for investment in housing leads to an increase in the number of children in a household.

To formally test for the absence of pre-trends in our outcome variables, we run a dynamic 2SLS specification as follows:

$$Fertility_{it} = \alpha_i + \alpha_{gt} + \sum_{s=-5, s\neq -1}^{5} \beta_s \cdot win_{it}^s + e_{it} \tag{10}$$

where win_{it}^s are dummy variables equal to 1 s years relative to when an individual wins a lottery, and 0 otherwise. This variable is instrumented with the corresponding simulated lottery outcomes $win\ sim_{it}^s$. We omit the year before an individual wins a lottery, which is equivalent to normalizing to zero in the year before winning a lottery. We pool the years from 5 years before individuals win a lottery and the years from 5 years after individuals win a lottery into one estimate, respectively.

Figure 2 provides the dynamic evolution of the effect of winning the consórcio lottery on the probability of having children (in red) and the number of children (in blue). The results in this figure indicate no systematic pre-treatment trends for any of the outcome variables, suggesting that the parallel trend assumption holds.

[24]Since the endogenous variable is just identified, the 2SLS estimate is a Wald estimate and is equivalent to the reduced-form coefficient scaled by the first-stage estimate.

Moreover, we observe a clear increase in all outcomes after treatment that is increasing over time, providing evidence for the causal impact of winning the housing lottery on fertility decisions.

Recent literature in econometrics has highlighted potential issues when examining staggered treatment effects. Specifically, short-term effects may be overweighted when the treatment effect is not constant over time for the same unit (Goodman-Bacon, 2021; Borusyak, Jaravel, and Spiess, forthcoming) or across units such that treatment effects vary with the timing of treatment (Callaway and Sant'Anna, 2021; Sun and Abraham, 2021; Borusyak, Jaravel, and Spiess, forthcoming; de Chaisemartin and D'Haultfoeuille, 2020; Goldsmith-Pinkham, Hull, and Kolesar, 2022). In our context, this concern would arise if treatment effects for earlier and later lottery winners within the same consórcio group were different.

To address this issue and support the validity of our estimates, we employ the methodology developed by Sun and Abraham (2021), which is robust to heterogeneous treatment effects across individuals over time. Since neither of the methods above supports 2SLS estimation, we examine the reduced-form estimates:

$$Fertility_{it} = \alpha_i + \alpha_{gt} + \sum_{s=-5, s\neq -1}^{5} \beta_s \cdot win\ sim_{it}^{s} + e_{it}. \tag{11}$$

Figure 3 presents the results from estimating equation (11) with (dashed lines) and without (solid lines) the application of the Sun and Abraham (2021) methodology for the probability of having a child (in red) and the number of children (in blue). The estimates obtained using both approaches are nearly identical, suggesting that heterogeneous treatment effects do not pose a concern in our setting. If anything, the point estimates without the application of Sun and Abraham (2021) are somewhat more conservative. Since the variation in equations (9) and (10) are based on the same variation as the reduced form estimates, the robustness of the reduced form estimates to heterogeneity in treatment effects across units over time implies that the IV estimates are robust to the same type of heterogeneity.

Next, we investigate the treatment effect by sex. To separately assess the effect of obtaining access to mortgage for men and women, we interact the independent variables and instruments in equation (10) with an indicator variable, representing the sex—male or female—of a participant i. The results are reported in Figure 4. The impact of access to a mortgage on the number of children in the household is similar for both male and female participants.

Finally, we explore how the treatment effect varies with the age of a participant. Medical literature suggests that, on average, the end of fertility occurs around the early 40s (Velde and Pearson, 2002; Voorhis, 2007; Eijkemans et al., 2014).[25] These findings suggest that it is safe for women to bear children until the age of 40. After this age, child-bearing involves risks to both the mother and the child. The mother can develop severe health consequences such as gestational diabetes, pre-eclampsia, placental abruption, or even death (Berg et al., 1996; Jacobsson, Ladfors, and Milsom, 2004). The child is also at an increased risk of Down's syndrome and other chromosomal abnormalities (Sherman et al., 2007).

To assess how the treatment effect changes with age, we interact the independent variables and instruments in equation (8) with the age of participants at the time of joining the group. Figure 5 reveals that the effect of accessing a mortgage is most pronounced for individuals aged 20-35.[26] The economic magnitudes of the effect are substantial. Individuals aged 20 to 25 years experience a 33% increase in the probability of having a child, and a 32% increase in the number of children. For individuals aged 25 to 35 years old, the corresponding effects range between 10% and 21% for the probability of having a child and 9% to 13% for the number of children. Importantly, consistent with the medical literature, we do not observe any treatment effects for individuals aged 40 or more.

It is worth noting that in our study, access to home equity or collateral is not a potential channel through which home-ownership affects fertility decisions. This is due to the specific institutional features of the consórcio system in Brazil. As discussed in Section 3.2, real estate properties purchased through consórcios are subject to a fiduciary lien, which means that the consórcio administrator retains legal ownership of the property until the credit is fully repaid. Consequently, all participants obtain legal home-ownership at the end of the group when the ownership titles are

[25] Eijkemans et al. (2014) found that almost 90% of women have their last child before 45 years old, and 100% by 50 years old. In addition, the probability of successful in vitro fertilization drops significantly with age, from 50% around the late 20s to less than 5% for women over 43 years old (Voorhis, 2007).

[26] The large effects for ages 20-35 capture both first births and additional children, with first births likely predominating at this age.

transferred to participants. This institutional feature distinguishes our study from other contexts where home equity or collateral might play a role in influencing the decisions of homeowners, such as, for example, Hurst and Stafford (2004); Lustig and Van Nieuwerburgh (2005, 2010); Leth-Petersen (2010); Mian and Sufi (2011); Lovenheim and Mumford (2013b); Dettling and Kearney (2014); DeFusco (2018) and Cloyne et al. (2019).

4.3 Total Fertility

In this section, we assess how each year of delayed access to housing affects overall lifetime fertility. It is hypothetically possible that in anticipation of eventually obtaining housing, consorcio participants simply postpone conceiving children, with limited effects on total fertility, but the evidence above is inconsistent with a simple delay. This is because the dynamic estimates of winners and not-yet winners in Figures 2 and 3 do not eventually converge. Our analysis in this section strengthens this conclusion, demonstrating significant and lasting effects on total lifetime fertility.

To gauge the effect on lifetime fertility, we analyze individuals who are above age 40 in 2020, the final period in our sample. This approach aligns with the medical literature, as well as our previous findings which show that fertility significantly declines after age 40. We also consider only those individuals who were younger than 40 at the point of joining the group, thus ensuring they could potentially have children after joining the group. For this sample, we estimate the following two-stage least squares equation:

$$Fertility_i = \alpha_g + year\ win_i + e_i. \tag{12}$$

where $year\ win_i$ measures the number of years (since joining the group) an individual takes to win the credit lottery, instrumented with the simulated waiting period ($year\ win\ simulated_i$). $Fertility_i$ measures fertility—number of children, or probability to have a child—for individual i in 2020. The identifying variation comes from the fact that some people win a credit lottery earlier than others within the same group (in the presence of group fixed effects α_g).

To assess how the treatment effect changes with age, we interact the independent variables and instruments in equation (12) with the age of participant i at the time of joining the group. To control for differences in fertility rates by cohort, we also add year of birth fixed effects. Table III reveals significant economic effects stemming from delayed access to housing in the age group between 20-34. More specifically, an individual who is 20 is 0.012 pp less likely to be a parent and has 0.0218 fewer kids for each additional year of waiting for housing. Figure 6 puts these estimates in relative terms. For an individual who wishes to acquire a house at the age of 20, obtaining the house at age 21 leads to 6% fewer children, and obtaining a house at age 30 leads to approximately 50% fewer children over their lifetime. Overall, the evidence here is consistent with delayed access to housing significantly negatively affecting lifetime fertility.

4.4 Cross-Sectional Variation in Treatment Effects

In this section, we investigate the heterogeneous treatment effects predicted by our theoretical model in Section 2. We present three key cross-sectional tests to investigate the heterogeneous effects of housing on fertility. First, we examine how the quality of initial housing conditions influences the fertility response to accessing a mortgage, testing the prediction that the benefits of improved housing are more pronounced for households that are initially in lower-quality dwellings. Second, we explore the role of rental payment savings in altering the impact of housing on fertility, assessing whether the effect is stronger for households experiencing greater reductions in rental expenses relative to income. Third, we analyze the relationship between income and the fertility response to housing, investigating whether higher-income households exhibit a weaker effect due to the increased opportunity cost of having children. Finally, we investigate the extent to which intra-household gender roles (namely, female contribution to household finance) affects the change in fertility with access to housing credit.

4.4.1 Quality of Housing

Our model suggests that the benefits of housing on fertility are more significant when the quality of housing experiences a greater improvement following access to a mortgage. To test this prediction, we acquire data on housing quality at the origin zip code level, and examine whether the treatment effect is stronger for households residing in areas with lower-quality housing, or in areas with a high number of people per bedroom.

