Fertility, financial literacy and household portfolios

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PRELIMINARY AND INCOMPLETE

Abstract

This paper examines the relationship between household portfolio choices and fertility, and its implications for self-insurance and housing wealth. The paper considers decisions taken by households with different levels of financial literacy to evaluate the impact of fertility on dynamic investment choices. I document two main empirical facts. First, households tend to accumulate more housing wealth around the time of birth relative to similar households with no children. This suggests the presence of active planning in response to changing housing needs. Second, portfolio choices around births are affected by the level of financial literacy and household wealth. While rich parents increase their housing wealth share, financial literacy speeds up housing accumulation among average-wealth households but slows it down among wealth-poor ones. That is, financially literate parents tend to accumulate housing relatively faster if they can afford it while maintaining a liquidity buffer. To quantitatively account for these portfolio choice patterns, I develop and estimate a life-cycle model with uninsurable income risk, liquidity constraints and heterogeneous fertility. The model includes heterogeneity in financial literacy which helps households to overcome transaction costs associated with buying housing while maintaining an adequate liquidity buffer. I use the model to evaluate the impact of fertility, financial literacy and housing policies on household portfolio choice. Results show that financial literacy can mitigate the negative welfare effects of fertility shocks by more than 20%.

Keywords: Financial literacy, fertility, portfolio choice

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1 Introduction

The influence of fertility on household consumption patterns and saving decisions has received ample attention in the literature, as evidenced by numerous studies (e.g. Attanasio, 1999; Alan, Attanasio, and Browning, 2009; Scholz and Seshadri, 2007). However, there has been limited research on its effect on a household's portfolio composition. There are multiple channels through which children can affect portfolio composition. First, the additional expenditures associated with them can lead to the sale of some assets, potentially changing the share of liquid assets in the portfolio. Second, parents may become more risk-averse once they have children (Görlitz and Tamm, 2015), reducing their exposure to risky assets (Love, 2009). Finally, some parents may increase savings, even from a child's early age, potentially leading to a rebalance in their portfolio. This paper addresses the rebalance of household portfolios with different fertility in the presence of heterogeneity in financial literacy.

The limited amount of literature on the effect of children on household portfolios focuses on financial assets. Love (2009) finds that the presence of children interacts with marital status to change the allocation between financial assets in favour of the safer one. Bogan (2013) further distinguishes the gender of children and how daughters can increase stock market participation. The literature has focused on the choice between risky and safe financial assets but does not consider the impact on other assets, such as housing. This paper adds to the literature by considering non-financial assets on household portfolios, specifically recognizing that durable goods, like housing, are a crucial component of household savings (e.g. Lusardi and Mitchell, 2007a), and that they can adjust not only their holding of financial assets when having a child.

The balance between liquid and illiquid assets is crucial in household decision-making, particularly when children are involved. Children increase household expenses and can bring them closer to the borrowing limit. This paper examines the impact of children on household portfolios by including housing, a major component of household savings that also represents the majority of illiquid assets. The potential change in the liquidity of household portfolios has yet to be explored in the context of fertility changes and financial literacy. As shown widely in the literature, the liquidity of the portfolios can have potentially important effects on other household decisions, for example, their marginal propensity to consume (e.g. Kaplan and Violante, 2014).

The empirical analysis in this paper uses data from the Panel Study of Income Dynamics (PSID) to examine changes in household portfolios around the birth of a child. This study leverages the PSID's ability to capture both housing and other assets, and to follow households' portfolios before and after the birth event. The identification strategy involves comparing households that experience a fertility change with those that do not while control-

ling for various sociodemographic characteristics. The results indicate that households with a child tend to increase the share of housing prior to the birth and continue to maintain this increase after the birth. This shift in asset allocation is largely compensated by a decrease in financial assets, which makes the overall portfolio less liquid.

The adjustment in the portfolio is not uniform across different wealth levels, with those in the middle of the wealth distribution exhibiting the largest increase in the share of housing in their portfolios. This pattern can show the ability of each group of the wealth distribution to adjust their portfolio. Those at the bottom are close to their borrowing constraint, with little room to rebalance, while those at the top are closer to their desired portfolio composition, so they do not have to adjust as much when having a child. Parents in the middle of the wealth distribution are probably in between, so they are the ones who have a larger rebalance with a fertility change.

In addition to the wealth level, financial literacy is a crucial factor in household portfolio rebalancing. Nevertheless, it has received limited attention in the literature on fertility and its impact on household portfolios. Previous research has demonstrated the significant impact of financial literacy on household financial decisions (Gaudecker, 2015; Hastings and Mitchell, 2020; Rooij, Lusardi, and Alessie, 2012), the accumulation of wealth throughout the life-cycle (e.g. Rooij, Lusardi, and Alessie, 2012; Lusardi and Mitchell, 2007b; Lusardi and Mitchell, 2007a; Lusardi, Michaud, and Mitchell, 2017), access to various financial assets, such as stocks (Gaudecker, 2015), and increasing returns from specific asset classes (Fagereng et al., 2020). The present study, using data from the Survey of Consumer Finances (SCF), adds to this body of literature by exploring the role of financial literacy in the speed of adjustment of households' portfolios towards housing when having a child while also considering the importance of maintaining a liquidity buffer.

The differences between financially literate and illiterate parents vary across the wealth distribution. At the top, i.e. in the highest tercile, financial literacy does not make a difference in the speed or magnitude of the housing increase in household's portfolios. This pattern is probably because these households can substitute financial literacy with resources, for example, hiring financial advisers, so all achieve an allocation close to their desired portfolio. In the middle of wealth distribution, in the second tercile, financially literate parents can increase the share of housing in their portfolios earlier in their children's life. On the contrary, at the bottom of the distribution, financial literacy slows the rebalance toward housing. An interaction between liquidity constraints, adjustment costs in housing, and financial education can explain these results. As long as parents are not constrained, they increase their share of housing, but if constrained, financial literacy plays a role in overcoming the constraints and adjustment costs of housing.

In the second part of the paper, a life-cycle model is developed to examine the effect

of fertility and financial literacy on household portfolio decisions. The model incorporates uninsurable income risk, heterogeneity in fertility, liquidity constraints, and financial literacy levels, and features two assets: a financial asset and a durable good (housing) with adjustment costs (e.g. Fernández-Villaverde and Krueger, 2011; Bajari et al., 2013). Both fertility and financial literacy are assumed to be exogenous, although they are drawn from a multivariate distribution that accounts for their correlation. Fertility increases the marginal utility of housing from birth until the child's adulthood. Financial literacy increases the return of the financial asset as in Lusardi, Michaud, and Mitchell (2017). Higher returns on the financial asset allow parents to increase the share of housing in their portfolios faster. However, for low-income households, only those with a high return on the financial asset can overcome liquidity constraints and increase their housing share.

Financial literacy critically impacts a household's ability to handle unexpected events, such as "unplanned" births. According to PSID data, households with lower wealth are more susceptible to these events (also documented by Su and Addo, 2018). The consequences of "unplanned" births are especially severe for households with low wealth already near the borrowing limit. Using the model, this paper examines the influence of financial literacy on portfolio decisions by households that experience an "unplanned" birth. Results indicate that higher financial literacy allows households to maintain stable portfolio compositions, reducing the adverse effects of "unplanned" births by more than 20%.

The paper also runs counterfactuals on other types of policies about fertility and housing access. First, changing the share of "unplanned" births, particularly for poor households. For example, with Roe v. Wade overturned, poor households could have an increase in these births. The model in the paper allows me to analyze how their welfare changes and how the effects could be partially offset with financial literacy policies. Second, decreasing transaction costs to access housing could benefit households with children as they show a rebalance towards this asset in the data. The analysis of implications for their liquidity buffer is also analyzed. Finally, the model is calibrated for different states and races, which allows for studying heterogeneity and policies that could improve their welfare.

The rest of the paper is organized as follows. Section 2 presents the data used in the paper, summary statistics and a description of the most important variables. Section 3 explains the empirical strategy used to analyze fertility and portfolio choice. It is followed by section 4, which presents the stylized empirical facts. Section 5 presents the model and its calibration, while section 6 analyses the counterfactuals and policy implications. Finally, section 7 concludes.

2 Data

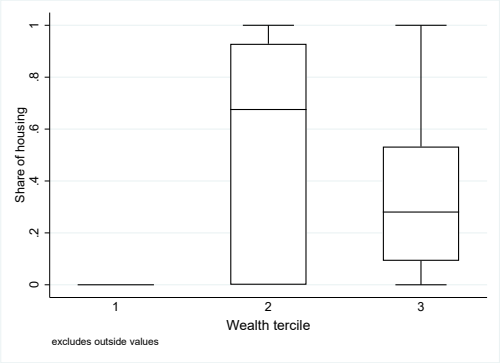
rvey of Consumer Finances (SCF). The PSID is an ideal dataset as it includes information on fertility and household portfolios and is a long panel, which allows me to follow households several periods before and after children are born. PSID is conducted every two years, and the information on portfolios is available since 1999. It includes financial assets: deposits, bonds, mutual funds, stocks, and retirement accounts, and real ones: housing, other real estate and private businesses. On the fertility side, PSID includes information on the number of children living at home, date of birth, and since 2013 questions on the intention of having the child. This last set of questions, which include if the child was "wanted" and the use of contraception before and when getting pregnant, allow me to use some of the births as exogenous "shocks". In the paper, the answer for "wanting" the child is used as a proxy for the exogenous shock, but results hold when using the questions on contraception use.

