Finance and Welfare: The Effect of Access to Credit on Family Structure

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There is a large debate over the welfare effects of the early 2000s housing boom and bust. One potentially important welfare effect is the impact of mortgage credit expansion on family structure. I exploit zip code level variation within US counties to study the effect of access to credit on fertility outcomes through a channel associated with a more efficient reallocation, which allows young households to access space by either moving to larger homes or achieving homeownership earlier in their life-cycle. To causally estimate this effect, I compare, within the same county, zip codes that have the same level of old (age>65) population, but have different levels old homeowners who live alone. I show that from 2000 to 2006, there is a disproportional increase in mortgages originated and sold relative to non-sold in zip codes with many old homeowners who live alone, despite no difference from 1995 to 2000. I estimate that between 330,000 and 480,000 babies were born between 2000 and 2006 because of the reallocation channel. I present suggestive evidence that the majority of this effect might have been a life-cycle rather than a life-time effect, young households shifted their fertility decision in their life-cycle. This evidence would explain part of the large drop in fertility observed during the financial crisis as a correction after the housing boom.

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I INTRODUCTION

The topic of access to finance and welfare has been studied in a number of dimensions. For example, studies have sought to quantify the impact of access to finance on welfare via its effects on intertemporal consumption smoothing (Jappelli and Pistaferri 2011; Gertler, Levine, and Moretti 2009), college enrollment (Levine and Rubinstein 2013), and job choices after graduation (Shu 2013). Others have studied the welfare impact of finance by documenting returns to finance jobs (Philippon and Reshef 2012; Kaplan and Rauh 2010), the elasticity of income with respect to financial output (Philippon and Reshef 2013), and borrower's behavior associated with distress finance (Melzer 2011; Karlan and Zinman 2010; Morse 2011).

In this paper, I introduce a new channel whereby access to credit can offer welfare improvements, namely in fertility outcomes.[1] Given that space and children are likely to be strong complements, the increase in the availability of mortgage credit during the U.S. housing boom, which is associated with a large increase in homeownership and home transactions, could have had a large impact on households' decisions to have children. This is because demographers have suggested that the transition from renting to homeownership is associated with an increase in fertility, arguably because households have access to more space (Felson and Solaun 1975; Kulu and Vikat 2007; Mulder and Billari 2010; Strom 2010). It is then possible that sizable changes in the number of births might have occurred due to the expansion of mortgage credit, allowing me to plausibly identify a causal effect of access to credit on fertility decisions. In short, the contribution of this paper is the identification and quantification of an effect of access to credit on fertility decisions through a channel associated with a more efficient reallocation of the existing housing stock among households, which creates access to space and for young households who want to expand their families.

The identification of the effect of access to credit on fertility outcomes relies on the ability to isolate a reallocation channel — associated with access to space — from other causes of fertility choices such as changes in household permanent income or changes in housing wealth. I do this

[1] To make this argument, it must be assumed that fertility choices are, on average, welfare-improving. Beyond revealed preference demographers commonly link fertility and welfare, e.g., Thomson and Brandreth (1995); Kohler, Behrman, and Skytthe (2005); Margolis and Myrskyla (2011). I proceed under the assumption that having children is welfare-improving.

by laying out three channels by which the housing market could affect fertility: a wealth channel and two space channels. The house wealth channel helps households who are homeowners finance child rearing. Dettling and Kearney (2011) study the effect of house wealth on household fertility decisions; using Metropolitan Statistical Area level house prices from 1996 to 2006, they find that a $10,000 increase in house prices is associated with a 0.8% increase in fertility rates across homeowners (5%) and renters (-2.4%). The space channels, on the other hand, make it feasible to accommodate another house member in the dwelling, and are associated with access to larger homes or first-time homeownership. The two space channels through which access to credit impacts fertility are new construction and more efficient reallocation of the housing stock among households.

My goal is to isolate the space channel associated with reallocation as a new causal channel between access to credit and fertility. To this end, I first estimate, after controlling for the observable determinants of fertility[2] and including county effects, the three housing channels in an ordinary least squares (OLS) framework. I proxy the intensity of reallocation associated with the expansion of credit supply by using the change in mortgages originated and sold—not kept in the lender's balance sheets. However, some mortgage origination is not associated with reallocation. By choosing an appropriate instrument and using a two-stage least squares (2SLS) approach, I isolate the mortgage origination associated with reallocation and address endogeneity concerns from the OLS estimation.

Although the OLS estimates reveal that the reallocation is the relevant housing channel, the OLS estimates can be biased in both directions. For example, male permanent income shocks relax households' budget constraint allowing them to fund child rearing and simultaneously obtain more easily a mortgage loan. In this case, the OLS estimates are biased upwards if permanent income cannot be precisely controlled. Conversely, a shock to the female's level of education, or potential labor income, creates a negative bias, since the female's opportunity cost of child rearing increases, while the chance of qualifying for a mortgage loan increases. Therefore, to credibly identify the effect of access to credit on households' fertility decisions through a reallocation channel, I need an instrumental variable that correlates with fertility through the channel of interest — reallocation

[2]Joseph Hotz et al. (1997) survey the fertility literature in developed economics and report the following variables as the most well identified determinants of fertility: income, unemployment, wealth, education, age structure, race, and ethnicity.

— and not through any other unobservable factor that drives fertility.

The empirical design is defined by four features. First, I assume that, between 2000 and 2006, the whole U.S. economy experienced an outward shift on supply of credit led by relaxation of credit standards (Mian and Sufi 2009; Keys, Mukherjee, Seru, and Vig 2010, Adelino, Schoar, and Severino 2012, Di Maggio and Kermani 2014). Second, to control for geographical differences between cities, especially differences in labor and housing markets that could confound the identification, I include county effects in all estimations, hence only the zip code level variation within-county is used for identification. Third, I use zip code level variation in the fraction of homeowners who are older than 65 and live alone in 2000 as an instrument, henceforth *old homeowners*, to generate plausible exogenous variation in the supply of houses that could easily be subject to reallocation. Fourth, I control for the fraction of population in the county who is older than 65 in 2000. This way, the empirical exercise consists in comparing the changes from 2000 to 2006 in two zip codes in the same county, with the same fraction of old population, but different levels of old homeowners who live alone. In a more conservative specification, I also include the fraction of homeowners who live alone and are older than 75. In this conservative specification, I aim to control for the natural reallocation that happens in the economy regardless of the expansion of credit supply, and thus provide a conservative estimation of the effect of access to credit on fertility outcomes.

The source of variation of the instrument relies on the underlying motives that old households have to exit their houses. During the housing boom, old homeowners exited their houses because they could monetize their home values, could not afford to pay increasing property taxes, or suffered from age-related health adversities such as death or disability. I claim that the exit due to monetization and increasing property taxes is driven by the global increase in house prices that was caused by the credit supply shock. Some old homeowners have a reservation price for their houses that credit constrained households can only pay when credit standards are loosened. Other old homeowners sell their houses and move out of their neighborhood when, due to increases in property assessments induced by the credit boom, property taxes rise to unaffordable levels relative to their income. The exit due to age-related health adversities is independent of the credit supply shock. Between 2000 and 2006 and within-county, the change in mortgage origination per capita

is much larger in zip codes with high fraction of old homeowners relative to zip codes with low fraction of old homeowners, implying that the rank condition is met. Moreover, the increase in homeownership for young households (age<44) and decrease in homeownership for old households (age>65) is also larger in zip codes with high fraction of old homeowners.