Specifically, we use data from the Brazilian Census to construct measures of housing quality, such as the proportion of households with wood walls or exposed brick walls, as well as the average number of people in the household per bedroom. We then estimate equation (9) and interact these housing quality measures with the independent variable as well as the instrument to assess whether the impact on fertility varies based on initial housing conditions. If the model's predictions hold, we expect to find larger treatment effects for households living in areas with poorer housing quality.

Table IV provides the results from this analysis. The results support the prediction of the model, that is, the treatment effect on fertility is greater, the poorer the initial living conditions. Both the probability of having a child and the number of children increase more for individuals living in zip codes with a higher fraction of households with wood walls (columns I and IV), exposed brick walls (columns II and V), and a higher number of people per bedroom (columns III and VI). The cross-sectional results are stronger for the number of children, "intensive margin" outcome (columns IV to VI), than for the probability of having children, "extensive margin" outcome (columns I to III) both in terms of statistical significant and economic magnitude. This suggests that while the impact of improved housing on the extensive margin of fertility (the decision to have children) may be less sensitive to initial housing conditions, the effect on the intensive margin (the number of children) is more strongly influenced by the quality of housing.

The economic magnitudes of these effects are substantial. For instance, a one-unit increase in the fraction of households with exposed brick walls in a zip code ($ExpBrickWalls_{zip}$) is associated with a 7.74 percent increase in the number of children following random access to a mortgage (column V). This effect size is approximately five times larger than the average treatment effect, and represents an increase of almost 15 percent relative to the unconditional average of the outcome variable. This implies that the fertility response to improved housing for households living in areas with a high prevalence of exposed brick walls is not only statistically significant but also economically meaningful.

4.4.2 Rental Savings

It is important to note that, as opposed to a classic mortgage, winning a credit lottery in a consórcio does not affect the total number or timing of mortgage payments. All participants make contributions from the start of the group until the end. Thus, mortgage payments are equivalent for both lottery winners and not-yet lottery winners, and cancel out in our empirical specifications (owing to the group-time fixed effects). That said, randomly accessing a mortgage allows individuals to move into their purchased house and therefore to stop paying rent for housing services.

The model predicts that the benefits of housing on fertility are greater when individuals experience greater savings on rent after winning a credit lottery. These savings can alleviate budget constraints faced by households, enabling them to have children. To test this prediction, we use data from the Brazilian census on the ratio of rental expenses to household income at the origin zip code level, and investigate whether the treatment effect is stronger for households in areas with higher rental expenses.

Table V presents the results, estimated using equation (9). Columns I and III show that individuals in zip codes with a 10 percent higher rental expenses to income ratio are associated with a 0.58 percent higher probability of having a child and 0.02 higher number of children, respectively. These numbers represent 2 percent and 4.2 percent of the unconditional averages of the respective outcome variables, indicating a meaningful impact on fertility.

Columns II and IV estimate the effect of access to mortgage on fertility outcomes by rent-to-income ratio quartiles. There are two aspects to notice from these results. First, while the treatment effect is weaker for households in the lowest quartile (Q1) of the rent-to-income ratio, the effect is stronger in the other quartiles. Second, the magnitude of the effect is similar for Q2, Q3, and Q4, suggesting that the fertility response to housing is relatively consistent across these quartiles. This finding implies that once households achieve a certain threshold of rental savings (income effect), further increases in rental savings have a low impact on their fertility decisions.[27]

[27] Another potential channel for increased fertility due to housing is the reduced risk associated with homeownership, which can act as a hedge against rent risk (Sinai and Souleles, 2005). However, if this were a primary driver, we would expect to see a more pronounced increase in fertility rates in areas with higher rent-to-income ratios, where rent uncertainty concerns would be greatest. Our analysis does not support this hypothesis.

These results have important implications for understanding the relationship between housing *affordability* (an income effect), and housing *availability* on fertility. While savings on rent (income effect) do seem to play a role in influencing fertility decisions, the fact that the benefits are less pronounced for households in higher rent areas (quartiles three and four) are consistent with the inference that having a house per se, not just housing affordability, is an important factor for household fertility.

4.4.3 Household Income

According to the model, the joint relationship of housing and income on fertility is ambiguous. On the one hand, higher income might allow individuals to purchase a bigger house and further alleviate space constraints. On the other hand, the opportunity costs of having children are higher when labor income is higher. To empirically test the direction of this relationship, we therefore estimate equation (9) and interact our independent and instrumental variables with the consórcio participant's income, their household's total income, and whether the household receives federal benefits, which is a useful indicator of low-income status. These variables are taken from RAIS, Receita Federal and Cadastro Unico.

Table VI presents the results. Columns I and IV show that higher participant income is associated with both a lower probability of having children, and a smaller number of children after randomly accessing a mortgage. These findings suggest that higher income leads to smaller effects of housing on household fertility rates. Similarly, household income is negatively associated with having children upon winning the lottery (columns II and V), although this is only significant when considering the number of children as the outcome variable. Consistent with these results, low-income households receiving federal benefits exhibit higher fertility rates following random housing credit access (see columns III and VI).

Overall, higher-income households experience smaller increases in fertility upon randomly gaining access to housing credit. This finding is consistent with the opportunity cost of having children rising with income, potentially offsetting the fertility benefits of improved housing conditions.

4.4.4 Female Fraction of Household Income

In typical households across the world and in Brazil, women do most of the child-rearing. This leads to a situation in which the time cost of having children depends mostly on women's wages rather than on household total wages. Consistent with this, our model in Section 2 predicts that the benefits of housing decrease with the woman's income share in the household. To test this, we estimate equation (9) and interact the independent and instrumental variables with the share of female income in the household.

Table VII reports the results. We find that both the probability of having a child (column I) and the number of children (column II) decrease with a higher share of female income in the household. The economic magnitude is as follows: a 10 percentage point increase in the female income share is associated with a 0.056 percentage point decrease in the probability of having a child, or about 0.19 percent of the unconditional mean. Similarly, a 10 percentage point increase in the female income share is associated with a 0.0054 decrease in the number of children or about 1 percent of the unconditional mean.

Thus, the opportunity cost of having children is primarily determined by women's wages rather than household wages. The negative relationship between the female income share and the fertility response to housing suggests that as societies become more egalitarian and women contribute a larger portion of household income, the benefits of improved housing conditions on fertility may diminish.

4.4.5 Simultaneous Analysis of Heterogeneous Treatment Effects

In Internet Appendix Table A.2, we simultaneously examine the multiple channels through which housing may affect fertility. We interact winning the consórcio (win_{it}) with variables representing each of the channels discussed in previous sections. The results largely confirm our earlier findings, with housing quality, participant income, and the fraction of female income in the household remaining significant factors. However, the rent-to-income ratio, which continues to positively influence the effect of housing on fertility, loses statistical significance when controlling for these other factors. This suggests that while housing quality, overall income, and the intra-household distribution of income play crucial roles in explaining the effect of housing on fertility, the impact of rental savings may be less pronounced when considered together with these other factors.

4.5 Discussion

Various policies have been studied for their impact on fertility rates. Labor market interventions (such as parental leave extensions) have shown modest effects. Lalive and Zweimüller (2009) found that extending paid parental leave in Austria from one to two years increased higher-order births by 5-7 percentage points. These policies aim to reduce the opportunity cost of having children by providing job security and financial support during early childcare.

Other economic policies show varying results. While Cohen, Dehejia, and Romanov (2013) find substantial fertility increases from child subsidies, Carneiro et al. (2021) observed no significant effect of cash transfers on fertility in Nigeria. These policies typically aim to directly reduce the financial burden of childrearing. Broader economic measures, such as pro-natal transfers and education taxes, have shown significant effects, with Kim, Tertilt, and Yum (2024) reporting a 28% increase in fertility in Korea. These measures often work by altering the relative costs and benefits of having children.

Recent research by Cumming and Dettling (2024) explores how changes in disposable income arising through monetary policy-induced mortgage payment changes can influence fertility. They find that a 1% increase in quarterly disposable income leads to a 0.86% increase in birth rates. This highlights how policies that do not directly target fertility can also have significant impacts on family planning decisions.

In a similar vein, housing interventions offer a different approach to influencing fertility rates. Unlike policies that directly target fertility, housing improvements address broader aspects of family life. Our study finds that access to housing through consórcios increases the probability of having a child by up to 33% and the number of children by 32% for 20 to 25 year-olds. Improved housing conditions may reduce perceived constraints on family size, while simultaneously providing the necessary stability for family planning. These effects are substantial and comparable to some of the larger impacts found in the literature, including those from changes in disposable income due to mortgage payment fluctuations.