The SCF includes questions on financial literacy which allows the classification of households into those with high and low financial literacy. The questions included are those developed by Lusardi and Mitchell (2007b), dubbed The Big 3. These questions measure the ability of the respondents to answer basic questions on compound interest rates, diversification and inflation. Since the SCF is a cross-section, I do not observe the portfolios before birth. I use the age of children to evaluate how households with different financial literacy allocate their portfolios through a child's life.

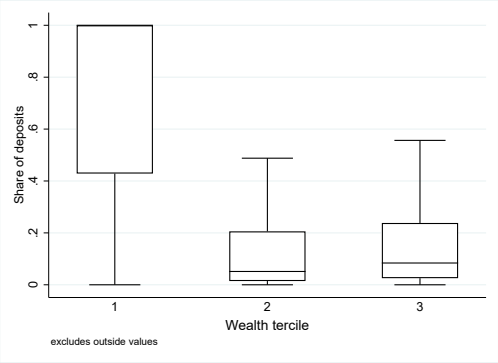
2.1 Summary statistics

Portfolio choice varies with wealth, even when only analyzing deposits and housing. The bottom of the wealth distribution is characterized by having most of its savings in deposits, while in the middle of the distribution, housing is the asset with the highest share. At the bottom, housing is part of most households' portfolios but to a minor degree compared to the middle (Figure 1).

Financial literacy is unequally distributed along the wealth distribution. While at the bottom, only 26.5% have high financial literacy, at the top, this number is 64%. This translates into some heterogeneity in portfolio choice, particularly at the bottom, where those with high financial literacy tend to have a lower share invested in deposits (Figure 2).

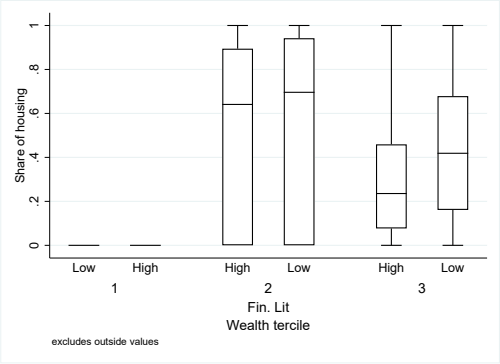


(a) Housing

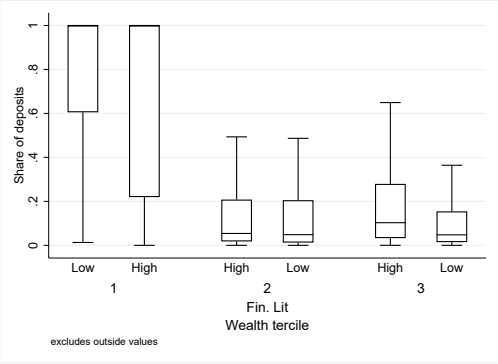


(b) Deposits

Figure 1: Median by wealth level



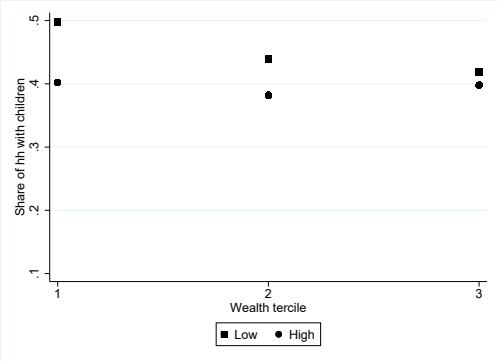
(a) Housing



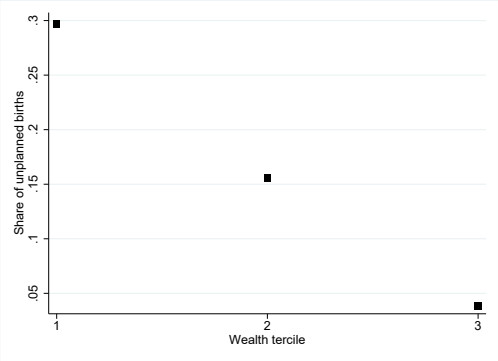
(b) Deposits

Figure 2: Median by wealth level and financial literacy

Fertility, defined as the share of households with at least one child, decreases along the wealth distribution as has been widely documented in the literature. While at the bottom, almost half of the households have a child, at the top, it is around 40% (Figure 3). The same pattern holds when using the questions related to contraception to define exogenous children (Figure 19). Those with higher financial literacy are less likely to have children, a difference starker at the bottom of the wealth distribution and that shrinks towards the top.



(a) Fertility



(b) "Unplanned"

Figure 3: Fertility and "unplanned" births by wealth level

Putting all the above together, Table 1 presents the correlation between financial literacy, fertility and the position in the wealth distribution. These are partial correlations when controlling for age. As expected, and in line with Lusardi, Michaud, and Mitchell (2017), financial literacy and the position in the wealth distribution are highly correlated, while fertility is negatively correlated with both.

Table 1: Correlation between financial literacy, fertility and wealth

	Fin. Lit.	Fertility	Wealth tercile
Fin. Lit.	1.00		
Fertility	-0.055	1.00	
Wealth tercile	0.27	-0.026	1.00

3 Empirical strategy

Since the dependent variable of interest is the share of an asset in the total portfolio, it is censored between 0 and 1, so the estimation uses a Tobit model. In the particular case of PSID, since it is a panel, it is a random effects Tobit while the estimations with th SCF is a standard Tobit. Let $y^k_{i,t}$ be the share of the portfolio invested in asset k, and $y^{*k}_{i,t}$ the corresponding latent variable:

$$y^k_{i,t} = \begin{cases} 0 & y^{*k}_{i,t} \leq 0 \\ y^{*k}_{i,t} & 0 \leq y^{*k}_{i,t} \leq 1 \\ 1 & y^{*k}_{i,t} \geq 1 \end{cases} \tag{1}$$

When estimating the effect of a "static" variable ($z_{i,t}$), such as having a child living at home, the Tobit takes the form in equation (2). The controls in $X_{i,t}$ include age, age squared, years of education, gender, marital status, state, number of adults in household, income tercile, wealth tercile, year fixed effects. The parameter of interest is γ^k, which denotes the effect of having a child at home on the share of asset k. In this regression the control group are those households without a child living at home. The estimation of the effect by wealth group would include the interaction between the variable of interest, $z_{i,t}$, and the wealth tercile. In that case, the control group would be those in the same welath tercile who do not have children living at home. Including age ad its squared in the regression adjusts for life-cycle trajectories of asset k share.

$$y_{i,t}^{*k} = \beta^k X_{i,t} + \gamma^k z_{i,t} + \epsilon_{i,t}^k \tag{2}$$

The other type of effect estimated is that around the birth of a child. In such a case the specification is that of equation (3). The controls are the same as described above and the coefficients of interest are γ_j^k. These coefficients represent the difference in the share of asset k between those households who have (had) a child j periods after (before) with respect to the control group. To analyze "planned" and "unplanned" births PSID allows to observe the household before and after, so $N_0 = 4$ and $N_1 = 2$ (this corresponds to 2-year periods). When analyzing the effect of financial literacy using the SCF only the after part can be observed, so $N_0 = 0$ and $N_1 = 18$.

$$y_{i,t}^{*k} = \beta^k X_{i,t} + \sum_{j=-N_0}^{N_1} \gamma_j^k \mathbb{1}\{birth_{i,t-j}\} + \epsilon_{i,t}^k \tag{3}$$

In all cases, equations (2) and (3), the standard errors are clustered at the household level. The following subsections discuss the specifics of the estimation of the effects of the birth of the first child, "unplanned" children, and heterogeneity by financial literacy.

3.1 Birth of first child

There are two options to define the control group. First, use the complete sample so the control group are those households who do not have a child. The disadvantage in this case is the presence of some households who might be planning to have a child in a few years and are adjusting their portfolio in advance. This would create a bias downwards of the estimates. The second option is to define the control as those who have not had a child and its members are too "old" to have a child. The advantage is that by using the observations of these households when they were younger the control group does not include any type of portfolio adjustment anticipating a birth. For this case I define the control group as those

households for whom the head of the households is observed being at least 40 years and not having a child registered at any point. Of the observed births only 10% correspond to a head of the household who is 40 or older at the moment of birth. The text presents the results for the whole sample as control group, although the results are robust to using the second control group.