The instrument then isolates mortgage origination associated with reallocation of young households with old homeowners who live alone. By projecting the change in mortgage origination per capita on the instrument defined as old homeowners, the first stage will pick up mortgage origination that is associated with reallocation.[3] The exclusion restriction is guaranteed by two conditions. First, young households move into to houses of old homeowners who live alone because of the easier access to credit, and not due to self-selection motives associated with other determinants of fertility, such as increases in unobservable permanent income. Second, the within-county zip code level variation of old homeowners who live alone in 2000 is not confounded by an omitted variable, such as unobservable school quality, which would consistently predict higher fertility outcomes in these zip codes regardless of an easier access to credit. To ensure that the exclusion restriction is met, I introduce a more conservative empirical design that controls for the level of old homeowners who live alone and are older that 75. Since the average life expectancy in the U.S. is 76 years for males and 81 years for females, shifting the age limit to 75 years old, increases the weight on the exit due to health-related reasons, a 'natural' reallocation mechanism. Hence, by attempting to control for 'natural' reallocation, the effect captured by the variation of homeowners who live alone and are older than 65 will not be contaminated by self-selection motives.

One may still be concerned with the exclusion restriction of the aforementioned identification, particularly because unobservable income innovations could drive housing demand of young and credit constrained households and consequently lead them to purchase homes of old homeowners, regardless of the credit supply shock.

If the effect of access to credit on fertility is driven by other factors that are not associated to the credit supply shock, it is plausible that the same effect will also be present before the expansion of mortgage credit, in particular from 1995 to 2000, a period when the US economy experienced high

[3]I assume that within-county houses are on average larger than apartments and thus suitable for young households to form and expand their families. I present anecdotal evidence in section III.a that supports this assumption.

income growth and house price growth. One can conduit two tests. First, during the period from 1995 to 2000, does per capita mortgage origination changes faster in zip codes with old homeowners who live alone? Second, during the period from 1995 to 2000, does per fertility changes faster in zip codes with old homeowners who live alone? If the impact of the instrument on fertility is zero when the credit induced reallocation channel is turned off, it will lend more confidence to the exclusion restriction. The answer to the both questions is no.There is no relative difference in mortgage origination from 1995 and 2000 in zip codes with old homeowners who live alone. There is no difference in fertility changes during this period in zip codes with old homeowners who live alone. During a period when the first stage fails, the instrument has no effect on the outcome variable.

To conduct my empirical analysis I construct a dataset of zip code level data that draws from a variety of data sources. I collect data on births from 11 Departments of Public Health: California, Idaho, Indiana, Florida, Kansas, New York, Massachusetts, Oregon, South Carolina, Texas, and Wisconsin. I use individual loan data from Home Mortgage Disclosure Act (HMDA) to compute mortgage origination at the zip code level, and use income data from the Internal Revenue Service (IRS) to compute per capita income growth. I use data extracted from Zillow to compute zip code level house prices growth and use the Census and American Economic Survey to compute the demographic variables. The final dataset encompasses 2,717 zip codes, and covers approximately 70 million people in 2000, approximately 25% of the total U.S. population.

My estimates of the three housing channels show that between 2000 and 2006, the house wealth had a negligible effect on fertility, the construction channel had a negative effect on fertility, and the reallocation had a large and positive effect on fertility. A one standard deviation increase in new construction leads to a 1.8% decline in fertility from 2000 to 2006. The negative sign suggests that new construction is associated with older households who have passed the fertility age. Dettling and Kearney (2011) find that a $10,000 increase in house prices is associated with a net annual increase of 0.8% in fertility rates. One possible explanation for this difference could rely on the heterogeneity of house price growth across metropolitan areas between 1996 and 2006, since in contrast with the early 2000s, house price growth from 1996 to 2000 happened mainly in geographies with high income growth (Glaeser, Gottlieb, and Tobio 2012; Ferreira and Gyourko 2011). Dettling and

Kearney (2011)'s results could be drawing from the beginning of the sample, while mine draw from the second part of the time period they analyze. I present suggestive evidence that this is the case. Changes in fertility from 1995 to 2000 are strongly correlated with contemporaneous house price growth, while no statistical relationship exists from 2000 to 2006.

By contrast, the reallocation of the existing housing stock has a larger impact, a one standard deviation increase in reallocation leads to a 4.6% to 7% increase in fertility from 2000 to 2006, which represents 20% to 30% of the standard deviation of fertility change from 2000 to 2006. Based on these coefficients, I estimate the aggregate effect of the credit induced reallocation channel. I estimate that approximately 330,000 to 480,000 new births occurred during the housing boom due to the reallocation channel.

Such a large increase in the number of births begs the question on how much of this increase was a life-time change, a permanent change in the number of births, or a life-cycle change, a change in the timing when households choose to have children. Both cases are important, but have different implications in the economy. To understand the nature of the change in the number of births, I study the fertility changes after the housing boom, from 2006 to 2010. If the increase in fertility during the housing boom was a life-time change, no relative difference should exist between high and low old homeowners zip codes after the housing boom. On the other hand, if the change in fertility during the housing boom was a life-cycle change, then a correction in fertility outcomes should be observable after the housing boom. Using a similar empirical design as explained above, I show that, between 2006 and 2010, zip codes that experienced high levels of credit induced reallocation were more likely to experience large drops in fertility outcomes. The drop is of the same size than the increase, implying that the increase in fertility during the housing boom was undone during the financial crisis. Although the empirical design is not ideal because it does not control for several other channels that might have impacted fertility outcomes during the financial crisis, the current results point in the direction of a full life-cycle change rather than a life-time change.

The remainder of this section presents the literature related to this paper. The next section outlines the dataset used in this paper, its construction, and summary statistics. Section III presents the empirical methodology, namely the housing-related mechanisms. Section III also lays out the

empirical design to explore the causal effect of access to finance on fertility decisions through the reallocation channel. OLS and IV results are in the first part of section IV. The second part of section IV presents robustness tests and the analysis of female participation in the labor force during the financial crisis. Finally, section V reports concluding remarks.

Related Literature. This paper relates to two strands of literature. Firstly, it relates to the literature that studies the implications of the mortgage credit expansion and its welfare effects. Mian and Sufi (2009) and Keys, Mukherjee, Seru, and Vig (2010) seminal works show that in the beginning of the 2000s the U.S. economy experienced an outward shift in the supply of credit. Mian and Sufi (2009) document that less creditworthy borrowers experienced easier access to mortgage credit despite their negative income growth. Keys, Mukherjee, Seru, and Vig (2010) suggest that existing securitization practices adversely affected the screening incentives of subprime lenders. Adelino et al. (2012) use exogenous changes in the conforming loan limit as an instrument for lower cost of financing and higher supply to show that easier access to credit significantly increases house prices. Motivated by these findings and the severity of the financial crisis, a subsequent literature started examining the welfare effects of the expansion of credit and the role of finance in the past decades. Greenwood and Scharfstein (2013) show that, starting in 1980, fees associated with residential mortgages became a sizable portion of the growth in the U.S. financial services industry, while Philippon and Reshef (2012) show that workers in finance earned an education-adjusted wage premium of 50% in 2006, despite no premium in 1990. Charles, Hurst, and Notowidigdo (2013) suggest that housing booms disguise unemployment growth as they reduce the likelihood that displaced manufacturing workers remain unemployed. Mian and Sufi (2012) find that geographical differences in household debt overhang explain the differences of cross-sectional unemployment in the non-tradable sector. Levine and Rubinstein (2013) present evidence that intrastate bank deregulation increases the probability to attend college for individuals with particular learning abilities and family traits. Shu (2013) shows that careers in finance, especially at hedge funds and trading positions, attract students with high raw academic talent. This paper adds to this literature by highlighting another welfare dimension that was affected by the expansion of mortgage credit - the family structure.