Since we rely on an instrumental variable strategy, our estimates are local average treatment effects for individuals targeted by the instrument. Specifically, our estimates apply to consórcio participants who obtain credit for housing purchase through lotteries. Consórcio participants are a selected group of individuals; our estimates apply to this group and may differ for the general population. By revealed preference, consórcio participants expect to benefit from access to housing, which may not apply to the same extent to the average individual in the population. In sum, our estimates apply to individuals who believe that obtaining credit to finance a housing purchase will benefit them, but are unable to invest in housing because they are credit-constrained. Finally, 1.4 percent of participants default on their payments after they receive credit and lose access to housing, meaning that these individuals are only partially treated. To the extent that consorcio participants are similar to mortgage borrowers as discussed in section 3.4, our results could also be informative about this group.

5 Conclusion

By exploiting randomized time-series variation in access to mortgage credit through a group-lending mechanism in Brazil (consórcios), we document that home-ownership has causal, significant, and persistent effects on fertility decisions. Consistent with the relaxation of space constraints, the ability to purchase housing, and the reduction in the housing costs relative to income, individuals who win the consórcio lottery experience an increase in the probability of having children, as well as the number of children. The effects are stronger for households initially residing in areas with lower-quality housing or higher rental expenses relative to income.

Our findings have important policy implications for addressing the challenges posed by declining fertility rates. Policymakers should consider the role of housing markets and policies that encourage home-ownership to affect fertility decisions, and design interventions that promote access to affordable and adequate housing to increase fertility. This may involve expanding access to mortgage credit, particularly for low- and middle-income households, as well as investing in the development of affordable housing stock. Additionally, policies that support the provision of childcare and educational facilities in areas with improved housing conditions can further amplify the positive effects of home-ownership on fertility.

Our results indicate that the positive effect of access to housing on fertility is not merely a result of delayed child-bearing. While individuals may postpone having children until they achieve home-ownership, biological constraints (the fact that fertility declines sharply with age past the age of 40) suggest that the observed increase in fertility is not simply a timing effect. The stronger impact on the number of children, particularly for younger women, supports the notion that improved housing conditions enable households to have more children overall. Our estimates suggest that for an individual aged between 20-24, waiting ten additional years for housing would lead to a total fertility rate that is half as large relative to obtaining housing immediately.

In conclusion, our study demonstrates the significant impact of access to housing on fertility decisions and underscores the importance of considering housing markets and policies in addressing demographic challenges. As policymakers and researchers continue to grapple with the complex interplay of factors influencing fertility rates, the insights provided by our paper offer valuable guidance for designing effective interventions and policies. By promoting access to affordable and adequate housing, supporting the provision of childcare and educational facilities, and leveraging market-based solutions to target credit to high-return populations, policymakers can create an enabling environment for family formation, and mitigate the adverse consequences of declining fertility rates.

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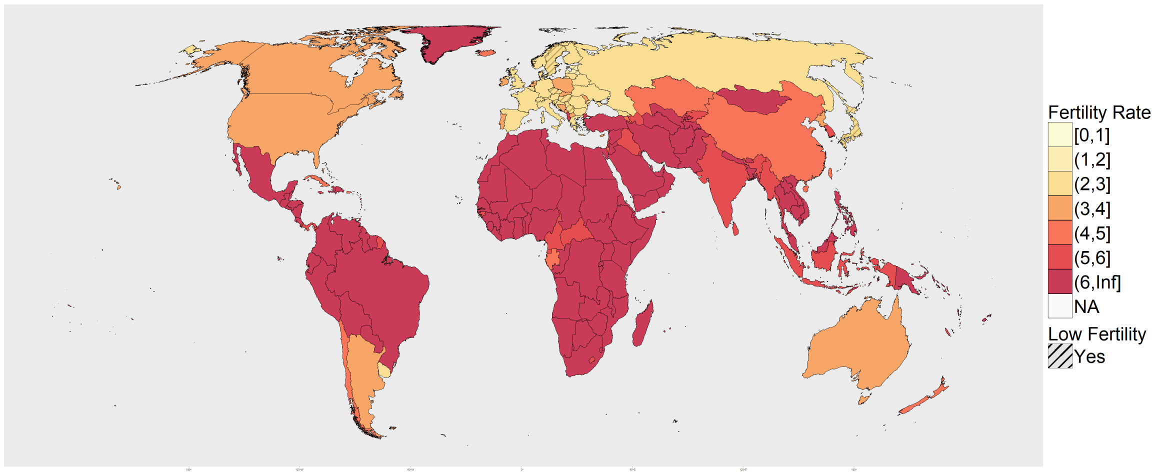
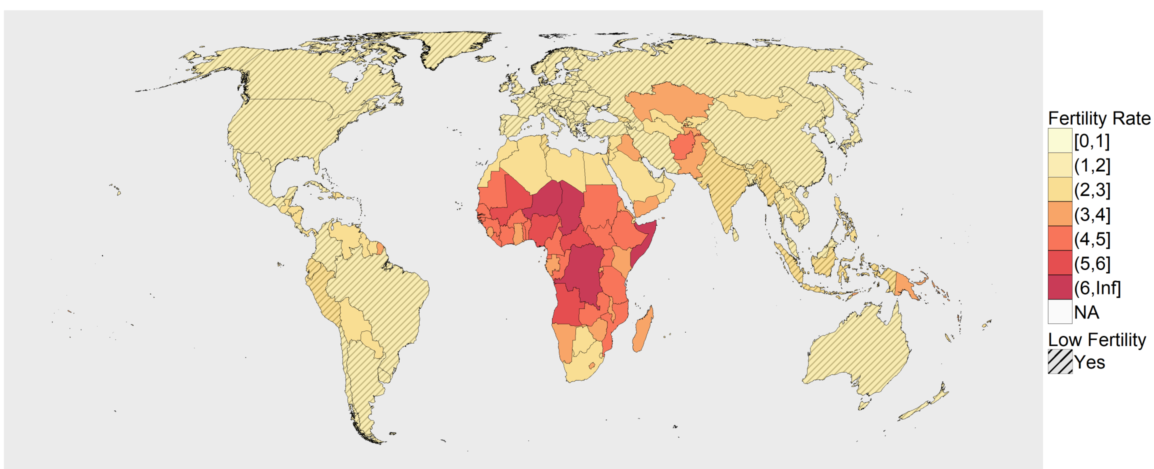