3.2 "Unplanned" births

There are three ways to define the control group in this case. Those who are observed above 40 without having a child, those who had a child and the whole sample (which includes those who do not have a child but are still young enough to make it likely for them to have one in the future). The results are robust to any choice, but the results presented in the main text are those using the first option, those who are observed being 40 or older not having a child. When using the second or third option, which include those who had a "planned" child[1], the estimated regression is

$$y_{i,t}^{*k} = \beta^k X_{i,t} + \sum_{j=-N_0}^{N_1} \gamma_{0,j}^k \mathbb{1}\{birth_{i,t-j}\} + \sum_{j=-N_0}^{N_1} \gamma_j^k \mathbb{1}\{birthunplanned_{i,t-j}\} + \epsilon_{i,t}^k \qquad (4)$$

3.3 Financial literacy in SCF

Since the SCF is not a panel and the analysis has to focus on the portfolio of households once they have a child. The young life of children is split in four periods (groups), 0-4, 5-9, 10-14, and 15-17. The estimated regression (equation (5)) includes the interaction of these variables (j) with the level of financial literacy (f) and the wealth tercile (l). In this case the coefficients of interest are ($\gamma_{l,f,j}^k$) which denote the effect of having a child on portfolio share of asset k with respect to households without children in the same wealth and financial literacy groups.

$$y_{i,t}^{*k} = \beta^k X_{i,t} + \sum_{l=1}^{3}\sum_{f=1}^{2}\sum_{j=1}^{4} \gamma_{l,f,j}^k \mathbb{1}\{\text{child group} = j\}\mathbb{1}\{\text{finlit group} = f\}\mathbb{1}\{\text{wealth tercile} = l\} + \epsilon_{i,t}^k \qquad (5)$$

[1] All the observations are used, including those births before the questions to determine if it was unplanned were included in the PSID. Using since 2010 to classify all births as planned or "unplanned" does not change the conclusions

4 Stylized facts on household portfolios

This section presents five empirical facts on household portfolios and fertility. The goal is to unveil how fertility affects portfolio choice along the wealth distribution, and how financial literacy can tilt the portfolio in favour of some of the assets. As explained above, PSID and SCF include data on different type of assets, however because of the importance in the bottom of the wealth distribution, I focus here in deposits and housing. The results can be extrapolated to a classification of assets between liquid and illiquid, as the effects on many of the other assets is not significantly different for those with and without children. The importance of liquidity has been widely analyzed in the literature (e.g. Kaplan and Violante (2014) among others on its effect in the marginal propensity to consume), but it becomes more important in the presence of children, which increases the total expenditure of households and pushes them closer to their borrowing limit.

I present five empirical facts. The first two are related to the difference in portfolios for households who include children and how these effects vary across the wealth distribution. The third and fourth facts are about the rebalances that occur around the birth of a child. I differentiate between the effect for all births aggregated and those that are "unplanned". Finally, the last empirical fact is about financial literacy and its role in any portfolio differences due to fertility.

4.1 Children living at home

There is a significant and sizable bias of households with children to have a higher share of housing in their portfolio. Table 2 shows how households with a child allocate almost 10% more of their portfolio to housing. This comes at the expense of having a lower share in deposits. This choice points to a preference for housing for parents, while always making it clear that those with children are more exposed to income shocks by having less liquid assets.

4.2 Children living at home - heterogeneity by wealth level

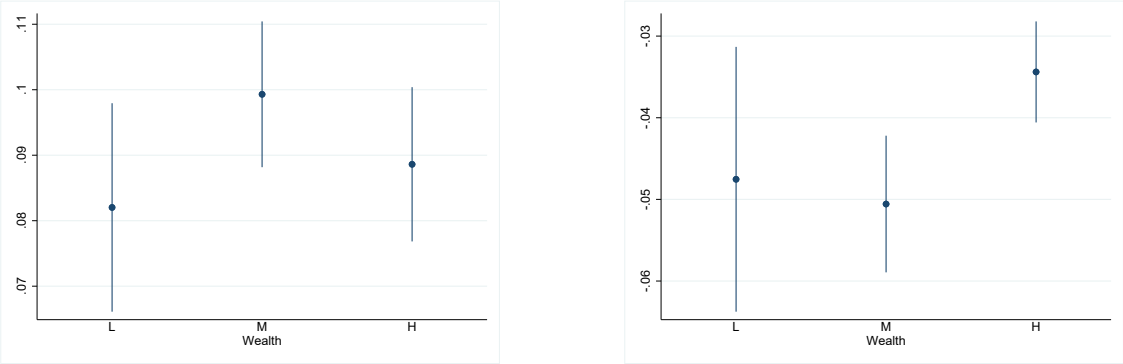
The above observation holds for all wealth levels. The magnitudes are different across the distribution though. In housing, those in the middle of the wealth distribution have the largest difference when compared to those without children. This can be understood as some of the households in the bottom of the distribution probably constrained and unable to have a larger share in housing, while those at the top having enough resources to own housing according to their preference without needing to invest a much larger share of their portfolio to it. Deposits presents a similar pattern but with the opposite sign. While parents

Table 2: Effect of child at home on shares in portfolio

	Housing	**Deposits**
Child at home	0.086***	-0.035***
	(0.004)	(0.003)
N	60,267	59,607

Standard errors clustered by household in parentheses. *** p-value<0.01, ** p-value<0.05, * p-value<0.1. Controls head of household: age, age squared, years of education, gender, marital status. Controls household: state, number of adults, year fixed effects, income tercile, and wealth tercile

at the bottom and top of the distribution do not change their portfolio shares as much when compared to their counterparts without children, those in the middle of the distribution are forced to have a lower share in deposits as they chose to have a larger share in housing.



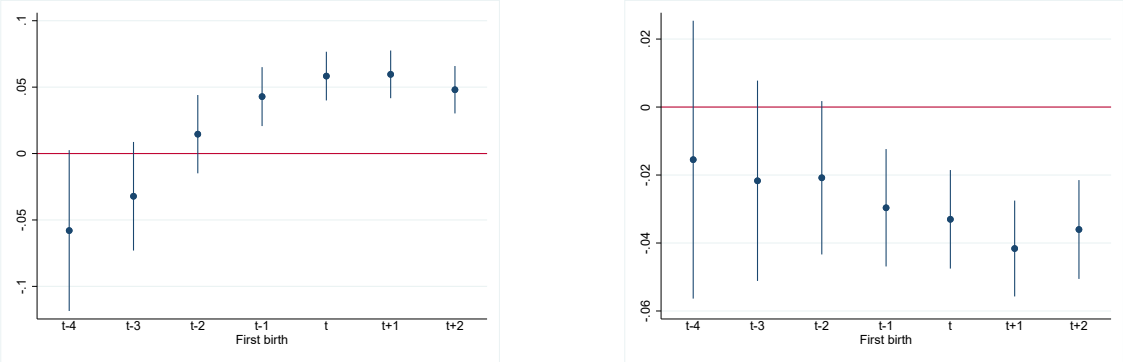
(a) Housing (b) Deposits

Figure 4: Effect of having at least one child at home

4.3 Anticipation to birth

Households adjust their portfolio in advance of the birth of children. This is easier to see when analyzing the birth of the first child (Figure 5). Households anticipate to the birth of a child by increasing their share of housing at least two years (one period in PSID) in advance. The purchase of housing is mostly funded with a mortgage, but also with deposits, which explains their decrease also before the birth. This implies that when households expect

to have a child in the future, they adjust their portfolio in advance and in the direction presented above.



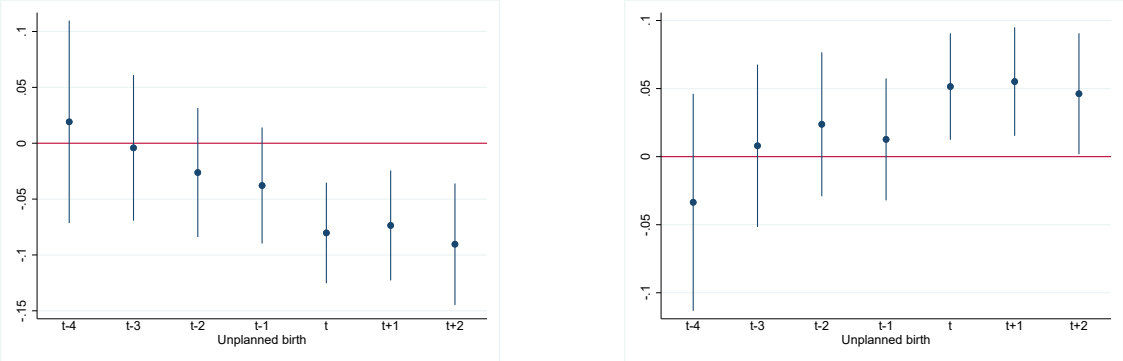
(a) Housing (b) Deposits

Figure 5: Birth of first child

4.4 "Unplanned" births

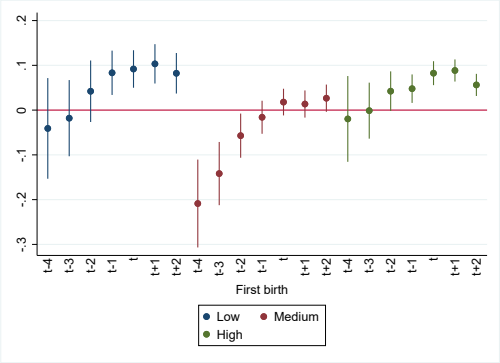
The case of unplanned births is a totally different story. When households face such a "shock" they respond by decreasing the share of illiquid assets (housing) and increasing deposits (Figure 6). As shown above, most of this births occur at the bottom or in the middle of the wealth distribution, explaining the need for liquid assets to face the increase in expenditures.

A possible explanation to this pattern could be that this is the way that households adjust their portfolio to birth in this part of the wealth distribution. However, Figure 7 shows how for all wealth levels, a "planned" birth implies an increase in the share of housing and a decrease in the share of deposits a couple years before the birth.