Secondly, this paper relates to the vast literature that studies the determinants of fertility. More than two centuries ago Malthus (1798) predicted a positive relation between income growth and population growth based on the hypothesis when people's incomes are higher they form families earlier and have more children. However, cross-national evidence over the last hundred years contradicts this prediction. As nations became industrialized and as their incomes increased, the fertility rate went down. Becker (1960), Becker and Lewis (1973) and Willis (1973) introduce the distinction between the quality and the number of children to explain the negative correlation between income and fertility. Angrist et al. (2010), however, show no evidence of a quantity-quality trade-off. Mincer (1963), Becker (1965), Willis (1973) and Schultz (1985) introduce women's time allocation decisions and emphasize the opportunity costs of women's time. Ermisch (1989) introduces market price of childcare to explain the impact of the mother's wage. Adsera (2005) suggests that the negative trend in fertility in developed countries is associated with constraints of the labor market where fertility decisions are taken. The cyclical behavior of fertility has received much attention since the work of Butz and Ward (1979). In most countries the fertility rate shows a negative response to unemployment along the business cycle, i.e., fertility is procyclical. Galor and Weil (1996) present a model where increases in women's wages lead to a decrease in fertility rates. Dettling and Kearney (2011) is the closest work to this paper. They use MSA house price variation to study the effect of house wealth effect on fertility decisions from 1996 to 2006. This paper reconciles their evidence with the other housing channels and highlights the importance of reallocation that stems from the relaxation of credit constraints.

II DATA

II.a Macroeconomic Indicators

Before discussing the micro dataset used in the empirical analysis, I show that, in the last 20 years, the relationship between mortgage origination and fertility is present in the aggregate data only during the housing boom. The top panel in Figure 1 shows that the aggregate number of births in the U.S. started an uptrend in 1996 that lasted until the end of the housing boom. The middle

panel shows that, over the same time period, the fertility rate[4] exhibited an uptrend between 2000 and 2007. Both time-series suggest a shift in fertility choices during the housing boom period. The bottom panel of Table 1 shows that the annual volume of mortgage origination for home purchase shifted to a higher level between 2000 and 2006. Figure 2 confirms that households used mortgage loans to purchase existing and newly constructed houses by showing that the number of home transactions increased faster between 2000 and 2006. Figure 2 also shows that the number of transactions of existing houses was significantly larger than the number of newly constructed houses. This difference suggests that during the housing boom households were more likely to move into an existing house than a newly constructed one. Figure 3, using county-level data, proceeds to investigate the potential relationship between access to credit and fertility by showing that since 1995 mortgage origination and fertility are only positively correlated in changes between 2000 and 2006. The absence of correlation from 1995 to 2000, a period of strong economic growth, raises the bar for the permanent income hypothesis to be a credible alternative hypothesis. In order for permanent income to explain the positive correlation between fertility change and per capita mortgage origination change from 2000 to 2006 the correlation of income growth and per capita mortgage origination change would need to change from 1995-2000 to 2000-2006. A different flavor of the same argument is delivered by Figure 4. Figure 4 sorts counties on the per capita mortgage origination change from 2000 to 2006 and depicts the time series of the fertility rate for the top and bottom quintiles between 1990 and 2010. Prior to 1996, fertility rates are not statistically different between the two groups. By 2000, the difference is small; however, between 2000 and 2006, fertility rates increased rapidly in high mortgage origination counties; yet, in low mortgage origination counties fertility rates remained fairly constant. Lastly, Figure 6 shows that between 2000 and 2005, young households experienced large gains in homeownership , while older households experienced small or no gains in homeownership. This pattern is however not present in the data from 1990 to 1995. In sum, the macro evidence suggests that access to credit was strongly associated with fertility decisions during the credit boom.

[4]According to the CDC, fertility rate is defined as the number of births divided by the number of women in child bearing age, assumed to be from 15 to 44 years old.

II.b Micro Data

I draw from a variety of data sources to construct the sample used in this paper. The sample consists of data on births, loans, income, house prices, employment, and demographics. Data on births is available by county and zip code, and was collected from the Department of Public Health (DPH) of each state. Birth statistics at the county level are available for 48 states from 2000 to 2006.[5]. I only use the county data to estimate the macro impact in change in fertility. Birth statistics at zip code level is available for 11 states: California, Idaho, Indiana, Florida, Kansas, New York, Massachusetts, Oregon, South Carolina, Texas, and Wisconsin. For confidentiality reasons, in some states birth statistics are not available when the number of births is smaller than five in a given geography. Data at the zip code level is available for years 1995, 2000 and 2006.

Home Mortgage Disclosure Act (HMDA) provides loan level data from 1990 to 2011. Loan level data is publicly available for lenders that meet a disclosure criteria defined by HMDA every year. Each loan application provides information on *year* of application, *lender*, *type of loan*, *loan amount*, *action taken* by the lender, *reason for denial*, in case the loan is denied, *race*, *sex* and *income* of the applicant and co-applicant, *census tract*, *county FIPS*, and *state FIPS* where the loan was originated, *owner occupancy*, and *purpose*. Loans have four types of purpose: *home purchase*, *home improvement*, *refinancing*, and *multifamily dwelling*. I only use loans that are originated for home purchase and are owner-occupied as principal dwelling.

I use the Internal Revenue Service (IRS) data to compute the zip code level income per capita. The IRS provides zip code level data for years 2001 and 2006. The provided income data includes adjusted gross income, number of returns, and wage income. Income per capita is defined as the ratio of the adjusted gross income to the number of returns.

Home prices are from Zillow. I extracted their sales-price-based price index for zip codes that have sufficient transaction level. Each Zillow Home Value Index (ZHVI) is a time series tracking the monthly median home value in a particular geographical region. In general, each ZHVI time series begins in April 1996. Instead of using a repeat sales methodology, Zillow uses the same underlying deed data as the Case-Shiller index but creates a hedonically adjusted price index. The

[5]The DPH of the state of Delaware and Louisiana did not make available their data at county level.

Zillow index uses detailed information about the property, collected from public records, including the size of the house, the number of bedrooms, and the number of bathrooms. To the extent that the average measured characteristics of the home change over time, the Zillow index will capture such changes.[6] Guerrieri, Hartley, and Hurst (2013) show that the correlation between Case-Shiller Index and Zillow Index where the two samples overlap is equal to 94%. Monthly home prices are available from 1996 to 2012 for 10,187 zip codes.

Data on number of hospitals per capita is from the County of Business Patterns (CBP) annual survey. CBP provides total employment for all establishments located in a given zip code broken down by NAICS five industries codes.

Zip code school scores were obtained from Global Report Card. Reading and math scores are available for each school district from 2004 onwards. I use the reading score level in 2004 as a measure of the school district quality. I map zip codes to school districts to obtain a zip code level measure of school quality.

Finally, I use the public data from the Decennial Census and the American Economic Survey to obtain zip code data on gender, race, ethnicity, type of household, educational attainment, housing tenure, and number of bedrooms. The 2000 Decennial Census provides zip code data directly. On the other hand, to access the zip code data from the ACS, one needs to use 5-year averages. I use the ACS's 5-year averages from 2005 to 2009.