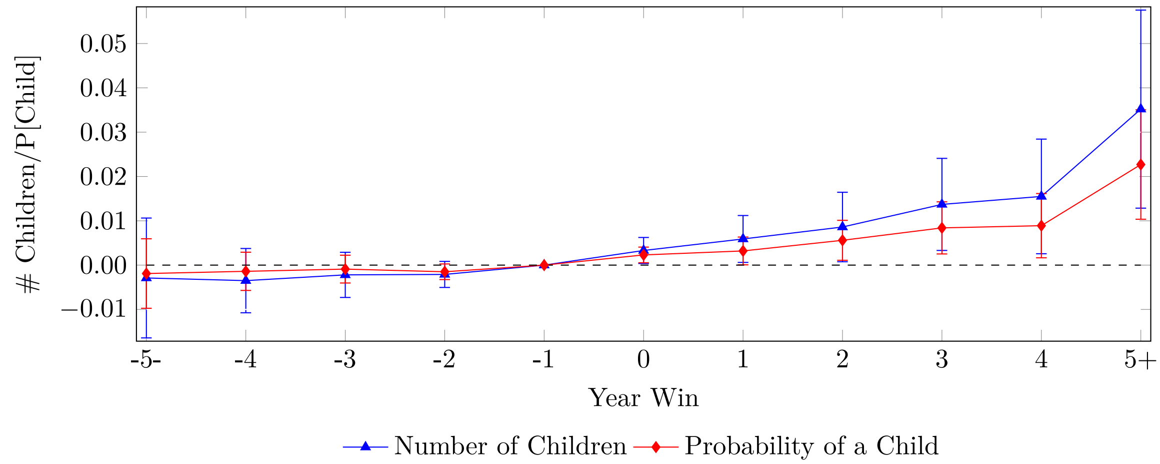
(a) Panel A: Fertility Rate in 1960



(b) Panel B: Fertility Rate in 2021

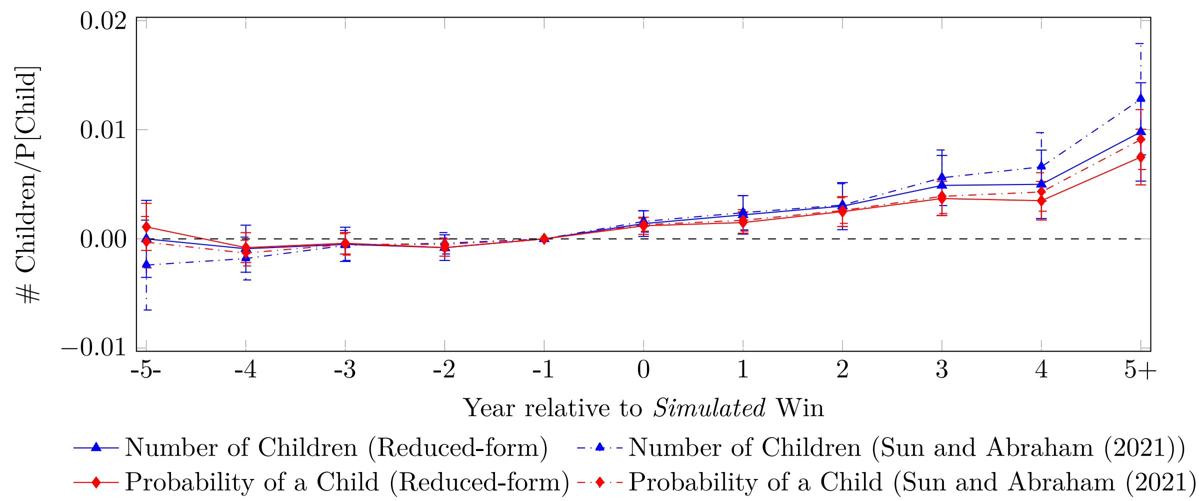
Figure 1: This figure shows a map of the fertility rate worldwide in 1960 (Panel A) and 2021 (Panel B). This graph was taken from Our World In Data and the data source is Gapminder. Low fertility means the area has a fertility rate below the replacement rate of 2.1 children per woman. For more information, see `https://ourworldindata.org/fertility-rate`.

Figure 2: **Random Access to Housing Credit and Fertility**



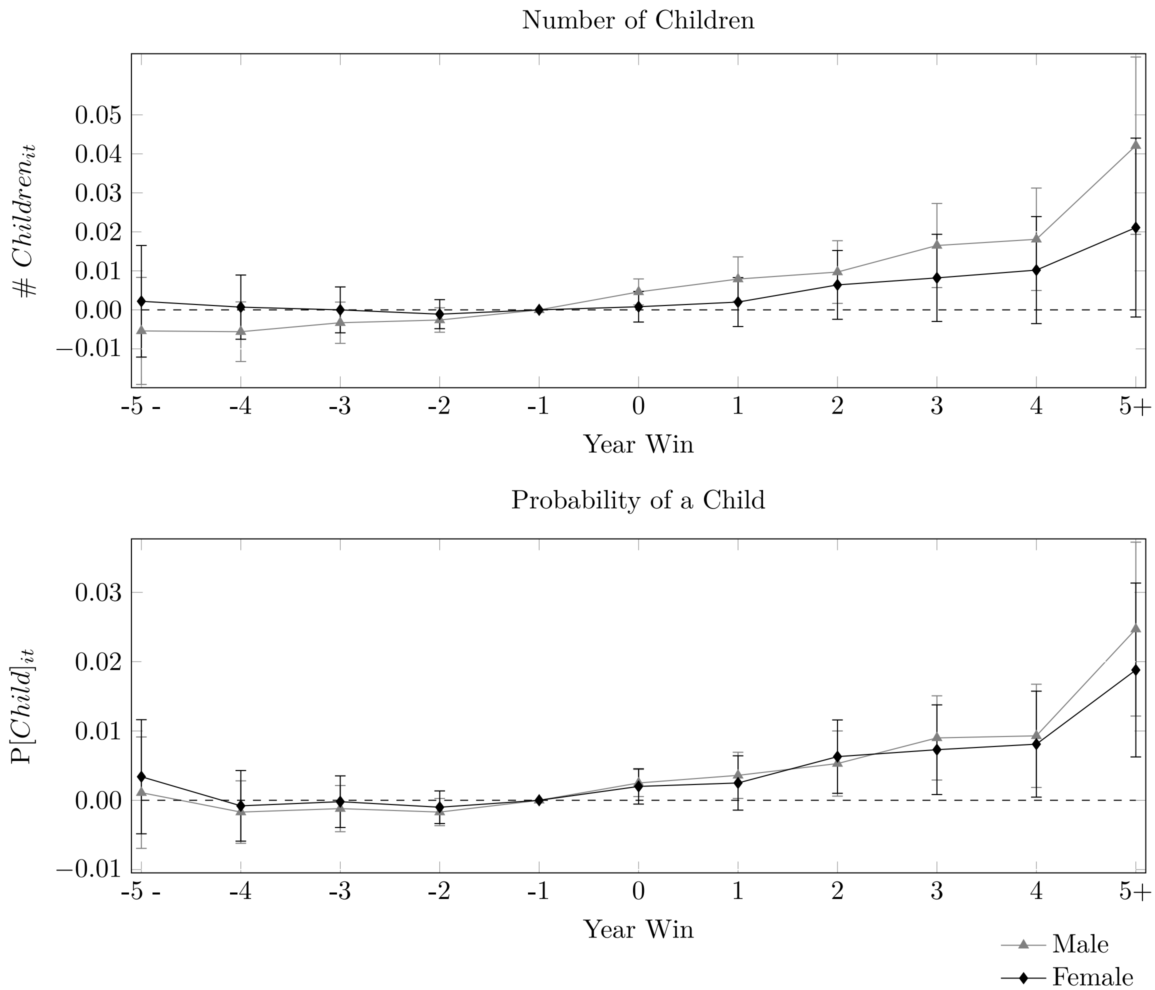
This figure depicts the dynamic treatment effects (with 95 percent confidence intervals) of winning a consórcio lottery on the probability of having a child (in red) and the number of children (in blue), estimated using the 2SLS specification in equation (10). The x-axis shows years relative to the lottery win, with the omitted category being the year before the win (t = -1).

Figure 3: **Random Access to Housing Credit and Fertility: Heterogeneous Treatment Effects**



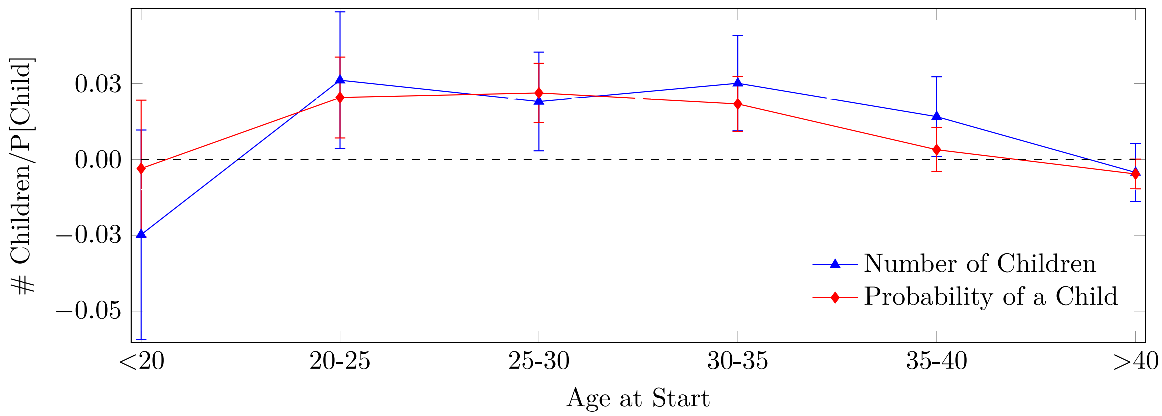
This figure depicts the reduced-form dynamic treatment effects (with 95 percent confidence intervals) of being predicted to win a consórcio lottery on the probability of having a child (in red) and the number of children (in blue), estimated using the equation (11). The x-axis shows years relative to the predicted lottery win, with the omitted category being the year before the predicted win (t = -1). Estimates with and without the methodology in Sun and Abraham (2021) are depicted as dashed and solid lines, respectively.

Figure 4: **Random Access to Housing Credit and Fertility: Gender Effects**



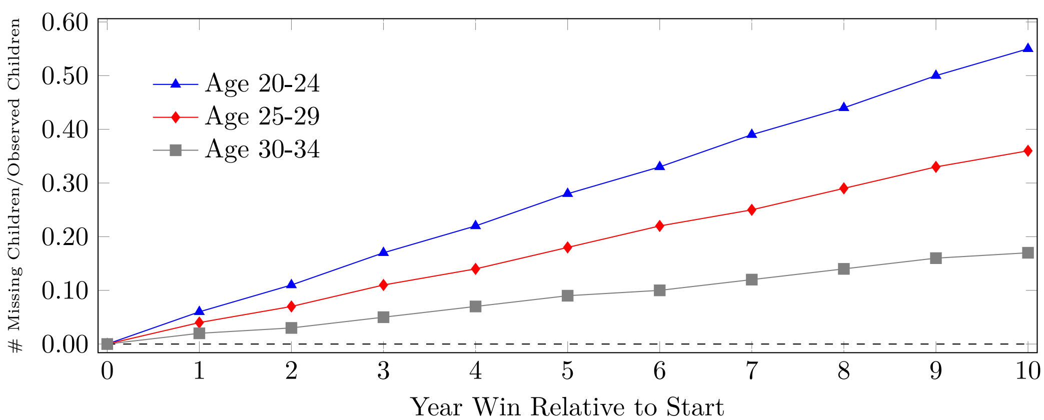
This figure depicts the dynamic treatment effects (with 95 perecent confidence intervals) of winning a consórcio lottery on the number of children (in the top panel) and the probability of having a child (in the bottom panel), estimated using the 2SLS specification in equation (10). The x-axis shows years relative to the lottery win, with the omitted category being the year before the win (t = -1). Estimates for male participants are in gray, and for female participants in black.