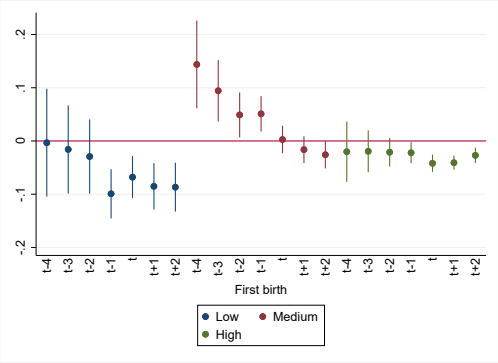


(a) Housing (b) Deposits

Figure 6: "Unplanned" birth. Control group: households with "planned" children



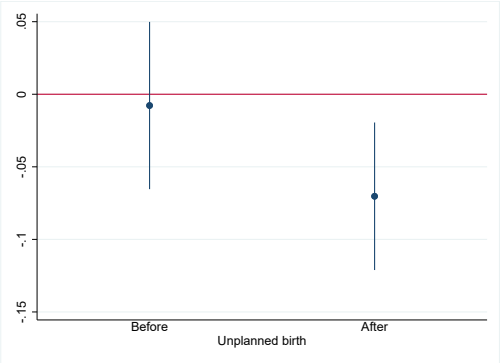
(a) Housing



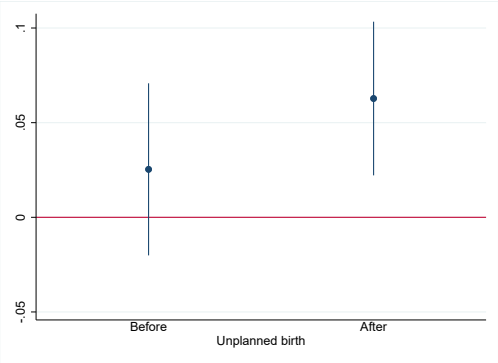
(b) Deposits

Figure 7: First birth by wealth

An easier way to see the effect of of an "unplanned" children on households portfolios is to compare the difference with the control group before and after the "shock". In particular, Figures 8 and 9 compare three periods before and after the "unplanned" birth. In both cases those with "unplanned" children increase the share of deposits after the birth, while decreasing the share of housing. When the control group are those households without children, the difference in the coefficients for housing before and after the "unplanned" birth is -0.110 with a p-value of 0.020, while for deposits the difference is 0.058 with a p-value of 0.098. When comparing to those with "planned" children the difference in housing is -0.133 with p-value of 0.011 and for deposits it is 0.074 with a p-value of 0.049. Figure 20 presents the comparison with the results when "unplanned" birth is defined with the contraception questions. Although the results on deposits are not significant, the decrease in housing is in the same direction and significant.

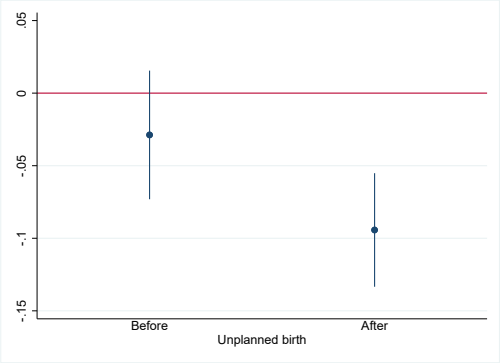


(a) Housing

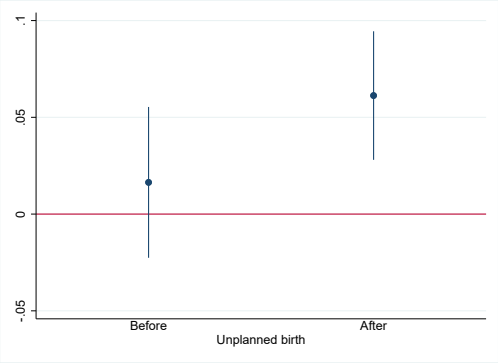


(b) Deposits

Figure 8: "Unplanned" birth before and after. Control group: households without children



(a) Housing



(b) Deposits

Figure 9: "Unplanned" birth before and after. Control group: households with "planned" children

4.5 The role of financial literacy

The heterogeneity of financial literacy plays a crucial role, particularly for the first two wealth terciles which are the ones more at risk when facing income shocks. In the bottom tercile those with low financial literacy invest more in housing at early ages of children, but then lag. On the contrary, those with high financial literacy increase the share of deposits during the first years of children and then, when children are 10, increase the share of housing. The ability to invest in deposits allows them to have a much higher share in housing later in children's lives. The difference in the patterns for the two levels of financial literacy could be explained by those with higher financial literacy having a higher return in financial assets and better terms when getting a mortgage, which allows them to overcome the transaction costs to own a house.

The pattern in the middle third of the wealth distribution supports the hypothesis. Those with high financial literacy are able to own a house earlier in the life of their children, so their share of housing increases earlier in their children's life. The difference between the first and second tercile is the speed at which they can save enough to overcome the transactions costs. While those at the bottom are closer to the borrowing constraint so the saving room is smaller, those in the middle of the wealth distribution could have accumulated enough resources to increase the share of housing once they have a child. The behaviour at the top of the wealth distribution corroborates the hypothesis. There is no difference in portfolio shares between those with different levels of financial literacy. In this part of the distribution the financial literacy does not play a role in overcoming the transaction costs.

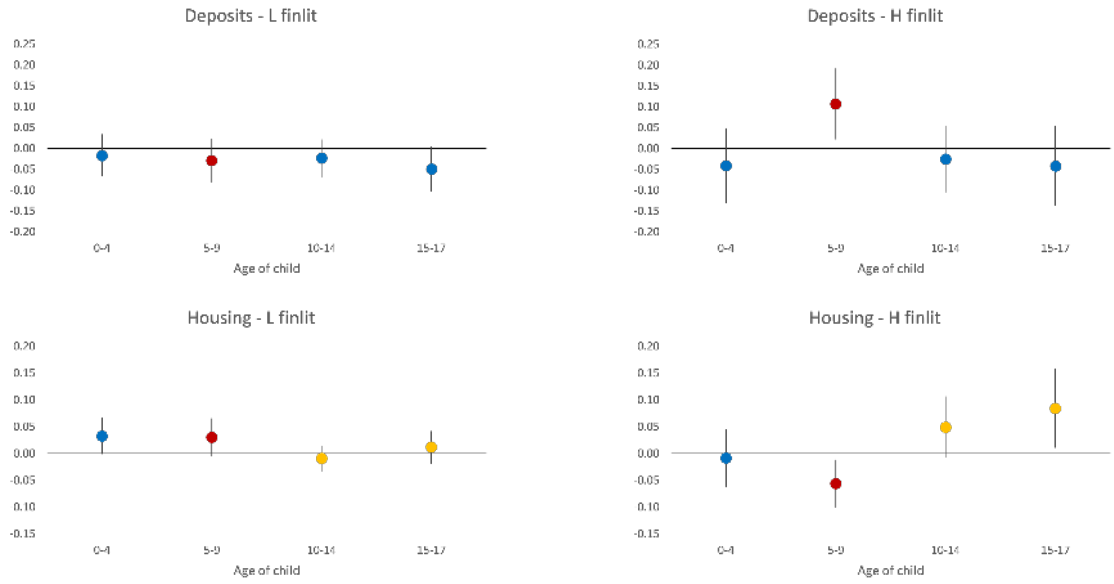


Figure 10: Effect of having a child on the share of deposits and housing for those in the bottom third of the wealth distribution. Red indicates difference between low and high financial literacy with p-value < 0.05, yellow indicates p-value$<$0.1

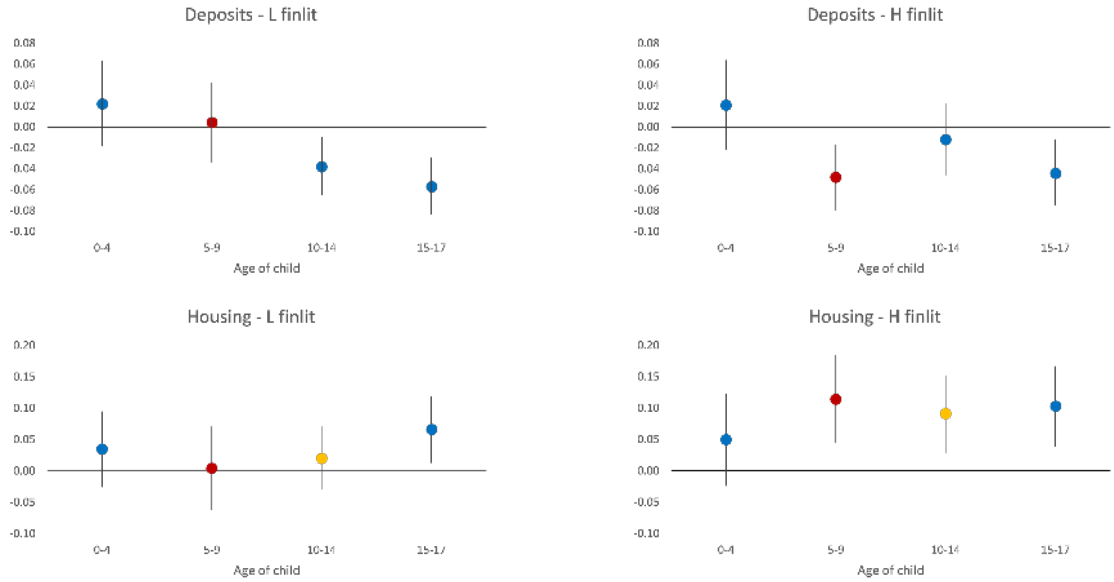
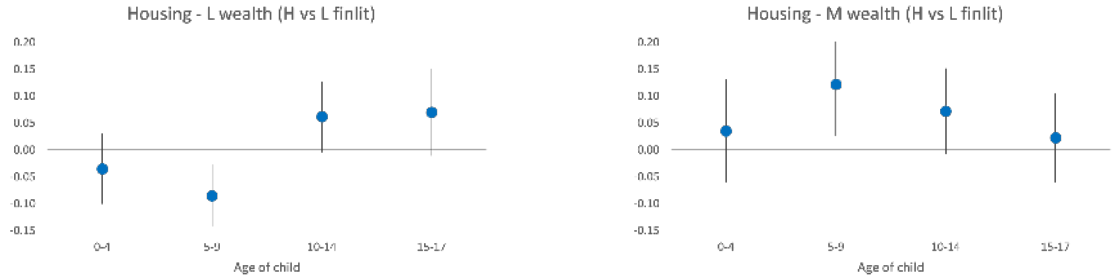


Figure 11: Effect of having a child on the share of deposits and housing for those in the middle third of the wealth distribution. Red indicates difference between low and high financial literacy with p-value < 0.05, yellow indicates p-value$<$0.1

Results are easier to understand when taking the difference between the effect for those with high financial literacy and those with low financial literacy. Figure 12 shows how those

at the bottom of the wealth distribution with high financial literacy hold less housing in their portfolio when their children are young, but increase their share later in their life. In the middle of the wealth distribution, those with high financial literacy hold a higher share of housing earlier in their children life.