The construction of the dataset proceeds as follows: I start by merging the births and the Zillow Price data. The merged data set covers 3,256 zip codes. I proceed to merge it with HMDA data, and the number of merged zip codes drops to 2,825. I then merge it with the IRS data and the CBP data, and as a result the number of zip codes drops to 2,793. Finally, after merging with the Census and ACS dataset the number of zip codes is 2,792. I then drop data points where births are missing in either 2000 or 2006, and repeat the same criteria for house prices and income data. The resulting dataset encompasses 2,717 zip codes, and covers 68.3 million people in 2000, approximately 25% of the total U.S. population.

[6]More information about the computation methodology of the Zillow home price index can be found here: http://www.zillow.com/blog/research/2012/01/21/zillow-home-value-index-methodology/.

Summary Statistics

Table 1 presents the summary statistics of the variables presented in this section. The average change in per capita mortgage origination between 2000 and 2006 was 0.64 per 1000 people on average, while the change in mortgages that were originated and sold during the same period was 1.71 per 1000 people, and the change in mortgages that were originated but not sold was -1.07 per 1000 people. This is consistent with the evidence that, during the housing boom, lenders increased origination and securitization (Mian and Sufi 2009; Keys, Mukherjee, Seru, and Vig 2010). The average house price growth from 2000 to 2006 was 107%, 12.8% in annualized terms. For the 6 year period of analysis, the per capita income growth was 22%, or 3.3% in annualized terms. Change in the female unemployment rate from 2000 to 2006 was 1.1%. Fertility changed by 3.37 per 1000 women in child bearing age from 2000 to 2006. The change in the zip code fraction of Hispanics and Blacks was on average 2.8% and 0.33%, respectively. The average zip code population in 2000 was 24,846.

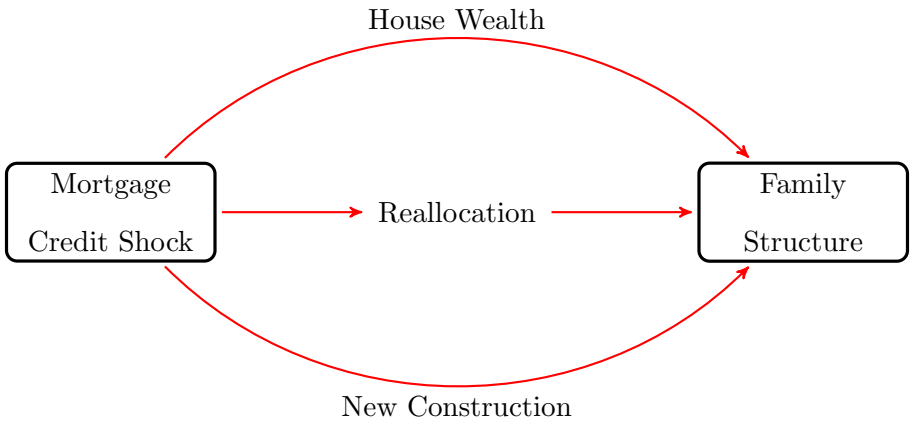
III EMPIRICAL METHODOLOGY

III.a Mechanism

If households are credit constrained, an outward shift in the supply of mortgage credit induces them to adjust their housing consumption. As a result, households move within the existing housing stock as well as to newly constructed houses. They access more space, as renters become first-time homeowners and existing homeowners move into larger or better quality houses. I assume that the transition from renting to homeownership provides households additional housing space.[7] The credit supply shock then provides households access to space that would have been unaccessible otherwise or would have only been reachable later in their life-cycle. As households access more space, they presumably change their consumption of complementary goods; specifically, if they

[7] I assume that the supply of apartments with more than two bedrooms is thin. Using 30 million Craigslist ads from 2008 to 2013, Figure 5 presents suggestive evidence of thinness in the rental market. The price difference from a one to two bedroom is on average $390. By contrast, the price difference from a two to three bedroom apartment is $1100, and from a three to four bedroom is $2220. The higher relative increase in rent prices for larger apartments suggests short supply of large dwellings in the U.S. rental market.

have a cobb-douglas utility function for housing and children they may increase their fertility. A similar argument between space and fertility has been suggested by demographers (Felson and Solaun 1975; Kulu and Vikat 2007; Mulder and Billari 2010; Strom 2010). When a household moves into an existing house, I define it as reallocation. The credit supply shock can then affect the household's fertility decisions through two space channels: a reallocation or a new construction channel. Furthermore, since the credit shock causes an outward shift in housing demand it also impacts house prices. Increases in house prices create a wealth effect that relaxes homeowners' budget constraints, allowing better financing of child rearing, which increases the probability of having a child. The credit shock can then affect the household fertility decision through three channels: house wealth, new construction, and reallocation. The picture below outlines the three channels:



III.b Measurement

I study three housing channels that can link the expansion of credit and fertility decisions: wealth gains from house price increases, new construction, and more efficient reallocation of the existing housing stock among households. In this section, I describe how I measure each channel as well as fertility.

III.b.1 House Wealth Channel

House prices impact family formation and expansion of homeowners and non-owners differently. An increase in house prices creates a wealth effect on homeowners, but tightens the budget con-

straint for renters since it increases the cost of housing. To distinguish the effect on homeowners and renters, Dettling and Kearney (2011) use a specification that interacts the house price growth and the initial level of homeownership, since the house price effect is larger in zip codes where the level of homeownership is larger. This specification is useful when one wants to separate the house price effect on renters and homeowners. In the context of this paper, it is only relevant to measure the aggregate effect of house prices, therefore, the measure of house wealth for a zip code i is simply the house price growth measure as:

$$\text{House Wealth Measure}_{\,2000\to2006,i} \quad = \quad \frac{\text{House Prices}_{\,2006,i} - \text{House Prices}_{\,2000,i}}{\text{House Prices}_{\,2000,i}}$$

where HP Growth is measured as the growth in the zip code level Zillow Price Index.

III.b.2 Construction Channel

An exogenous shock in new construction affects house prices and housing consumption. House prices are affected through a pure supply channel. The effects on housing consumption depend on the relative size and quality of new houses constructed. To capture the space effect created by new construction, I use the growth in the total number of housing units:

$$\text{Construction Measure}_{\,2000\to2006,i} = \frac{\#\text{House Units}_{\,2006,i} - \#\text{House Units}_{\,2000,i}}{\#\text{House Units}_{\,2000,i}}$$

where house units are measured using the Census data and the American Community Survey.