Figure 5: **Random Access to Housing Credit and Fertility: Age Effects**



This figure depicts the dynamic treatment effects of winning a consórcio lottery on the probability of having a child (in red) and the number of children (in blue), estimated using the 2SLS specification in equation (9). The x-axis indicates the estimates for different cohorts of participants by age at the start of the consórcio. 95 percent confidence intervals are also plotted for each estimate. The table at the bottom depicts the mean values for each dependent variable by age group at the start of the group.

Figure 6: **Total Fertility by Age Group**



This figure illustrates the impact of delayed housing access on lifetime fertility for different age groups. The y-axis shows the ratio of missing children to observed children, while the x-axis represents the number of years between joining the consórcio and winning the housing lottery. Each line corresponds to a different age group at the time of joining the consórcio: 20-24-year-olds (blue with triangles), 25-29-year-olds (red with diamonds), and 30-34-year-olds (gray with squares).

Table I: **Descriptive Statistics**

Panel A: Consórcios	Mean	Median	Std.
Groups	3,040		
Members per group	50.38	52	29.39
Duration (months)	154.41	144	39.59
Number of individuals	153,155		
Panel B: Individual Characteristics (means)	**Consorcio**	**Working-Age**	**Mortgage**
Formal Employment Share	0.22	0.37	0.94
Salary	2,480	1,715	2,098
Age	40.5	33.20	36.3
Male	0.67	0.51	0.55
Probability of a Child	0.26	0.49	0.39
Number of Children	0.44	1.06	0.69
Panel C: Local and Individual Characteristics	**Mean**	**Median**	**Std.**
WoodWalls_{zip}	0.07	0.06	0.05
$\text{ExpBrickWalls}_{zip}$	0.06	0.00	0.11
Ppl/Bedroom_{zip}	1.54	1.50	0.21
Rent/Income_{zip}	0.15	0.15	0.029
$\text{ParticipantInc}_{i}$	10.91	10.95	1.18
Benefits_{i}	0.05	0.00	0.21
$\text{FemaleIncShare}_{i}$	0.26	0.00	0.41

Panel A shows descriptive statistics on the number of consórcio groups, the number of members per group, and the duration of the groups. Panel B shows descriptive statistics for all working-age individuals, mortgage and consórcio participants. Panel C includes summary statistics of the variables used in our heterogeneous treatment effect tests.

Table II: **Random Access to Housing Credit and Fertility**

	I	II
Dep. Var.:	P[$Child$]$_{it}$	$Number$ $Children_{it}$
Mean:	0.30	0.52
Panel A: First Stage win_{it}		
$win\ sim_{it}$	0.3127***	
	(0.0042)	
Panel B: Reduced Form		
$win\ sim_{it}$	0.0036**	0.0051***
	(0.0009)	(0.0016)
R^2	0.92	0.94
Panel C: IV		
win_{it}	0.0115***	0.0164***
	(0.0029)	(0.0051)
R^2	0.92	0.94
F-stat	90.92	132.27
Observations	2,909,945	2,909,945
Group-Time FE	yes	yes
Individual FE	yes	yes
Clustered SE	group	group

This table presents the results from the first-stage estimation in equation (7) in Panel A, the reduced form estimation in equation (8) in Panel B, and the IV estimation in equation (9) in Panel C. The dependent variable is a dummy variable indicating whether an individual i has a child in year t in column I, and the number of children each individual i has in year t in column II. The variable win_{it} ($win\ sim_{it}$) equals one from the year an individual receives (is predicted to receive) credit for housing purchase and zero before. Standard errors, clustered at the group level, are reported in parentheses. The table also includes individual and group-time fixed effects. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table III: **Total Fertility**

	I	II
Dep. Var.:	$\text{P}[Child]_i$	$Number$ $Children_i$
Mean:	0.30	0.52
$Age :< 20 \cdot year\ win_i$	-0.0055	-0.0175
	(0.0073)	(0.0124)
$Age : 20 - 24 \cdot year\ win_i$	-0.0120***	-0.0218***
	(0.0037)	(0.0073)
$Age : 25 - 29 \cdot year\ win_i$	-0.0110***	-0.0189***
	(0.0019)	(0.0038)
$Age : 30 - 34 \cdot year\ win_i$	-0.0061***	-0.0096***
	(0.0016)	(0.0032)
$Age : 35 - 39 \cdot year\ win_i$	-0.0012	0.0028
	(0.0017)	(0.0034)
R^2	0.07	0.06
F-stat	9.92	10.33
Observations	49,861	49,861
Group FE	yes	yes
Birth FE	yes	yes
Clustered SE	group	group

This table presents the results of estimating the total fertility effect of winning a consórcio lottery by age group. The dependent variable in column I is a dummy variable indicating whether an individual i has a child, and in column II is the total number of children individual i has in 2020, the final period in our sample. The variable $year\ win_i$ represents the number of years (since joining the group) an individual takes to win the credit lottery, interacted with age group dummies. Age groups are defined based on the individual's age at the start of the consórcio. Standard errors, clustered at the group level, are reported in parentheses. The table includes group and birth time fixed effects. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table IV: **Heterogenous Treatment Effects: Housing Characteristics**

	I	II	III	IV	V	VI
Dep. Var.:		P[$Child_{it}$]			$Number\ Children_{it}$	
Mean:		0.30			0.52	
win_{it}	0.0080**	0.0091***	0.0081	-0.0025	0.0120**	-0.0791***
	(0.0032)	(0.0031)	(0.0078)	(0.0058)	(0.0055)	(0.0138)
$win_{it} * WoodWalls_{zip}$	0.0499***			0.2891***		
	(0.0176)			(0.0328)		
$win_{it} * ExpBrickWalls_{zip}$		0.0365***			0.0774***	
		(0.0103)			(0.0179)	
$win_{it} * Ppl/Bedroom_{zip}$			0.0021			0.0626***
			(0.0047)			(0.0085)
R^2	0.92	0.92	0.92	0.94	0.94	0.94
Observations	2,603,209	2,603,209	2,603,209	2,603,209	2,603,209	2,603,209
Group-Time FE	yes	yes	yes	yes	yes	yes
Individual FE	yes	yes	yes	yes	yes	yes
Clustered SE	group	group	group	group	group	group

This table reports the results from estimating equation (9) using 2SLS, where the treatment variable win_{it} and its interactions with housing quality measures are instrumented using the predicted lottery win ($win\ sim_{it}$) and its interactions. The dependent variable is a dummy indicating whether individual i has a child in year t in columns I to III, and the number of children individual i has in year t in columns IV to VI. Housing quality measures include the fraction of households with wood walls ($WoodWalls_{zip}$), exposed brick walls ($ExpBrickWalls_{zip}$), and the average number of people per bedroom ($Ppl/Bedroom_{zip}$) at the zip code level. Standard errors, clustered at the group level, are reported in parentheses.

Table V: **Heterogenous Treatment Effects: Rental Savings**

	I	II	III	IV
Dep. Var.:	P[$Child_{it}$]		$Number\ Children_{it}$	
Mean:	0.30		0.52	
win_{it}	0.0024		-0.0142	
	(0.0057)		(0.0101)	
$win_{it} * Rent/Income_{zip}$	0.0581*		0.2007***	
	(0.0320)		(0.0572)	
$win_{it} * Rent/IncomeQ1_{zip}$		0.0080**		0.0071
		(0.0033)		(0.0058)
$win_{it} * Rent/IncomeQ2_{zip}$		0.0136***		0.0196***
		(0.0034)		(0.0062)
$win_{it} * Rent/IncomeQ3_{zip}$		0.0110***		0.0213***
		(0.0034)		(0.0064)
$win_{it} * Rent/IncomeQ4_{zip}$		0.0136***		0.0217***
		(0.0037)		(0.0064)
R^2	0.92	0.92	0.92	0.94
Observations	2,603,209	2,603,209	2,603,209	2,603,209
Group-Time FE	yes	yes	yes	yes
Individual FE	yes	yes	yes	yes
Clustered SE	group	group	group	group

This table presents the results from estimating equation (9) using 2SLS, where the treatment variable win_{it} and its interactions with rental expense measures are instrumented using the predicted lottery win ($win\ sim_{it}$) and its interactions. The dependent variable is a dummy indicating whether individual i has a child in year t in columns I and II, and the number of children individual i has in year t in columns III and IV. Rental expense measures are based on the ratio of rental expenses to household income at the zip code level, with $Rent/Income_{zip}$ representing the continuous measure and $Rent/IncomeQ1_{zip}$ to $Rent/IncomeQ4_{zip}$ representing quartile dummies. Standard errors, clustered at the group level, are reported in parentheses.