(a) Wealth tercile 1

(b) Wealth tercile 2

Figure 12: Effect of having a child on the share of housing. Difference between high and low financial literacy

5 Model

The empirical results point to the relative importance of housing over liquid financial assets, such as deposits. The results of this trade-off vary with wealth and financial literacy levels. Consider a simple model in which households are composed of two adults (a) and possibly a child (d_t). In each period t, households choose to allocate savings between two assets: a liquid financial asset b_t and a durable consumption good (h_t). Return of both type of assets is known, and while the return of the durable good is the same for all households, there are two levels of return on the liquid asset (R): those with higher financial literacy have a higher return than those with low financial literacy (Fagereng et al. (2020) in Table 6 find that a degree in economics or business has an effect in the returns). This is in line with the model in Lusardi, Michaud, and Mitchell (2017), where financial literacy increases the expected value of a risky asset. The household problem at time t can be written as

$$V_t(b_t, h_{t-1}, d_t) =$$

$$\max_{c_t^a, c_t^d, b_{t+1}, h_t} \left\{ \frac{\left(\alpha_1 (c_t^a)^\rho + \psi d_t (c_t^d)^\rho + (\alpha_2 + g(d_t))\,(h_t)^\rho\right)^{(1-\sigma)/\rho}}{1-\sigma} + \beta \mathbb{E}_t[V_{t+1}(b_{t+1}, h_t, d_{t+1})] \right\}$$

s.t.

$$b_{t+1} + h_t + c_t^a + d_t c_t^d + \phi(h_t, h_{t-1}) = R_b b_t + R_h h_{t-1} + y_t$$

$$b_{t+1} \geq 0$$

$$h_t \geq 0$$

The utility function $u(c^a, c^d, h)$ is a composed function (based on Fernández-Villaverde and Krueger (2011); Attanasio et al. (2016)). The outer one is a CRRA that controls the intertemporal substitution, where $1/\sigma$ is the elasticity of intertemporal substitution. The inner function is a CES with elasticity $1/(1-\rho)$ among consumption of durable and non-durable consumption. The parameters α_1 and ψ govern the relative weight of the consumption of adults and children (if any) within a household, while the parameter α_2 and the function $g(d)$ govern the marginal utility of housing. The function $g(d)$ is increasing, so that households with children enjoy more a given unit of housing. The distinction between b and h is not only on the return or the utility but on its liquidity. Housing is less liquid, a characteristic which is captured by the function $\phi(h_t, h_{t-1})$. This function would capture many type of transaction costs on the housing market such as commissions and down payments.

In the last period households only consume and leave bequest if they had children during their life. The bequest motive is governed by the parameters κ and ϕ_{beq}:

$$V_T(b_T, h_{T-1}, y_T, d_T) = \max_{c_T^a, c_T^d, b_{T+1}, h_T} \left[u\left(c_T^a, c_T^d, h_T\right) + \mathbb{1}\{\max\{d_t\}_{t=0}^T > 0\}\beta\kappa \ln(\phi_{\text{beq}} + b_{T+1} + h_T)\right]$$

s.t.

$$b_{T+1} + h_T + c_T^a + d_T c_T^d + \phi(h_T, h_{T-1}) = R_b b_T + R_h h_{T-1} + y_T$$

$$b_{T+1} \geq 0$$

$$h_T \geq 0$$

5.1 Optimality conditions

Let $\lambda_t, \gamma_t^1, \gamma_t^2$ be the Lagrange multipliers of the constraints, then the FOCs are

$$u_1\left(c_t^a, c_t^d, h_t\right) - \lambda_t = 0 \tag{6}$$

$$u_2\left(c_t^a, c_t^d, h_t\right) - d\lambda_t = 0 \tag{7}$$

$$u_3\left(c_t^a, c_t^d, h_t\right) - \lambda_t(1 + \phi_1(h_t, h_{t-1})) + \mathbb{E}_t[(R_h - \phi_2(h_{t+1}, h_t))\beta\lambda_{t+1}] + \gamma_t^2 = 0 \tag{8}$$

$$-\lambda_t + R_b\beta\mathbb{E}_t[\lambda_{t+1}] + \gamma_t^1 = 0 \tag{9}$$

The first two conditions define the relationship between adults and children consumption. As shown below, this allows to write the problem in terms of total household consumption. The relationship between both assets (h and b) is given by the last two equations. While the total "return" of h is composed of two terms: increase in utility and transfer of savings across time (net of transaction consts), the return of b is only given by R_b. Thus, there are three aspects governing the choice between h and b:

1. Utility by consuming durable goods
2. Higher return of one of the two assets
3. Transaction costs associated with changes in housing

The first is the only one of the three aspects that favors housing. By assuming an interior solution ($\gamma_t^1 = \gamma_t^2 = 0$) we can see more clearly from equations (8) and (9):

$$u_3\left(c_t^a, c_t^d, h_t\right) + \beta\mathbb{E}_t[(R_h - \phi_2(h_{t+1}, h_t))\lambda_{t+1}] = (1 + \phi_1(h_t, h_{t-1}))\beta R_b\mathbb{E}_t[\lambda_{t+1}] \tag{10}$$

5.2 Total household consumption

The problem above can be written in terms of the total consumption of the household. Let $c_t = c_t^a + d_t c_t^d$ be household total consumption. From equations (6) and (7):

$$\alpha_1(c_t^a)^{-\theta} = \psi(c_t^d)^{-\theta} \Rightarrow c_t^a = (\psi/\alpha_1)^{1/(1-\rho)}c_t^d \tag{11}$$

From this equation and the definition of c_t we can rewrite the household problem as

$$
\begin{aligned}
V_t(b_t, h_{t-1}, y_t, d_t) = \max_{c_t, b_{t+1}, h_t} & \frac{\left(\alpha_1(1 + d_t(\psi/\alpha_1)^{1/(1-\rho)})^{1-\rho} c_t^{\rho} + (\alpha_2 + g(d_t))\,(h_t)^{\rho}\right)^{(1-\sigma)/\rho}}{1-\sigma} \\
& + \beta \mathbb{E}_t[V_{t+1}(b_{t+1}, h_t, y_{t+1}, d_{t+1})] \\
& \text{s.t.} \\
& b_{t+1} + h_t + c_t + \phi(h_{t-1}, h_t) = R_b b_t + R_h h_{t-1} + y_t \\
& b_{t+1} \geq 0 \\
& h_t \geq 0
\end{aligned}
$$

Children have three effects on the household decision. First, children increase the marginal utility of consumption by increasing its weight from α_1 to $\alpha_1(1+d_t(\psi/\alpha_1)^{1/(1-\rho)})^{1-\rho}$. Second, they also increase the utility of housing from α_2 to $\alpha_2 + g(d)$. Finally, they increase total household consumption, from c^a to $c^a(1 + d(\psi/\alpha_1)^{1/(1-\rho)})$.

5.3 Functional forms

The income process is composed of a deterministic part (y_t^f), a persistent shock z_t and a transitory shock (ϵ_t)

$$\ln(y_t) = y_t^f + z_t + \epsilon_t \tag{12}$$

$$z_t = \rho_y z_{t-1} + \nu_t \tag{13}$$

The adjustment cost of housing is a maximum function with two components: one which is proportional to h_t, which captures commission costs, and one which is a fixed amount capturing down-payments

$$\phi(h_t, h_{t-1}) = \begin{cases} 0 & h_t = h_{t-1} \\ \max(\phi_1 h_t + \phi_2 (h_t - h_{t-1})^2, \phi_0) & h_t \neq h_{t-1} \end{cases} \tag{14}$$

The function that changes the weight of durable goods for households with children takes the form $g(d) = \eta^d - 1$, so that $g(0) = 0$. The model only considers at most one child in each household ($d = 0.25$), so the parameter η governs the additional utility of housing for households with children.