III.b.3 Reallocation Channel

Credit constrained households have below optimal housing consumption. A credit supply shock that lowers the lending standards facilitates the reallocation of housing resources. In the event of a credit supply shock, zip codes that experience large increases in mortgage origination are likely to experience high levels of reallocation. The ideal measure of reallocation quantifies the number of houses that are bought by credit constrained households from homeowners who were underutilizing their house. Since such measure is not available an alternative proxy for reallocation during a

period of credit expansion is the change in per capita mortgage origination:

$$\begin{aligned}\text{Reallocation Measure}_{\,2000\to2006,i} &= \left[\frac{\#\text{ Mortgage Origination}}{\#\text{ Population}}\right]_{2006,i} \\ &- \left[\frac{\#\text{ Mortgage Origination}}{\#\text{ Population}}\right]_{2000,i}\end{aligned}$$

One potential shortcoming is that the increase in origination may not be associated with the shock in the supply of credit, although very correlated as shown by Mian and Sufi (2009). One potential improvement is to refine the above measure to mortgages that were originated and sold. Since it has been widely shown that, during the housing boom, the ability to not keep loans in the lender's balance sheets was one of the key features of the expansion of credit (Keys et al. 2010). Therefore an alternative measure for credit induced reallocation is:

$$\begin{aligned}\text{Reallocation Measure}_{\,2000\to2006,i} &= \left[\frac{\#\text{ Mortgages Originated \& Sold}}{\#\text{ Population}}\right]_{2006,i} \\ &- \left[\frac{\#\text{ Mortgages Originated \& Sold}}{\#\text{ Population}}\right]_{2000,i}\end{aligned}$$

The increase in mortgages that were originated and sold is likely to be negatively correlated with the decrease of mortgages kept in-house. However, all else equal, the variation in mortgages not sold and kept in-house is informative. Hence, a third alternative measure for the credit induced reallocation is:

$$\begin{aligned}\text{Reallocation Measure}_{\,2000\to2006,i} &= \left[\frac{\#\text{ Originated \& Sold} - \text{Originated \& Non Sold}}{\#\text{ Population}}\right]_{2006,i} \\ &- \left[\frac{\#\text{ Originated \& Sold} - \text{Originated \& Non Sold}}{\#\text{ Population}}\right]_{2000,i}\end{aligned}$$

The empirical analysis below uses these three measures of reallocation.

III.b.4 Fertility Change

To measure fertility rates at the zip code level, I compute the ratio of the number of births over the number of women in child bearing age, assumed by the Centers for Disease Control and Prevention to be women with ages between 15 and 44. The Fertility change from 2000 to 2006 is

then defined as:

$$\text{Fertility Change}_{2000\rightarrow 2006,i} = \left[\frac{\#\text{ Births}}{\#\text{ Women}_{15<\text{age}<44}}\right]_{2006,i} - \left[\frac{\#\text{ Births}}{\#\text{ Women}_{15<\text{age}<44}}\right]_{2000,i}$$

III.c Estimation Methodology

The identification of the effect of access to credit on fertility outcomes relies on the ability to isolate a space effect, associated with a better reallocation of the housing stock, from other causes of fertility choices - notably household permanent income. I do this by laying out three channels by which the housing market could affect fertility: a wealth channel and two space channels. The wealth effect helps households finance child rearing, but is only relevant to existing homeowners. The other housing channels that can explain fertility choices relate to space. Space makes it feasible to accommodate another house member in the dwelling and is provided by access to larger homes and first-time homeownership. The two channels by which space impacts fertility are new construction and efficient reallocation of the housing stock. My goal is to isolate the space channel, associated with reallocation, as a new causal relationship between access to finance and fertility. To this end, I first implement an empirical strategy in which the three effects are jointly estimated in an ordinary least squares framework. Then, using an instrumental variable approach, I isolate the channel of interest, credit induced reallocation, and address issues related to endogeneity.

III.c.1 OLS

I first exploit zip code level variation with county effects to estimate the three housing effects that link access to finance with the change in fertility outcomes. Since the regressors are likely to be endogenous, the estimates are potentially inconsistent. However, the direction of the coefficients and their magnitudes are informative about the potential economic significance of each channel. Furthermore, the comparison of the estimates with and without the observable determinants of fertility is also informative about the stability of the coefficients and potential orthogonality of the regressor and the error term. In all regression specifications, errors are robust and clustered at the

state level. The regression model for zip code i is:

$$\begin{aligned}\text{Fertility Change}_{\,2000\to2006,i} &= \beta_0 + \beta_1 \times \text{Reallocation}_{\,2000\to2006,i} \\ &+ \beta_2 \times \text{Construction}_{\,2000\to2006,i} \\ &+ \beta_3 \times \text{House Wealth}_{\,2000\to2006,i} \\ &+ \alpha \times X_i + \text{County Effects} + \varepsilon_i.\end{aligned}$$

The literature on economics of the family documents fertility as a function of male and female income, wealth, unemployment, and the female's cost of time, race and ethnicity (Joseph Hotz et al. 1997, Butz and Ward 1979, Schultz 1985, Adsera 2005). Positive male permanent income shocks are associated with higher total fertility. More permanent income relaxes the household's budget constraint and allows it to finance child rearing. Transitory female income and unemployment shocks are associated with changes in fertility timing. Women time their fertility decision for times when their opportunity cost is small (Schultz 1985). Based on these documented *traditional determinants*, X_i includes controls for: per capita income growth from 2001 to 2006;[8] log of per capita income in 2001; change in unemployment for women with ages between 25 and 44; changes in male unemployment; a proxy for the quality of the school system, and the percentage of hospital facility per capita; and changes in composition of race and ethnicity. X_i also includes changes of the fraction of women with age from 15 to 24, and 25 to 34, out of all the women with ages from 15 to 44.

III.c.2 Endogeneity Concerns and IV

The OLS estimates provide a preliminary sense of what housing channels may have been relevant during the credit boom period. The OLS estimates, presented in the results section, suggest that the reallocation is the relevant channel to explain the effect of access to finance on fertility, however, they can be biased in both directions. For example, male permanent income shocks relax the household's budget constraints allowing it to fund child rearing and simultaneously more

[8] IRS income data is not available at the zip code level in 2000, only in 2001.

easily obtain a mortgage loan. In this case, if such a shocks are not appropriately controlled for, OLS estimates of the impact of reallocation on fertility is biased upwards. On the other hand, a shock to the female's level of education or potential labor income creates a negative bias since the female's opportunity cost of child rearing increases, but at the same time the chance of qualifying for a mortgage loan increase. To identify the effect of access to finance on the household's fertility decision, I need an instrumental variable that correlates with fertility through the channel of interest - reallocation - and not through any other unobservable factor that drives fertility.

The empirical design is defined by four features. First, I assume that, between 2000 and 2006, the whole U.S. economy experienced an outward shift on supply of credit led by relaxation of credit standards (Mian and Sufi 2009; Keys, Mukherjee, Seru, and Vig 2010, Adelino, Schoar, and Severino 2012, Di Maggio and Kermani 2014). Second, to control for geographical differences between cities, especially differences in labor and housing markets that could confound the identification, I include county effects in all estimations, hence only the zip code level variation within-county is used for identification. Third, I use zip code level variation in the fraction of homeowners who are older than 65 and live alone in 2000 as an instrument, henceforth *old homeowners*, to generate plausible exogenous variation in the supply of houses that could easily be subject to reallocation. Old Homeowners is defined as:

$$\text{old homeowners} = \frac{\#\text{Homeowners Older than 65 years old and Living Alone }_{2000}}{\#\text{Households }_{2000}}.$$

Fourth, I control for the fraction of population in the county who is older than 65 in 2000. This way, the empirical exercise consists in comparing the changes from 2000 to 2006 in two zip codes in the same county, with the same fraction of old population, but different levels of old homeowners who live alone. In a more conservative specification, I also include the fraction of homeowners who live alone and are older than 75. In this conservative specification, I aim to control for the natural reallocation that happens in the economy regardless of the expansion of credit supply, and thus provide a conservative estimation of the effect of access to credit on fertility outcomes.