Table VI: **Heterogenous Treatment Effects: Household Income**

	I	II	III	IV	V	VI
Dep. Var.:		P[$Child_{it}$]			$Number\ Children_{it}$	
Mean:		0.30			0.52	
win_{it}	0.1451***	0.0206	0.0113***	0.2507***	0.0983***	0.0144***
	(0.0171)	(0.0130)	(0.0029)	(0.0301)	(0.0240)	(0.0051)
$win_{it} * ParticipantInc_i$	-0.0126***			-0.0226***		
	(0.0015)			(0.0026)		
$win_{it} * HouseholdInc_i$		-0.0007			-0.0084***	
		(0.0012)			(0.0021)	
$win_{it} * Benefits_i$			0.0036			0.0406***
			(0.0045)			(0.0091)
R^2	0.89	0.91	0.92	0.94	0.94	0.94
Observations	1,164,491	1,572,193	2,603,209	1,164,491	1,572,193	2,603,209
Group-Time FE	yes	yes	yes	yes	yes	yes
Individual FE	yes	yes	yes	yes	yes	yes
Clustered SE	group	group	group	group	group	group

This table reports the results from estimating equation (9) using 2SLS, where the treatment variable win_{it} and its interactions with income measures are instrumented using the predicted lottery win ($win\ sim_{it}$) and its interactions. The dependent variable is a dummy indicating whether individual i has a child in year t in columns I to III, and the number of children individual i has in year t in columns IV to VI. Income measures include the participant's income ($ParticipantInc_i$), household income ($HouseholdInc_i$), and a dummy for receiving government benefits ($Benefits_i$), all measured in the year before obtaining credit. Standard errors, clustered at the group level, are reported in parentheses.

Table VII: **Heterogenous Treatment Effects: Female Income Share**

	I	II
Dep. Var.:	P[$Child$]$_{it}$	$Number\ Children_{it}$
Mean:	0.30	0.52
win_{it}	0.0150***	0.0256***
	(0.0043)	(0.0075)
$win_{it} * FemaleIncShare_i$	-0.0056*	-0.0544***
	(0.0029)	(0.0049)
R^2	0.92	0.94
Observations	1,572,193	1,572,193
Group-Time FE	yes	yes
Individual FE	yes	yes
Clustered SE	group	group

This table presents the results from estimating equation (9) using 2SLS, where the treatment variable win_{it} and its interaction with the female income share is instrumented using the predicted lottery win ($win\ sim_{it}$) and its interaction. The dependent variable is a dummy indicating whether individual i has a child in year t in column I, and the number of children individual i has in year t in column II. $FemaleIncShare_i$ represents the share of household income earned by the female partner measured before obtaining credit. Standard errors, clustered at the group level, are reported in parentheses.

Online Appendix: Housing and Fertility

For Online Publication Only

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Online Appendix A: Extended Derivations

We start by solving the optimization model delineated in Section 2. The problem of the household is given by:

$$\max u(c,n,h,e) = log(c) + \beta \cdot log(h) + \delta \cdot log(n) + \delta\gamma \cdot log(e+\theta)$$

s.t.:

$$c + p_h \cdot h + p \cdot e \cdot n \leq (1-\phi n)w$$

$$\frac{n}{h} \leq s$$

$$c, n, h, e \geq 0$$

In this model, the household derives utility from consumption (c), housing (h) the number of children (n), and children's human capital via education (e). $\beta, \delta > 0$ are parameters that represent how much households value housing and children, respectively. Child human capital is produced through parental investments in education per child, which raise children's human capital according to the investment technology $q = (\theta + e)^{\gamma}$, where γ captures the return to education investments and θ represents the intrinsic human capital children have without any parental investment. The parent earns a market wage w, and raising each child takes a fixed amount of time, ϕ. The price of education investment e is given by p, which can be thought of as a teacher's wage. The price of housing is p_h, which can be understood as the cost of utilities, maintenance and potential rental costs. The parent's budget constraint, normalized to a time endowment of one, is determined by their wage, the time cost of raising children, and the cost of education investment. In addition to the budget constraint, we introduce a space constraint, which limits the number of children based on the available housing space. In this constraint, s represents housing quality (which we mainly interpret as how spacious each unit of housing is).

Before proving the propositions in Section 2, we first solve for the optimal c^*, n^*, h^*, e^*.

Proposition A.1: For binding space constraints, optimal c, n, h, and e are given by:

$$c^\star = \frac{w}{1+\delta+\beta} \tag{A1}$$

$$e^\star = \frac{w\phi\gamma + \gamma\frac{p_h}{s} - (1+\frac{\beta}{\delta})p\theta}{p(1-\gamma+\frac{\beta}{\delta})} \tag{A2}$$

$$n^\star = \frac{\delta}{1+\delta+\beta}\frac{(1-\gamma+\frac{\beta}{\delta})}{\left(\phi - \frac{p}{w}\theta + \frac{p_h}{w}\frac{1}{s}\right)} \tag{A3}$$

$$h^\star = \frac{1}{s}\frac{\delta}{1+\delta+\beta}\frac{(1-\gamma+\frac{\beta}{\delta})}{\left(\phi - \frac{p}{w}\theta + \frac{p_h}{w}\frac{1}{s}\right)} \tag{A4}$$

Proof: The Lagrangean of the household problem is given by:

$$\begin{aligned}\mathcal{L} &= log(c) + \beta \cdot log(h) + \delta \cdot log(n) + \delta\gamma \cdot log(e+\theta) \\ &+ \lambda\left[w(1-\phi n) - p_h h - c - pen\right] + \nu(sh-n) + \mu e\end{aligned}$$

Assuming an interior solution ($\mu = 0$) with the space constraint binding ($\nu > 0$), we have the following first-order conditions

$$\frac{\partial \mathcal{L}}{\partial c} : \boxed{\frac{1}{c} = \lambda} \tag{A5}$$

$$\frac{\partial \mathcal{L}}{\partial e} : \boxed{\frac{\delta\gamma}{\theta + e} = \lambda pn - \mu} \tag{A6}$$

$$\frac{\partial \mathcal{L}}{\partial n} : \boxed{\frac{\delta}{n} = \lambda(w\phi + pe) + \nu} \tag{A7}$$

$$\frac{\partial \mathcal{L}}{\partial h} : \boxed{\frac{1}{h} = \lambda p_h - \nu s} \tag{A8}$$

Using the space constraint with equality, the FOCs with respect to the number of children (A7) and education (A6), we have:

$$\Rightarrow \boxed{e^{\star} = \frac{w\phi\gamma + \gamma\frac{p_h}{s} - (1 + \frac{\beta}{\delta})p\theta}{p(1 - \gamma + \frac{\beta}{\delta})}} \tag{A9}$$

From equations (A5) and (A6), we obtain a formula for consumption as a function of n and e:

$$c = \frac{pn(\theta + e)}{\delta\gamma} \tag{A10}$$

Using this formula in the budget constraint, together with equation (A9), leads, with some rearrangement of terms, to:

$$\begin{aligned} \delta w(1 - \gamma + \frac{\beta}{\delta}) - w\phi n(1 + \delta + \beta) &= -pn\theta\,(\delta + 2) + \frac{p_h}{s}n(1 + \delta + \beta) \\ \delta w(1 - \gamma + \frac{\beta}{\delta}) &= n(1 + \delta + \beta)\left(w\phi - p\theta + \frac{p_h}{s}\right) \end{aligned}$$

Thus:

$$\boxed{n^{\star} = \frac{\delta}{1+\delta+\beta}\frac{(1-\gamma+\frac{\beta}{\delta})}{\left(\phi-\frac{p}{w}\theta+\frac{1}{w}\frac{p_h}{s}\right)}} \tag{A11}$$

Replacing $n^{\star}$ and $e^{\star}$ in equation (A10) leads to:

$$\boxed{c^{\star} = \frac{w}{1+\delta+\beta}} \tag{A12}$$

Finally, $h^{\star}$ is:

$$\begin{aligned} h^{\star} &= \frac{1}{s}n^{\star} \\ &= \frac{1}{s}\frac{\delta}{1+\delta+\beta}\frac{(1-\gamma+\frac{\beta}{\delta})}{\left(\phi-\frac{p}{w}\theta+\frac{p_h}{w}\frac{1}{s}\right)} \\ &\Rightarrow \boxed{h^{\star} = \frac{1}{s}\frac{\delta}{1+\delta+\beta}\frac{(1-\gamma+\frac{\beta}{\delta})}{\left(\phi-\frac{p}{w}\theta+\frac{p_h}{w}\frac{1}{s}\right)}} \end{aligned} \tag{A13}$$

□

Online Appendix A.1: Proof of Proposition 1

From the equation (A11) for the optimal number of children, we can calculate the partial derivative of n^{*} with respect to p_h and s.

$$\frac{\partial n^{\star}}{\partial\left(\frac{p_h}{s}\right)} = -\left[\frac{1}{w}\right]\frac{\delta}{1+\beta+\delta\gamma}\frac{(1-\gamma+\frac{\beta}{\delta})}{(\phi-\frac{p}{w}\theta+\frac{1}{w}\frac{p_h}{s})^2} < 0$$

Thus, a decrease in p_h or an increase in s will increase the optimal number of children in the household.