5.4 Parameter values

Most of the parameter values are externally calibrated. The elasticity of substitution between durable and non-durable goods comes from Fernández-Villaverde and Krueger (2011) and is

equal to one. This implies a Cobb-Douglas utility function. The authors conclude there is not clear concensus on this parameter and there are estimations for ρ above and below 0. The weights in the CES (α_1, α_2) and the elasticity of intertemporal substitution $(1/\sigma)$ are very standard in the literature. The parameter ψ is chosen in such a way that the ratio of non-durable consumption of a household with and without a child matches the international estimations. The return on housing is to 1.03 (this implies an annual return around 1.5%, in between the long-run estimation by Shiller (2011) and the average return in the last two decades). The parameter ϕ_1 is set to 0.06 in line with Bajari et al. (2013) who assume that the buyer pays all the transaction costs.

Table 3: Parameter values

Parameter	Value	Source
ρ	0	Fernández-Villaverde and Krueger (2011)
α_1	0.85	Kaplan and Violante (2014)
α_2	0.15	Kaplan and Violante (2014)
σ	2.0	Fernández-Villaverde and Krueger (2011)
ψ	0.92	Attanasio et al. (2016)
y_t^f		Hansen (1993)
ρ_y	0.935	Fernández-Villaverde and Krueger (2011)
σ_ν	0.247	Fernández-Villaverde and Krueger (2011)
σ_ϵ	0.130	Fernández-Villaverde and Krueger (2011)
κ	0.031	Cooper and Zhu (2016)
ϕ_{beq}	1.834	Cooper and Zhu (2016)
β	0.88	Kaplan and Violante (2014)[2]
R_h	1.03	Shiller (2011) and average 2000-2020
ϕ_1	0.06	Bajari et al. (2013)

The parameters of the functions $g(.)$ and $\phi(.,.)$, and the returns on the liquid asset are set to match moments of the data shown in Table 4. There are three type of moments in the table. First, the additional share of housing in portfolios for households with children. There is a moment for every wealth tercile. The total return of b is set to 1.05 or 2.5% annually. Finally, there are four moments for the double difference by children at home and financial literacy for households at the bottom of the wealth distribution (Figure 12a).

To have more flexibility, there is a parameter η for different stages of a child life: 0-4 years, 5-9, 10-14 and 15-17. The value of η around 4.0 implies an increase in the weight of the durable good from 0.15 $(= \alpha_2/(\alpha_1 + \alpha_2))$ to 0.34 $(= (\alpha_2 + \eta^{0.25} - 1)/(\alpha_1 + 0.25 \times$

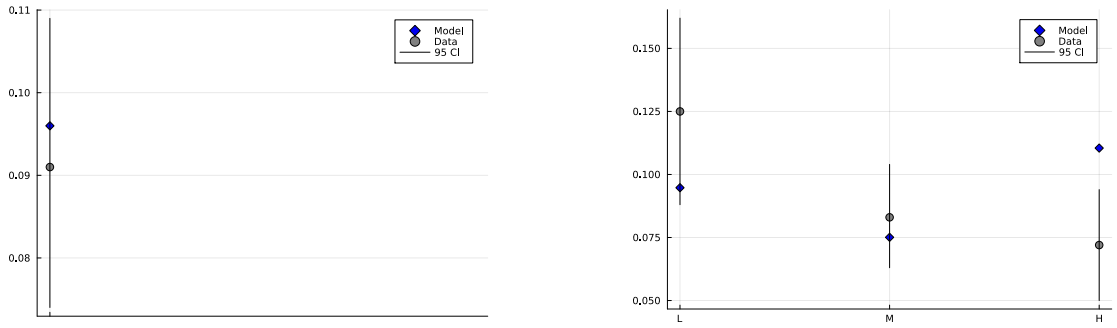
[2]In the SCF median wealth over median biannual income is 1.4. The model produces an equivalent moment of 1.2 after the calibration of the parameters in Table 4

$0.92 + \alpha_2 + \eta^{0.25} - 1))$ for families with a child. The parameter ϕ_0 implies that every time the household adjusts the value of housing has to pay 6% of the value of the new housing plus a quadratic cost or 0.46 (the model is in tens of thousands of dollars, which implies a fixed cost of \$5,000) whichever is larger. The difference in return between households with different financial literacy levels is 2% which is approximately 1.0% annually.

Table 4: Moments are excess of share in housing children vs no children

Parameter	Value	Moment	Model	Data
η_{0-4}	4.59	Child at home tercile 1	0.095	0.125
η_{5-9}	3.38	Child at home tercile 2	0.075	0.083
η_{10-14}	4.10	Child at home tercile 3	0.110	0.072
η_{15-17}	3.43	R	1.059	1.05
ϕ_0	0.47	Figure 12a 0-4	-0.038	-0.035
ϕ_2	0.14	Figure 12a 5-9	-0.049	-0.082
$R_{\text{lowfinlit}}$	1.05	Figure 12a 10-14	0.024	0.063
$R_{\text{highfinlit}}$	1.07	Figure 12a 15-17	0.019	0.070

The targeted moments and the results of the model are shown in Figures 13 and 14. The model replicates the additional share in housing by wealth level when households have a child, with a slight overestimation in the highest tercile. Since policies and counterfactuals are analyzed in the first two terciles this does not impact largely the results. The model is also able to replicate the difference in paths between those with high financial literacy and those with low financial literacy in the lowest tercile. In particular, the fact that those with higher financial literacy increase less the share of housing during the first years of a child's life while increasing it more later.