The source of variation of the instrument relies on the underlying motives that old households have to exit their houses. During the housing boom, old homeowners exited their houses because

they could monetize their home values, could not afford to pay increasing property taxes, or suffered from age-related health adversities such as death or disability. I claim that the exit due to monetization and increasing property taxes is driven by the global increase in house prices that was caused by the credit supply shock. Some old homeowners have a reservation price for their houses that credit constrained households can only pay when credit standards are loosened. Other old homeowners sell their houses and move out of their neighborhood when, due to increases in property assessments induced by the credit boom, property taxes rise to unaffordable levels relative to their income. The exit due to age-related health adversities is independent of the credit supply shock. Between 2000 and 2006 and within-county, the change in mortgage origination per capita is much larger in zip codes with high fraction of old homeowners relative to zip codes with low fraction of old homeowners, implying that the rank condition is met. Moreover, the increase in homeownership for young households (age<44) and decrease in homeownership for old households (age>65) is also larger in zip codes with high fraction of old homeowners.

The instrument then isolates mortgage origination associated with reallocation of young households with old homeowners who live alone. By projecting the change in mortgage origination per capita on the instrument defined as old homeowners, the first stage will pick up mortgage origination that is associated with reallocation.[9] The exclusion restriction is guaranteed by two conditions. First, young households move into to houses of old homeowners who live alone because of the easier access to credit, and not due to self-selection motives associated with other determinants of fertility, such as increases in unobservable permanent income. Second, the within-county zip code level variation of old homeowners who live alone in 2000 is not confounded by an omitted variable, such as unobservable school quality, which would consistently predict higher fertility outcomes in these zip codes regardless of an easier access to credit. To ensure that the exclusion restriction is met, I introduce a more conservative empirical design that controls for the level of old homeowners who live alone and are older that 75. Since the average life expectancy in the U.S. is 76 years for males and 81 years for females, shifting the age limit to 75 years old, increases the weight on the exit due to health-related reasons, a 'natural' reallocation mechanism. Hence, by attempting to control for

[9] I assume that within-county houses are on average larger than apartments and thus suitable for young households to form and expand their families. I present anecdotal evidence in section III.a that supports this assumption.

'natural' reallocation, the effect captured by the variation of homeowners who live alone and are older than 65 will not be contaminated by self-selection motives.

One may still be concerned with the exclusion restriction of the aforementioned identification, particularly because unobservable income innovations could drive housing demand of young and credit constrained households and consequently lead them to purchase homes of old homeowners, regardless of the credit supply shock.

If the effect of access to credit on fertility is driven by other factors that are not associated to the credit supply shock, it is plausible that the same effect will also be present before the expansion of mortgage credit, in particular from 1995 to 2000, a period when the US economy experienced high income growth and house price growth. One can conduit two tests. First, during the period from 1995 to 2000, does per capita mortgage origination changes faster in zip codes with old homeowners who live alone? Second, during the period from 1995 to 2000, does per fertility changes faster in zip codes with old homeowners who live alone? If the impact of the instrument on fertility is zero when the credit induced reallocation channel is turned off, it will lend more confidence to the exclusion restriction. The answer to the both questions is no.There is no relative difference in mortgage origination from 1995 and 2000 in zip codes with old homeowners who live alone. There is no difference in fertility changes during this period in zip codes with old homeowners who live alone. During a period when the first stage fails, the instrument has no effect on the outcome variable.

Lastly, although the empirical design may be valid, it does not guarantee external validity of the results. Young credit constrained households can achieve space through reallocation by moving into to a vacant house, a house where the previous household was dissolved, a house where the current household upgrades to a larger house, or a house where the current household downsizes to a smaller house. Under these different options for reallocation, one should be concerned whether the treatment effect of reallocation on fertility produced by the variation of *old homeowners* is the same as the average treatment effect of all types of space increase on fertility. The causal mechanism of reallocation is that access to space causes family expansion. Therefore, it seems plausible to assume that as long as young households access more space they will expand their families, despite who the previous homeowners were or the conditions that led the previous household to leave the

house. Under this assumption, that space is a key variable, I assume that the local treatment effect estimated in the empirical design on this paper is equal to the average treatment effect of access to credit on fertility outcomes.

Table 10 reports the OLS regression coefficients of *old homeowners* on the change in homeownership for different age groups, after controlling for county effects. Table 10 shows that the instrument captures precisely the variation of interest. In zip codes with high fraction of old homeowners, the homeownership increased for households whose head age is between 25 and 34 as well as between 35 and 44. The correlation coefficient is equal to 0.34 and 0.46, respectively, and statistically significant. On the other hand, the correlation coefficient on the change in homeownership for households whose head age is between 65 and 74 is -0.35, and above 75 is -0.49. The regression coefficient on the change in homeownership for households whose head age is between 44 and 65 is almost zero and insignificant. These regression coefficients show that, from 2000 to 2006, in zip codes with high fraction of *old homeowners* there was a reallocation of the housing stock whereby old households sold their houses to younger households.

To implement the empirical strategy discussed above, I use a two stage least squares estimation (2SLS). In the *first stage*, I estimate:

$$\begin{aligned}
\text{Reallocation Measure}_{2000\to2006,i} &= \theta_0 + \theta_1 \times \left[\frac{\#\text{Homeowners, age>65 and Living Alone}}{\#\text{Households}}\right]_{2000,i} \\
&+ \theta_2 \times \text{Construction Measure}_{\,2000\to2006,i} \\
&+ \theta_3 \times \text{House Price Measure}_{\,2000\to2006,i} \\
&+ \theta_4 \times \%\text{ Pop Age>65}_{\,2000\to2006,i} + \Theta \times X_i + \text{County Effects} + \eta_i,
\end{aligned}$$

and in the *second stage*, I estimate:

$$\begin{aligned}
\text{Fertility Change}_{\,2000\to2006,i} &= \beta_0 + \beta_1 \times \widehat{\text{Reallocation}}\text{ Measure}_{\,2000\to2006,i} \\
&+ \beta_2 \times \text{Construction Measure}_{\,2000\to2006,i} \\
&+ \beta_3 \times \text{House Price Measure}_{\,2000\to2006,i} \\
&+ \beta_4 \times \%\text{ Pop Age>65}_{\,2000\to2006,i} + \alpha \times X_i + \text{County Effects} + \varepsilon_i.
\end{aligned}$$

Vector X_i includes controls for: per capita income growth from 2001 to 2006;[10] log of per capita income in 2001; change in unemployment for women with ages between 25 and 44; changes in male unemployment; a proxy for the quality of the school system, and the percentage of hospital facility per capita; and changes in composition of race and ethnicity. X_i also includes changes of the fraction of women with age from 15 to 24, and 25 to 34, out of all the women with ages from 15 to 44.

As discussed above, a more conservative specification includes as control:

$$\left[\frac{\text{\#Homeowners, age>75 and Living Alone}}{\text{\#Households}}\right]_{2000,i},$$

to measure reallocation that naturally happens in the economy regardless of the existence of a credit supply shock.