Online Appendix A.2: Proof of Proposition 2

If we calculate the cross-partial derivative with respect to p_h/s and w, we have:

$$\frac{\partial^2 n^\star}{\partial\left(\frac{p_h}{s}\right)\partial w} \quad = \quad -\frac{\delta(1-\gamma+\frac{\beta}{\delta})}{1+\beta+\delta\gamma}\frac{(w\phi-p\theta+\frac{p_h}{s})-2w\phi}{(w\phi-p\theta+\frac{p_h}{s})^3}$$

Thus

$$\frac{\partial^2 n^\star}{\partial\left(\frac{p_h}{s}\right)\partial w} < 0 \quad \Leftrightarrow \quad (w\phi - p\theta + \frac{p_h}{s}) - 2w\phi > 0$$

$$\Leftrightarrow \quad \frac{p_h}{s} > w\phi + p\theta$$

And similarly,

$$\frac{\partial^2 n^\star}{\partial\left(\frac{p_h}{s}\right)\partial w} > 0 \quad \Leftrightarrow \quad \frac{p_h}{s} < w\phi + p\theta$$

□

Online Appendix A.3: Proof of Proposition 3

For this proposition, we modify the budget constraint slightly. First, we define k as the fraction of household wage income brought by the female partner. Thus, $w_f = k \cdot w$ is the wage of the female partner and $w_m = (1-k)\cdot w$ the wage of the male partner. Second, under the assumption that women do all child-rearing, men are not affected by the opportunity cost of raising a child, i.e., the right hand side of the budget constraint becomes $w_m + (1-\phi\cdot n)\cdot w_f = (1-\phi\cdot n\cdot k)\cdot w$, and thus the budget constraint becomes:

$$c + p_h h + p \cdot e \cdot n \leq (1 - \phi n k) w \tag{A14}$$

Under this new budget constraint, it is straightforward to see that:

$$n^\star = \frac{\delta(1-\gamma+\frac{\beta}{\delta})}{1+\delta+\beta} \frac{w}{(kw\phi - p\theta + \frac{p_h}{s})}$$

and:

$$\frac{\partial n^\star}{\partial\left(\frac{p_h}{s}\right)} = -\frac{\delta(1-\gamma+\frac{\beta}{\delta})}{1+\delta+\beta} \frac{w}{(kw\phi - p\theta + \frac{p_h}{s})^2} < 0$$

Then, to show that an increase in the fraction of female income in the household k reduces the effect of homeownership on the number of optimal children, we take the second derivative with respect to k, which is:

$$\frac{\partial n^\star}{\partial\left(\frac{p_h}{s}\right)\partial k} > 0$$

□

Online Appendix B: Model Extentions

Online Appendix B.1: Financial Income

Let us modify our model to explicitly account for different income sources:

$$Y = w \cdot L + r \cdot A \tag{B15}$$

where Y is total income, w is the wage rate, L is labor supply, r is the return on assets, and A is the value of assets.

The budget constraint becomes:

$$c + p_h \cdot h + p \cdot e \cdot n \leq w \cdot (1 - \phi \cdot n) + r \cdot A \tag{B16}$$

The optimal number of children now depends on both labor and passive income:

$$n^* = \frac{\delta}{1 + \delta + \beta} \cdot \frac{1 - \gamma + \frac{\beta}{\delta}}{(\phi - \frac{p}{w}\theta + \frac{1}{w}\frac{p_h}{s} - \frac{r \cdot A}{w})} \tag{B17}$$

This result reveals that the presence of financial assets ($A > 0$) increases the optimal number of children relative to the basic model where $A = 0$. The term $-rA/w$ in the denominator effectively reduces the opportunity cost of child-rearing, as it represents income that is not compromised by time allocated to children. Consequently, this extension of the model predicts that households with higher levels of passive income may opt for larger families.

Online Appendix B.2: Paid Childcare

This appendix extends our basic model to incorporate the option of paid childcare, which may be more accessible to high-income households.

We introduce the level of childcare effectively paid by the family as $\chi \in [0, \overline{\chi}]$ with $\overline{\chi} \leq 1$. The effective opportunity cost of child-rearing becomes:

$$\phi = (1 - \chi)\phi'$$

Here, ϕ' is defined as the opportunity cost of childrearing when $\chi = 0$. As χ increases, the effective time cost ϕ decreases. The maximization problem is now given by:

$$\max_{(c,n,h,e,\chi)} u(c, n, h, e) = log(c) + \beta \cdot log(h) + \delta \cdot log(n) + \delta\gamma \cdot log(e + \theta)$$

s.t.:

$$c + p_h h + pen + p_\chi \chi n \leq (1 - (1 - \chi)\phi' n)w$$

$$\frac{n}{h} \leq s$$

In this problem, the optimal number of children is now given by:

$$n^\star = \frac{\delta}{1+\delta+\beta} \frac{(1-\gamma+\frac{1}{\delta})}{\left(\phi' - \frac{p}{w}\theta + \frac{p_h}{w}\frac{1}{s} + \left(\frac{p_\chi}{w} - \phi'\right)\chi\right)}$$

Note that n^* is negatively related to the price of childcare (p_χ). Moreover, n^* is positively related to the levels of childcare for $p_\chi < w\phi'$.

From the first order condition with respect to childcare χ, we find that:

$$p_\chi = \phi' w$$

This is a "knife's edge" condition. Under this condition with equality, χ^* can take any value from $[0, \overline{\chi}]$. If childcare costs (p_χ) are higher than the opportunity cost in monetary terms ($\phi' w$), then families would choose not to take any childcare ($\chi = 0$), and we would return to our original case (see Proposition 2). If childcare is less expensive than the opportunity cost, families would choose to maximize childcare services and set it to the maximum ($\overline{\chi}$). This would slightly change Proposition 2 of the paper as now

$$\frac{\partial^2 n^\star}{\partial\left(\frac{p_h}{s}\right)\partial w} < 0 \Leftrightarrow \frac{p_h}{s} > w\phi + p\theta - \left(\frac{p_\chi}{w} - \phi'\right)\overline{\chi}$$

While this extension captures the option of paid childcare, it does not fundamentally alter our overall conclusions. The key relationships between income, fertility, and housing decisions remain consistent. Our model still shows how opportunity costs and resource allocation influence family choices, although the magnitude of some effects might be moderated by the use of paid childcare.

We note that since we do not have data on childcare costs for the families in our sample, we are not able to empirically test this model extension. Nevertheless, this theoretical exercise provides additional insight into how the availability of paid childcare might interact with our main findings.

Online Appendix B.3: Comparative Policy Analysis: Housing vs. Other Interventions

This appendix extends our model to compare the effects of housing policies on fertility with other potential interventions, specifically childcare subsidies and education cost increases.

Online Appendix B.3.1: Housing vs. Childcare Subsidies

We extend our model by defining the opportunity cost of child-rearing as $\phi = (1-\chi)\phi'$, where χ represents the level of subsidized childcare. We then compare the partial derivatives of n^* with respect to p_h/s and χ:

$$\frac{\partial n^*}{\partial(p_h/s)} = -\frac{1}{w} \cdot \frac{\delta}{1+\beta+\delta\gamma} \cdot \frac{(1-\gamma+\frac{\beta}{\delta})}{(\phi - \frac{p}{w}\cdot\theta + \frac{1}{w}\cdot\frac{p_h}{s})^2} \tag{B18}$$

$$\frac{\partial n^*}{\partial \chi} = \phi' \cdot \frac{\delta}{1+\beta+\delta\gamma} \cdot \frac{(1-\gamma+\frac{\beta}{\delta})}{(\phi - \frac{p}{w}\cdot\theta + \frac{1}{w}\cdot\frac{p_h}{s})^2} \tag{B19}$$

The relative effect of housing costs to childcare subsidies is:

$$\left| \frac{\frac{\partial n^*}{\partial(p_h/s)}}{\frac{\partial n^*}{\partial \chi}} \right| = \frac{1}{\phi' \cdot w} \tag{B20}$$

This result suggests that when $\phi' \cdot w < 1$ (i.e., when households' intrinsic opportunity cost is low), the effect of reducing housing costs on fertility is stronger than that of increasing the availability of free childcare. This finding implies that in contexts where wages are relatively low, policies aimed at reducing housing costs or improving housing quality might be more effective in increasing fertility rates compared to policies focused on reducing childcare costs or other opportunity costs of child-rearing.