(a) All wealth levels

(b) By wealth level

Figure 13: Share of housing with a child living at home

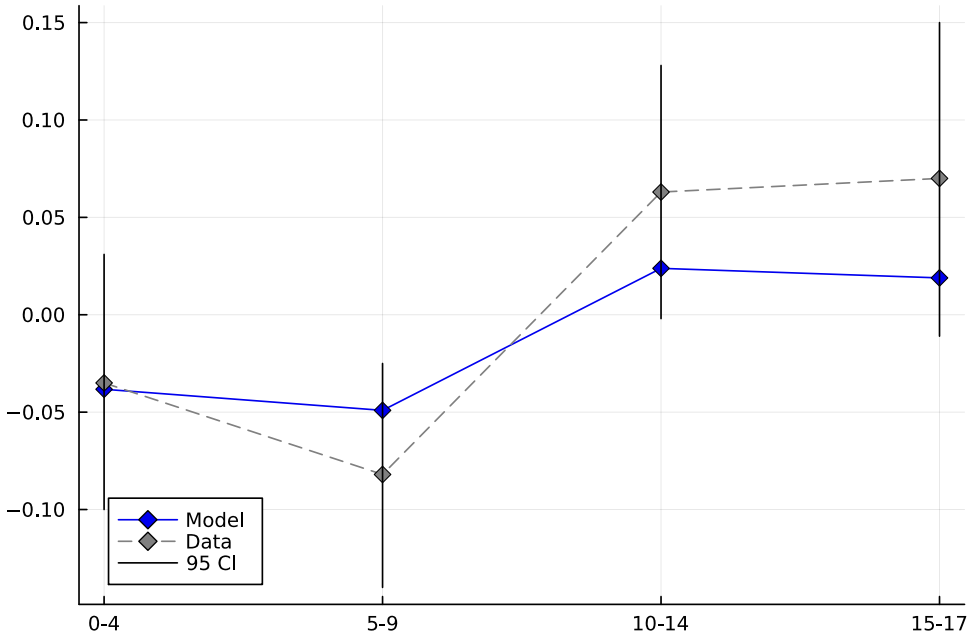


Figure 14: Low wealth. Difference in share in housing

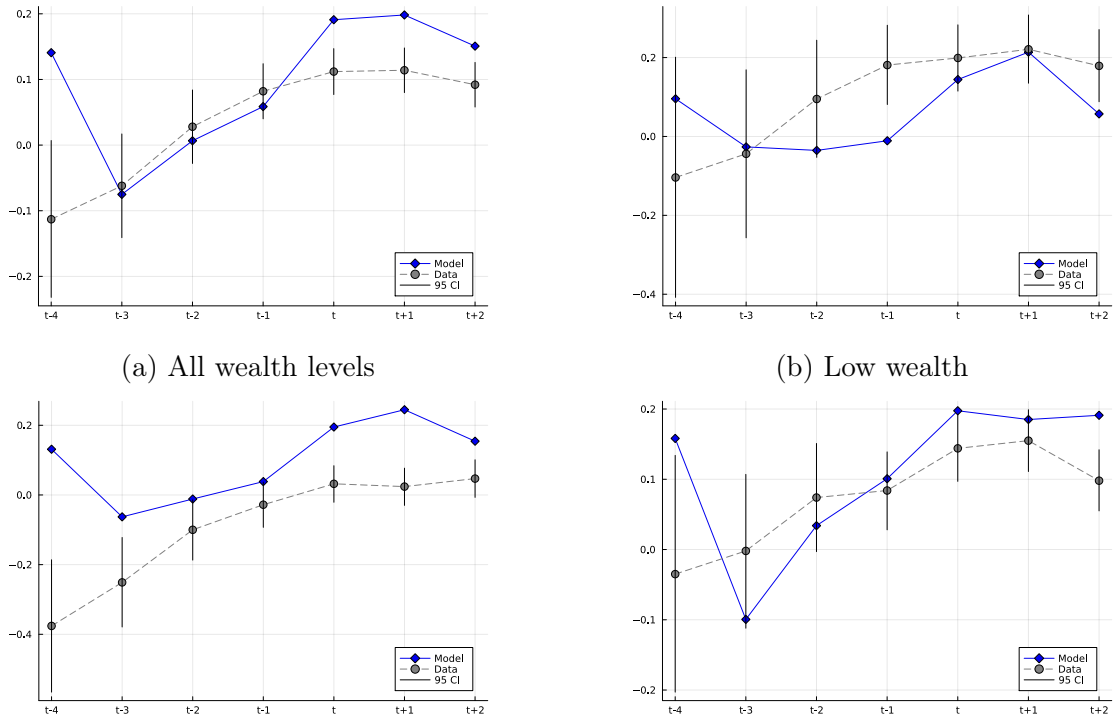
5.5 Simulation

Households are simulated for 23 periods, each corresponding to two years, that is, from age 20 to age 66. They are born with a given level of financial literacy (high or low), a dummy for fertility and initial level of the permanent income shock. With the correlation among these 3 variables from data I estimate a copula from which I simulate initial conditions. The moment of the birth is either period 4 or 7 and known from moment 0. These two periods are the first and second tercile of the age of the household in the PSID. The initial assets are 60% of the initial income, which corresponds to the median asset to income and the mean of wealth to income in the data. The assets are mostly housing with probability of 13% or only deposits with the remaining probability which corresponds to the probability in the data for those younger than 25. The probabilities of having an unplanned birth also depend on the initial level of the permanent income shock and they were estimated from data. Those with the lowest level have a probability of 0.4 of having an unplanned birth, those in the middle group have a probability of 0.2 and those with the highest level a probability of 8%. Both b and h are partitioned in 60 points, the permanent shocks z_t in three and the transitory shock ϵ in two. The model is solved using the endogenous grid method developed by Fella (2014).

5.6 Non-targeted moments

The model picks up quite well other non-targeted moments. Figure 15 shows the difference in share of housing between those with and without children at different wealth levels. In the lowest tercile the model has a slower increase in the share of housing, making the values at $t-1$ and t lower than in data. The path in the medium of the wealth distribution is very similar to data but consistently higher. Finally, at the top of the wealth distribution the model overshoots the increase when children are born. In any case, it is important to note that the shape of the paths are similar to those in data.

Figure 16 presents the comparison between planned and unplanned births. The model replicates correctly the trend before the birth and the decrease in the share of housing at the time of birth. Finally, Figure 17 shows the double difference in the second tercile of the wealth distribution between those with and without children for the two financial literacy levels. This is the equivalent to Figure 12a but for the second tercile. The model replicates correctly that those with higher financial literacy hold a higher share of housing in their portfolio, unlike in the first tercile where it depends on the age of the child.



(a) All wealth levels

(b) Low wealth

(c) Medium wealth

(d) High wealth

Figure 15: Share of housing around time of birth

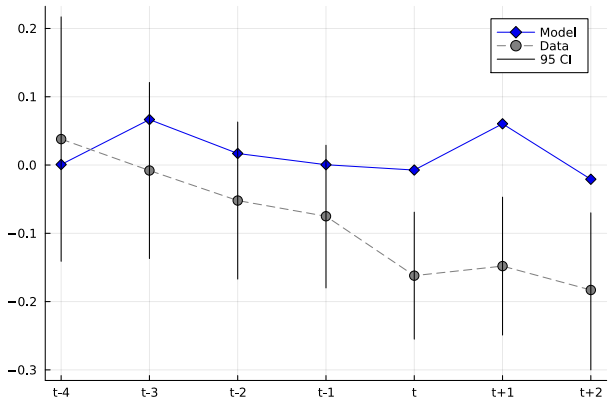


Figure 16: Share of housing "unplanned" birth. Control group: planned children

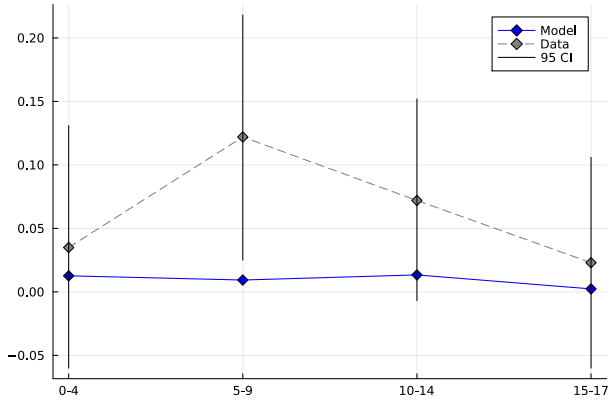


Figure 17: Medium wealth. Difference in share in housing

5.7 Possible extensions

This simple model can be extended with the following parameters:

- Introduce shocks to returns (R_b). Financial literacy could play a double role: increasing mean return and decreasing the volatility of such returns
- Make the borrowing limit also depend on the stock of housing. This would allow households to use housing as collateral

6 Counterfactuals and policy analysis

6.1 Unplanned children with different financial literacy levels

Financial literacy significantly impacts household portfolios in the event of "unplanned" births. As documented in the empirical section, financial literacy allows households to hold

a higher share of housing in their portfolio when they have children. When households face an "unplanned" birth, their expenses increase unexpectedly, making liquid assets more valuable. Financial literacy helps households to save the same amount with less initial funds due to a higher interest rate on the liquid asset. This analysis can not be carried out empirically, as no database includes questions on "unplanned" births and financial literacy, which makes the model useful for this comparison.

Figure 18 illustrates the path for households who face "unplanned" births with different levels of financial literacy. Households with higher financial literacy maintain a stable share in housing compared to those with planned children. In contrast, those with low financial literacy experience a decline in housing allocation and an increased need to save in liquid assets at the time of birth (as shown at time t in Figure 18). Those with higher financial literacy experienced a lower decrease and a more stable share of housing over time.

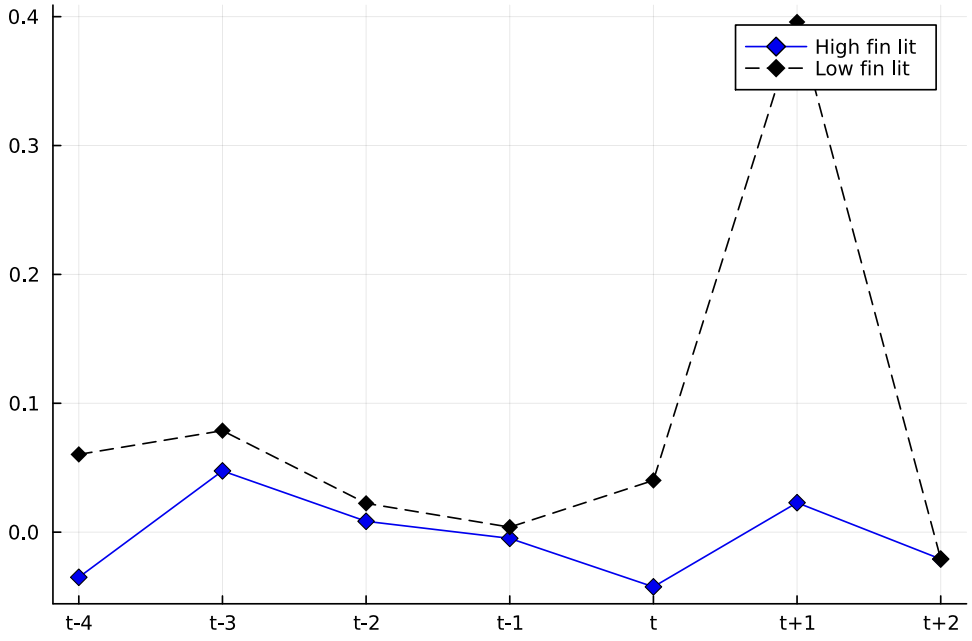


Figure 18: Unplanned births by financial literacy level. Control group: planned children

6.2 Can financial literacy programs increase welfare?

A direct measure of welfare is the change in consumption units necessary to make two households have the same utility, i.e., find the value of m such that:

$$\mathbb{E}\sum_{t=0}^{T}\beta^t u(c_t^1, h_t^1, d_t^1) = \mathbb{E}\sum_{t=0}^{T}\beta^t u(m \times c_t^2, h_t^2, d_t^2) \tag{15}$$

Since children affect the utility of households it is easier to compare households with equal

number of children born at the same time, so that $d_t^1 = d_t^2$. As expected, financial literacy comes with higher consumption and thus higher utility given the higher wealth of households. So financial literacy programs, from a partial equilibrium point of view, would be welfare enhancing. The most interesting aspect of it is for which groups it is more important. Table 5 shows the comparison for three groups: no children, planned children and "unplanned" ones. Financial literacy has the lowest impact on households with no children, in which case the difference is 0.14%. However, for households with "unplanned" children financial literacy increases welfare by 0.24%, almost twice the increase for households without children. When comparing the means, the effect of financial literacy is more than 1% and more than 7x higher when comparing households with "unplanned" births and without children.

Table 5: Comparison in non-durable consumption units. Same children different financial literacy

Group	Median	Mean
No child. High vs Low finlit	0.14%	0.16%
Planned child. High vs Low finlit	0.18%	0.56%
Unplanned. High vs Low finlit	0.24%	1.25%

200 simulations. Comparison between households with the same income stream. Initial persistent component of income set at lowest value.

6.3 Roe v Wade: How would more "unplanned" births affect welfare and household finances?

The increase in "unplanned" births is a very likely scenario given the overturn of Roe v Wade. However, financial literacy can mitigate the impact on households' welfare. Table **??** shows that "unplanned" children imply a decrease in welfare (measured in consumption units) of 0.06% when the household has low financial literacy. However, this difference is 0.02% with high financial literacy. This is a decrease of almost 70%. When comparing the means the difference is smaller but still close to 20%.This implies that financial literacy can decrease significantly the negative impact of "unplanned" births on households' welfare.