IV RESULTS

IV.a OLS: Zipcode Level

Traditional Determinants

Previous literature has documented various determinants of fertility, namely male and female income, wealth, unemployment, and the female's cost of time, race and ethnicity (Joseph Hotz, Klerman, and Willis 1997, Butz and Ward 1979, Schultz 1985, Adsera 2005). Since I can measure most of these determinants, I can estimate them, and then compare the estimated signs and magnitudes to the ones previously found in the literature. Table 2 reports that the change in male unemployment correlates negatively with the change in fertility from 2000 to 2006 and is statistically significant. On the other hand, female unemployment is positively correlated with the fertility change and very significant. Male unemployment reduces household's fertility because of the large negative income shock and uncertainty associated with the loss of employment (Butz and Ward 1979). Given male unemployment, female unemployment is commonly associated with

[10] IRS income data is not available at the zip code level in 2000, only in 2001.

timing whereby women choose to have children when their opportunity cost of child rearing is low (Schultz 1985). The signs of the two unemployment coefficients match the ones found previously in the fertility literature. Although not statistically significant, the level of income, measured by IRS data, is negatively correlated with fertility changes. Lower income households are more likely to have more children (Galor and Weil 2000); for example, teenagers in low income families tend to have higher fertility rates than teenagers in high income families. The per capita income growth effect, measured with the IRS data, on fertility is positive, and statistically significant than zero with a p-value of 0.02. When households experience positive income innovations they can afford child rearing more easily. The effect of number of hospitals per capita, a proxy for the quantity of health care facilities in the zip code, on fertility change from 2000 to 2006 is statistically zero. During the housing boom, there is no statistical difference in fertility changes with different school quality, as measured by the schooling score in 2004. Table 3 reports the coefficients on the age and demographic variables of the same regression. Consistent with the literature on fertility (Parrado and Morgan 2008), zip codes where the fraction of Hispanics increases experience an increase in fertility. Likewise, if the zip code experiences an increase in the fraction of blacks it also experiences an increase in fertility. Finally, zip codes that experience larger changes in the relative number of women with ages between 25 and 24 experience higher increases in fertility between 2000 and 2006. The effect is the opposite if the zip code experience an increase in women with ages between 15 and 24.

IV.b Discussion of the Housing Channels

I examine three housing channels that can link the expansion of credit and fertility decisions: wealth gains from house price increases, new construction, and more efficient reallocation of the existing housing stock among households. The goal is to isolate the space channel associated with reallocation as a new causal channel of access to credit on fertility. To this end, I first estimate, in an ordinary least squares framework, the three housing channels controlling for the traditional determinants of fertility. Then, using an instrumental variable approach, I isolate the mortgage origination associated with the reallocation channel and address endogeneity concerns that arise

from the OLS estimation. I present the results of the IV estimation in the next section, while in this one, I discuss the OLS estimation based on the results reported in Table 2. The OLS estimation allows the following three inferences:

First, I find that the house wealth channel had no effect on fertility outcomes between 2000 and 2006. The results suggest that given an increase in house prices, the negative effect on fertility from renters cancels out the positive effect from homeowners. Dettling and Kearney (2011) use MSA level house price variation to study the house wealth effect on fertility decisions from 1996 to 2006. They find that a $10,000 increase in house prices is associated with a 5% increase in births among homeowners and a 2.4% decrease among non-owners. At the mean of U.S. homeownership rate the net effect is 0.8%. One possible explanation for the difference between my results and theirs relies on the heterogeneity of house price growth across metropolitan areas from 1996 to 2006, since in contrast with the early 2000s, house price growth from 1996 to 2000 happened mainly in high income growth areas (Glaeser, Gottlieb, and Tobio 2012; Ferreira and Gyourko 2011). Dettling and Kearney (2011)'s results could be drawing from the beginning of their sample, while mine draw from the second part of the time period they analyze. Table 12 provides supporting evidence for this hypothesis. The correlation between house price growth between 1996 and 2000 and fertility change from 1995 and 2000 is 0.338 and statistically different than zero at 1% level, while the correlation between house price growth from 2000 to 2006 and fertility change during the same period is 0.024 with a p-value of 0.31.

The second inference is that, when measured by zip code growth in the number of house units, the space effect due to new construction channel is negative. A one standard deviation increase in growth in number of bedrooms (0.26) leads to a 1.8% decline in fertility from 2000 to 2006, which is 7% of a standard deviation of fertility change. The negative sign suggests that new construction is associated with older households who have passed the fertility age. Moreover, the negative sign corroborates an equilibrium where households move up, meaning older households move up to new houses and young households move into existing houses. In Table 11, I present evidence that corroborates this hypothesis. Zip codes that experienced high growth in construction experienced positive changes in homeownership for households older than 60. On the other hand, the new

construction variation does not explain the change in homeownership for housesholds younger than 44. Under this view, the new construction channel is consistent with the reallocation channel.

Third, reallocation, as measured by the change in per capita mortgages originated and sold, correlates positively with the change in fertility. The beta coefficient without controls is 0.155 and statistically different than zero. After accounting for other traditional determinants and the other housing channels, the OLS beta coefficient decreases to 0.140. It barely changes. Table 4 shows that the beta coefficient is 0.148 if we measure reallocation with the change in mortgage loans originated and sold minus mortgages originated but not sold. On the other hand, if we consider total mortgage origination as a measure of credit induced reallocation, the coefficient is 0.124. In both cases the OLS coefficients are statistically significant than zero. This evidence is consistent with the expansion of mortgage credit was fueled by the ability to originate and distribute that lender's experienced during the beginning of the 2000s. Although the OLS coefficients seem very stable with the addition of a long list of controls, the OLS coefficient can still be biased in either direction. Furthermore, per capita mortgage change is a noisy proxy for reallocation, there are many cases in which mortgages are originated for borrowers who, for example, have past the fertility period, or are not even a family. In the following section, to address this potential identification issues, I instrument the variation of mortgage origination with the fraction of homeowners who live alone and are older than 65 (*old-homeowners*), as discussed in the section III.c.2.

IV.c Instrumental Variable: Old Homeowners

To address the identification issues discussed above, I introduce in this section a novel instrument that uses the fraction of homeowners who live alone and are older than 65, *old homeowners*, to generate variation in credit induced reallocation that is potentially uncorrelated with other unobservable determinants of fertility rates. Two important additional features of the empirical design is to control for the fraction of the population that is older than 65, and to control for the fraction of the homeowners who live alone and are older than 75, *75-homeowners*. The first feature guarantees that the instrument is not picking variation associated with young versus old neighborhoods, the second additional feature provides a lower bound for the credit induced reallocation by separating

off the natural reallocation that occurs in the economy in the absence of a credit supply shock.

Table 5 reports the first-stage and the IV estimates of the effect of access to credit on fertility outcomes. In the first-stage, the estimated beta coefficient on old homeowners is 0.127 with a t-statistic of 5.15, implying a F-statistic of 15.45.[11] The first stage reinforces the importance of credit induced reallocation during the housing boom. One standard deviation change in the fraction of homeowners who live alone and are older than 65 leads to 1 extra mortgage originated and sold per 1000 people in the zip code. Table 5 provides four different IV specifications. The first in column (4) only controls for the fraction of the population that is older than 65, and the fraction of the homeowners who live alone and are older than 75. The IV beta coefficient is 0.191 and statistically different than zero at 1% level. The second empirical specification includes all the controls described above. The IV beta coefficient in this case is 0.181 and statistically different than zero at 1% level. The stability of the IV coefficient across these two specifications reflects the orthogonality of the instrument with respect to observable determinants of fertility, and reinforces the assumption that the instrument is exogenous to unobservable determinants of fertility. Column (6) and (7) repeat the same IV procedure, but exclude the control *75-homeowners*. This specification provides an upper bound for the credit induced reallocation. It might be the case the reallocation associated with the homeowners older than 75 is associated with the credit supply shock. However, it might be the case that the reallocation measured with homeowners older than 65 is mainly natural reallocation that occurs in the economy in the absence of a credit supply shock. The first two specifications already show that the majority of the reallocation effect is coming from homeowners who are with ages between 65 and 75. Column (6) and (7) show the upper bound for the effect credit induce reallocation on fertility outcomes. The IV beta is equal to 0.330 and statistically significant than zero.