Online Appendix B.3.2: Housing vs. Education Cost Increases

We next compare the effects of housing costs and education costs on fertility. A similar policy was evaluated by Kim, Tertilt, and Yum (2024) that find that a tax on education increases fertility rates in Korea.

Let us first revisit the partial derivatives of n^* with respect to p_h/s and p:

$$\frac{\partial n^*}{\partial(p_h/s)} = -\frac{1}{w} \cdot \frac{\delta}{1+\beta+\delta\gamma} \cdot \frac{(1-\gamma+\frac{\beta}{\delta})}{(\phi - \frac{p}{w}\cdot\theta + \frac{1}{w}\cdot\frac{p_h}{s})^2} \tag{B21}$$

$$\frac{\partial n^*}{\partial p} = \frac{\theta}{w} \cdot \frac{\delta}{1+\beta+\delta\gamma} \cdot \frac{(1-\gamma+\frac{\beta}{\delta})}{(\phi - \frac{p}{w}\cdot\theta + \frac{1}{w}\cdot\frac{p_h}{s})^2} \tag{B22}$$

The relative effect of housing costs to education costs is:

$$\left| \frac{\frac{\partial n^*}{\partial(p_h/s)}}{\frac{\partial n^*}{\partial p}} \right| = \frac{1}{\theta} \tag{B23}$$

This ratio suggests that when $\theta > 1$, changes in education costs have a larger impact on fertility than equivalent changes in housing costs, and vice versa when $\theta < 1$. This comparison suggests that the relative effectiveness of housing policies versus education policies in promoting fertility may depend on the level of intrinsic human capital (θ) in the population. In contexts where θ is low, policies targeting housing costs might be more effective, while in contexts with high θ, focusing on increasing education costs could yield better results.

These theoretical extensions offer intriguing insights into the comparative effects of different policy interventions on fertility rates. While our current study focuses primarily on housing interventions, for which we have robust empirical evidence, these extensions highlight potential avenues for future research. A comprehensive empirical analysis comparing the effects of housing policies, childcare subsidies, and education costs on fertility would require additional data beyond the scope of our current study. Such research could provide valuable guidance for policymakers seeking to address declining fertility rates through various interventions. We appreciate the thoughtful feedback that inspired these extensions, as it not only enhances our understanding of the complex factors influencing fertility decisions but also opens up promising directions for future investigations in this important area.

Online Appendix C: Credit Allocation in Consórcio Groups

In this section, we provide an example of an algorithm to illustrate the credit allocation procedure in consórcio groups and the implementation of our instrumental variable (IV) strategy.

Online Appendix C.1: Algorithm: Example

Each week, five five-digit numbers are drawn in Brazil's national lottery. While there are a large number of different algorithms used by different administrators, they all share the key feature that each participant has the same unconditional probability of winning the lottery at the start of the group.

The algorithm that we use for the example in this section uses the first of the five-digit numbers from the national lottery to determine the allocation of credit. The number is divided by the number of participants in the group and then the remainder is multiplied by the number of participants. For example, if the first five-digit number from the national lottery is 10084 and there are 250 participants in the group, the remainder from dividing 10084 by 250 is 0.336, which multiplied by 250 is 84. Thus, credit would be allocated to the participant with ticket number 84.[28]

If the individual with ticket number 84 has already been awarded credit in a previous round, the algorithm simply adds one to the initial result. In our example, this means that credit would be allocated to the holder of ticket number 85. If this participant has also been awarded credit before, the algorithm subtracts one from the initial result, which in our case would imply that ticket number 83 is awarded credit. The algorithm continues to add and subtract two, then three, and so on, relative to the initial result, until a ticket number is selected that has not been awarded credit before.

[28] If the remainder is zero, credit goes to the highest ticket number.

Online Appendix C.2: Simulated Allocation

The majority of consórcio groups combine credit allocation through lotteries and auctions. The allocation of credit through auctions is a threat to our empirical analysis since, unlike for lotteries, the outcome of auctions is not random and is potentially endogenous with respect to fertility outcomes. For example, individuals with higher unobserved wealth or tighter family connections who are also potentially planning to have more children may be more likely to submit higher bids and therefore obtain credit for real estate purchases earlier. This source of endogeneity is not eliminated by limiting attention to lottery winners. Over time, individuals who obtain credit through auctions disappear from the pool of potential lottery winners. If auction winners systematically differ on important characteristics, the control group of non-winners is depleted of individuals with better labor market opportunities over time. This could lead to a bias in estimating the effect of obtaining credit for real estate purchases on fertility outcomes.

As a consequence, we resort to an instrumental variable strategy that simulates the allocation of credit in each consórcio group *as if* all credit is allocated through lotteries. To do so, we combine data on the outcome of the national lottery with data on the ticket numbers of all consórcio group participants and the algorithm used by a given group. This procedure allows us to simulate the allocation of credit within groups, as if only lotteries but no auctions were held. We restrict our analysis to groups for which we have information on the algorithm that they use.

Next, we illustrate this procedure using a fictional example. Suppose that a group has 200 members and allocates credit to two members every period, one through a lottery and one through an auction. Suppose that in the first period the lottery winner is ticket number 25 and the auction winner is ticket number 60. In the next period, the lottery is won by ticket number 30 and the auction is won by ticket number 80. In the third period, the algorithm determines ticket number 60 as the winner of the lottery. However, since ticket number 60 obtained credit through the auction in the first period, the ultimate lottery winner in the real group is ticket 61. Hence, the presence of auctions has altered the order in which credit is allocated compared to an allocation based purely on lotteries. Instead, in the simulated group, the lottery winner would be ticket number 60, as the outcomes of auctions are ignored.

Thus, for the first three periods our instrument from the simulated lotteries would predict the lottery winners to be ticket numbers 25, 30, and 60, since these are the numbers that would have won the lottery if the group did not hold auctions. We simulate all lotteries for each group from the first to the last period and predict lottery winners through this procedure, which avoids distortions in the timing of lottery winners due to the presence of auctions.

Online Appendix D: Additional Tables and Figures

Table A.1: **Variable Definitions**

Variable	Definition (Source)
Formal Employment Share	Share of individuals with formal employment contracts (RAIS)
Salary	Salary of individuals in formal employment contracts (RAIS)
Age	Age of individuals (Receita Federal)
Male	Categorical variable equal to 1 for male and 0 for female individuals (Receita Federal)
P[Child$_{it}$]	Probability equal to 1 if family has at least one child and 0, otherwise (Receita Federal)
Number Children$_{it}$	Number of children of a family (Receita Federal)
win$_{it}$	Categorical variable equal to 1 for those that win the consórcio, and 0 otherwise (Consórcio)
win sim$_{it}$	Categorical variable equal to 1 for those that win the lottery, and 0 otherwise (Consórcio)
WoodWalls$_{zip}$	Proportion of households with wood walls per zip code (Brazilian Census)
ExpBrickWalls$_{zip}$	Proportion of households with exposed brick walls per zip code (Brazilian Census)
Ppl/Bedroom$_{zip}$	Average number of people per bedroom in a household per zip code (Brazilian Census)
Rent/Income$_{zip}$	Ratio between rent expenses and income per zip code (Brazilian Census)
ParticipantInc$_{i}$	Participant's income (RAIS)
HouseholdInc$_{i}$	Household's income (RAIS)
Benefits$_{i}$	Categorical variable equal to 1 if receives social benefits, and 0 otherwise (Cadastro Unico)
FemaleIncShare$_{i}$	Female income share in the household (RAIS and Receita)

Table A.2: **Heterogeneous Treatment Effects: Housing and Demographics**

	I	II
Dep. Var.:	P[$Child_{it}$]	$Number\ Children_{it}$
win_{it}	0.1415***	0.1666***
	(0.0236)	(0.0405)
$win_{it} \cdot Ppl/Bedroom_{zip}$	-0.0021	0.0518***
	(0.0086)	(0.0143)
$win_{it} \cdot Rent/Income_{zip}$	0.0935	0.1127
	(0.0601)	(0.1049)
$win_{it} \cdot ParticipantInc_i$	-0.0129***	-0.0223***
	(0.0016)	(0.0028)
$win_{it} \cdot FracIncShare_i$	-0.0179***	-0.0553***
	(0.0034)	(0.0055)
R^2	0.88	0.92
Observations	1,055,089	1,055,089
Group-Time FE	yes	yes
Individual FE	yes	yes
Clustered SE	group	group

This table reports the results from estimating the effects of lottery wins on child-related outcomes, considering housing characteristics and demographics. The dependent variable is P[$Child_{it}$] (probability of having a child) in column I, and $Number\ Children_{it}$ (number of children) in column II. Treatment variables include the main effect (win_{it}) and its interactions with residents per bedroom, fraction of rentals, participant income, and fraction of females in the neighborhood. Standard errors, clustered at the group level, are reported in parentheses. The table includes individual and group-time fixed effects. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.