Table 6: Comparison in non-durable consumption units. Same financial literacy different birth type

Group	Median	Mean
Low finlit. Planned vs "Unplanned" children	0.06%	0.37%
High finlit. Planned vs "Unplanned" children	0.02%	0.30%

200 simulations. Comparison between households with the same income stream. Initial persistent component of income set at lowest value.

6.4 Decreasing the cost to buy housing for those with children

6.5 State and race differences

7 Conclusions

This paper provides new evidence on the relationship between household portfolio choices, fertility, and financial literacy. The empirical analysis shows that households tend to accumulate more housing wealth around a child's birth and that financial literacy significantly impacts the speed of portfolio rebalancing. The model confirms these findings and suggests that financial literacy programs could help households overcome transaction costs associated with buying housing while maintaining an adequate liquidity buffer.

Counterfactual results show that financial literacy can mitigate the negative welfare effects of "unplanned" births by more than 20%. These results highlight the importance of financial literacy for household financial decisions. They suggest that policymakers could consider various programs to improve financial literacy and support families with young children. Further research could focus on endogenizing fertility and exploring the role of financial literacy in shaping the probability of unplanned births.

References

Alan, Sule, Orazio Attanasio, and Martin Browning (2009). "Estimating Euler equations with noisy data: two exact GMM estimators". In: *Journal of Applied Econometrics* 24(2), pp. 309–324.

Attanasio Orazio P, et al (1999). "Humps and Bumps in Lifetime Consumption". In: *Journal of Business & Economic Statistics* 17(1), pp. 22–35.

Attanasio, O. et al. (2016). "Global Demographic Trends". In: *Handbook of the Economics of Population Aging*. Ed. by John Piggott and Alan Woodland. Vol. 1. Handbook of the Economics of Population Aging. Elsevier. Chap. 0, pp. 179–235.

Bajari, Patrick et al. (2013). "A Dynamic Model Of Housing Demand: Estimation And Policy Implications". In: *International Economic Review* 54(2), pp. 409–442.

Bogan, Vicki L. (2013). "Household investment decisions and offspring gender: parental accounting". In: *Applied Economics* 45(31), pp. 4429–4442.

Cooper, Russell and Guozhong Zhu (2016). "Household Finance over the Life-Cycle: What does Education Contribute?" In: *Review of Economic Dynamics* 20, pp. 63–89.

Fagereng, Andreas et al. (2020). "Heterogeneity and Persistence in Returns to Wealth". In: *Econometrica* 88(1), pp. 115–170.

Fella, Giulio (2014). "A generalized endogenous grid method for non-smooth and non-concave problems". In: *Review of Economic Dynamics* 17(2), pp. 329–344.

Fernández-Villaverde, Jesús and Dirk Krueger (2011). "Consumption And Saving Over The Life Cycle: How Important Are Consumer Durables?" In: *Macroeconomic Dynamics* 15(5), pp. 725–770.

Gaudecker, Hans-Martin von (2015). "How Does Household Portfolio Diversification Vary with Financial Literacy and Financial Advice?" In: *The Journal of Finance* 70(2), pp. 489–507.

Görlitz, Katja and Marcus Tamm (2015). *Parenthood and Risk Preferences*. Ruhr Economic Papers 552. RWI - Leibniz-Institut für Wirtschaftsforschung. Ruhr-University Bochum. TU Dortmund University. University of Duisburg-Essen.

Hansen, G. D. (1993). "The cyclical and secular behaviour of the labour input: Comparing efficiency units and hours worked". In: *Journal of Applied Econometrics* 8(1), pp. 71–80.

Hastings, Justine and Olivia S. Mitchell (2020). "How financial literacy and impatience shape retirement wealth and investment behaviors". In: *Journal of Pension Economics and Finance* 19(1), pp. 1–20.

Kaplan, Greg and Giovanni L. Violante (2014). "A Model of the Consumption Response to Fiscal Stimulus Payments". In: *Econometrica* 82(4), pp. 1199–1239.

Love, David A. (2009). "The Effects of Marital Status and Children on Savings and Portfolio Choice". In: *The Review of Financial Studies* 23(1), pp. 385–432.

Lusardi, Annamaria, Pierre-Carl Michaud, and Olivia S. Mitchell (2017). "Optimal Financial Knowledge and Wealth Inequality". In: *Journal of Political Economy* 125(2), pp. 431–477.

Lusardi, Annamaria and Olivia S. Mitchell (2007a). "Baby Boomer retirement security: The roles of planning, financial literacy, and housing wealth". In: *Journal of Monetary Economics* 54(1), pp. 205–224.

Lusardi, Annamaria and Olivia S. Mitchell (2007b). "Financial Literacy and Retirement Preparedness: Evidence and Implications for Financial Education". In: *Business Economics* 42(2), pp. 35–44.

Rooij, Maarten C.J. van, Annamaria Lusardi, and Rob J.M. Alessie (2012). "Financial literacy, retirement planning and household wealth". In: *The Economic Journal* 122(560), pp. 449–478.

Scholz, JohnKarl and Ananth Seshadri (2007). *Children and Household Wealth*. Working Papers wp158. University of Michigan, Michigan Retirement Research Center.

Shiller, Robert J. (2011). "33. Long- Term Perspectives on the Current Boom in Home Prices". In: *The Economists' Voice*. Ed. by Joseph E. Stiglitz, Aaron S. Edlin, and J. Bradford DeLong. Columbia University Press: New York Chichester, West Sussex, pp. 269–287.

Su, Jessica Houston and Fenaba R. Addo (2018). "Born Without a Silver Spoon: Race, Wealth, and Unintended Childbearing". In: *Journal of Family and Economic Issues* 39(4), pp. 600–615.

A Other definitions of "unplanned" children

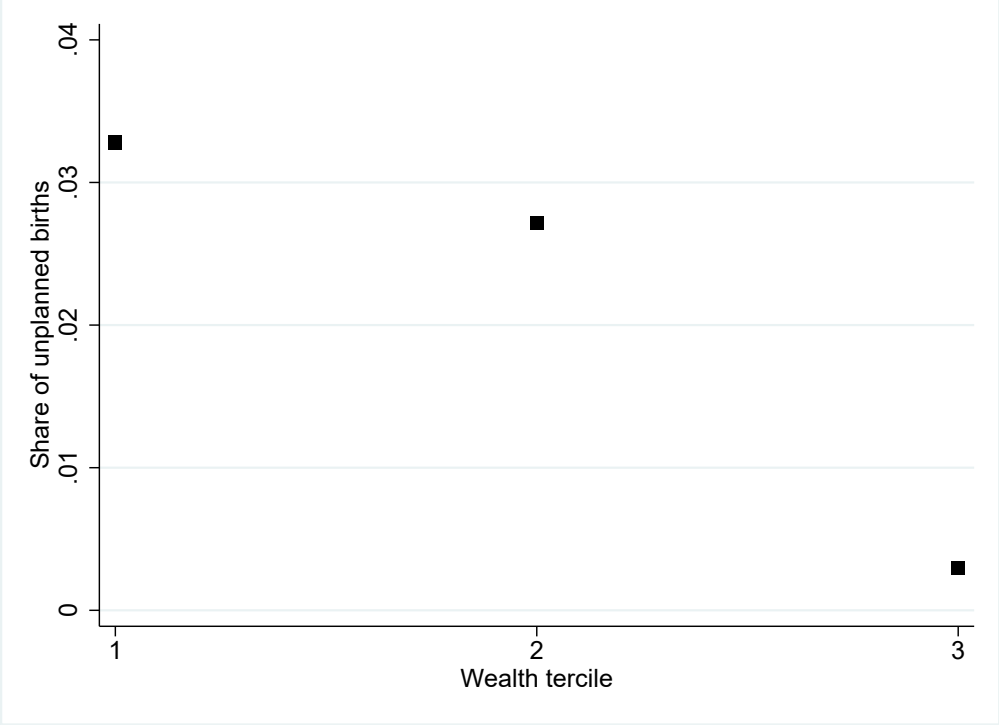
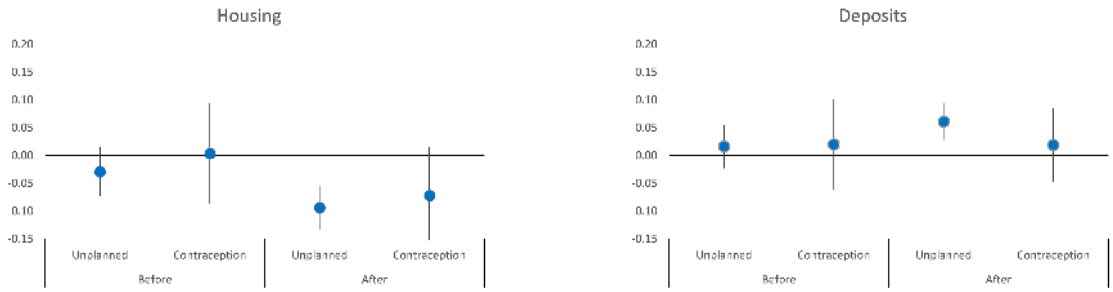


Figure 19: "Unplanned" births by wealth level using contraception questions



(a) Housing (b) Deposits

Figure 20: Comparison births based on answers on use of contraception and "planned". Before and after shock. Control group: households with "planned" children