Table 6 and 7 replicate Table 5, but using different measures of reallocation, as discussed in section III.b.3. Table 6 uses as reallocation measure the total mortgage origination, while Table 7 computes reallocation by subtracting mortgages originated and kept in the lender's balance sheets from mortgages originated and sold. The results are unchanged. The beta on Old Homeowners in

[11] According to Staiger and Stock (1997), who formalized the definition of weak instruments, since the F-statistic exceeds 10, the instrument is considered strong.

the first stage of Table 6 has higher sensitivity to the addition of controls, a reflection that Total Origination is a noisy measure of reallocation relative to the other two measures. In opposition, the beta on Old Homeowners in the first stage of Table 7 is very stable after adding a long list of controls, and is higher than the counterpart in Table 6. The IV betas vary within the same range than the ones presented in Table 5.

IV.d Economic Magnitude

To estimate the magnitude of the effect of the access to credit through the reallocation channel, I use county level data because the zip code dataset only covers 25% of the US population. I start by sorting counties by change in the per capita mortgage origination from 2000 to 2006. I use the whole sample of counties where I have data on births and loans from HMDA, that is 2091 counties that cover approximately 93% of the U.S. population. I create 20 equal sized bins, and using the estimated sensitivities from the IV regression, I estimate the change in fertility for each bin from 2000 to 2006. According to the estimates presented in Tables 5, 6, and 7, I use a beta of 0.20 as lower bound, and 0.30 as upper bound. Then, using the change in fertility and number of women of child bearing age in each bin, I compute the number of births in 2006 in each bin due to the reallocation channel. Finally, I assume the bottom bin to be the 'control' bin and the others to be the 'treatment' bins. The estimate of births in 2006 is then equal to the sum of 'treatment' bins minus 'control' bin. Using this methodology and relying on the assumption that the bottom bin is a fair 'control' group, the estimated upper bound number of births is equal to 136,000 in 2006, while the lower bound is 90,000. If I assume that the growth in fertility is linear from 2001 to 2006, as Figure 1 suggests, then in 2001 I estimate the upper bound number of births to be 22,800, and the lower bound 15,000. The sum of all the reallocation-related births from 2001 to 2006 falls between 317,000 and 478,000. About 2% to 3% of the children that were born in 2006 were due to the housing boom.

IV.e Life-time versus Life-cycle Effect

Such a large increase in the number of births begs the question on how much of this increase was a life-time change—a permanent change in the number of births—or a life-cycle change—a

change in the timing when households choose to have children. Both cases are important, but have different implications in the economy. To understand the nature of the change in the number of births, I study the fertility changes after the housing boom, from 2006 to 2010. If the increase in fertility during the housing boom was a life-time change, no relative difference should exist between high and low old homeowners zip codes after the housing boom. On the other hand, if the change in fertility during the housing boom was a life-cycle change, then a correction in fertility outcomes should be observable after the housing boom. Table 9 reports the regression coefficients of a similar empirical design as discussed in III.c.2, except that the dependent variable is the change in fertility from 2006 to 2010. The OLS beta coefficients are not statistically different than zero. However, they can be largely biased because many shocks during the financial crisis that can explain the change in fertility are correlated with the distribution of the credit supply shock. Using the same instrument than above, Table 9 also reports the IV estimated betas. The IV betas on the other hand are negative, large and statistically significant. One standard deviation change in the per capita mortgages originated and sold leads a decrease in approximately 5.8 units in fertility from 2006 to 2010. From the analysis between 2000 and 2006, the same increase in per capita mortgages originated and sold leads to an increase in from 2.60 to 4.3 units in fertility. The drop from 2006 to 2010 is larger than then increase form 2000 to 2006, implying that the increase in fertility during the housing boom was potentially undone during the financial crisis. Although the empirical design is not ideal because it does not control for several other channels that might have impacted fertility outcomes during the financial crisis, the current results point in the direction of a life-cycle change rather than a life-time change. Another potential issue with the results from 2006 to 2010, is the amount of migration that resulted from foreclosures. These effect is more likely to be strong in zip codes that experienced large increase in mortgage origination during the housing boom. Further research on fertility behavior during the financial crisis is needed.

V Concluding Remarks

This paper introduces a new welfare effect of access to finance whereby access to credit can offer welfare improvements, namely in fertility outcomes. I conduct within-county analysis with zip code level data to document that changes in mortgage origination are strongly associated with changes in fertility rates beyond traditional fertility determinants such as income and unemployment. I examine three housing channels that could explain this correlation: wealth gains from house price increases, new construction, and more efficient reallocation of the existing housing stock among households. I claim that after controlling for the house wealth and construction channel, mortgage origination measures the reallocation channel. The reallocation allows young households to move to larger homes or achieve homeownership earlier in their life-cycle, while older households can downsize their housing consumption. I exploit zip code level variation in fraction of homeowners older than 65 and living alone to causally identify the reallocation channel. During the housing boom, old homeowners exited their houses because they could monetize their home value, could not afford to pay increasing property taxes, or suffered from age-related health adversities such as death or disability. I claim that the exit due to monetization and property taxes is driven by the credit supply shock. Some old homeowners have a reservation price for their house that credit constrained households can only pay when credit standards are loosened. Other old homeowners sell their houses and move out of the neighborhood because property taxes raise to unaffordable levels relative to their income, when property assessments increase induced by the credit boom. The exit due to age-related health adversities is purely exogenous. The variation generated by the instrument allows me estimate the causal effect of access to finance on fertility decisions through the reallocation channel. The IV estimates show that one standard deviation increase in reallocation leads to a 4.6% to 7% increase in fertility from 2000 to 2006, which represents 20% to 30% of the standard deviation of fertility change.

Beyond the direct impact on utility and the impact on expenditures, fertility decisions produce significant changes at the aggregate level by affecting population growth and economic growth (Barro and Becker 1989 and Becker et al. 1990). Therefore, if the expansion of credit affected the fertility rate of U.S. households, it is relevant to estimate the magnitude of the aggregate effect. I

estimate that approximately 330,000 to 480,000 babies were born between 2000 and 2006 due to the reallocation channel.

How much of this increase was a life-time change or a life-cycle change? I show that, between 2006 and 2010, zip codes that experienced high levels of credit induced reallocation were more likely to experience large drops in fertility outcomes. The drop is larger is size than the increase, implying that the increase in fertility during the housing boom was undone during the financial crisis. Although the empirical design is not ideal because it does not control for several other channels that might have impacted fertility outcomes during the financial crisis, the current results point in the direction of a life-cycle change rather than a life-time change. This paper not only contributes to the literature on the welfare effects associated to the access to finance, but also documents a determinant of fertility that was not well-identified.

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Figure 1: Fertility Rate and Mortgage Origination in US from 1990 to 2010

The top panel shows the aggregate number of births (in millions) in the U.S. between 1990 and 2000. The mid panel presents the aggregate fertility rate for women in the U.S. in the same period. Fertility rate is defined as the total number of births divided by the number of women (in thousands) with ages between 15 and 44. The aggregate data on births is from the Centers for Disease Control and Prevention (`http://www.cdc.gov/nchs/births.htm`). The bottom panel shows the aggregate value in millions of dollars of originations for home purchase from HMDA between 1990 to 2010.

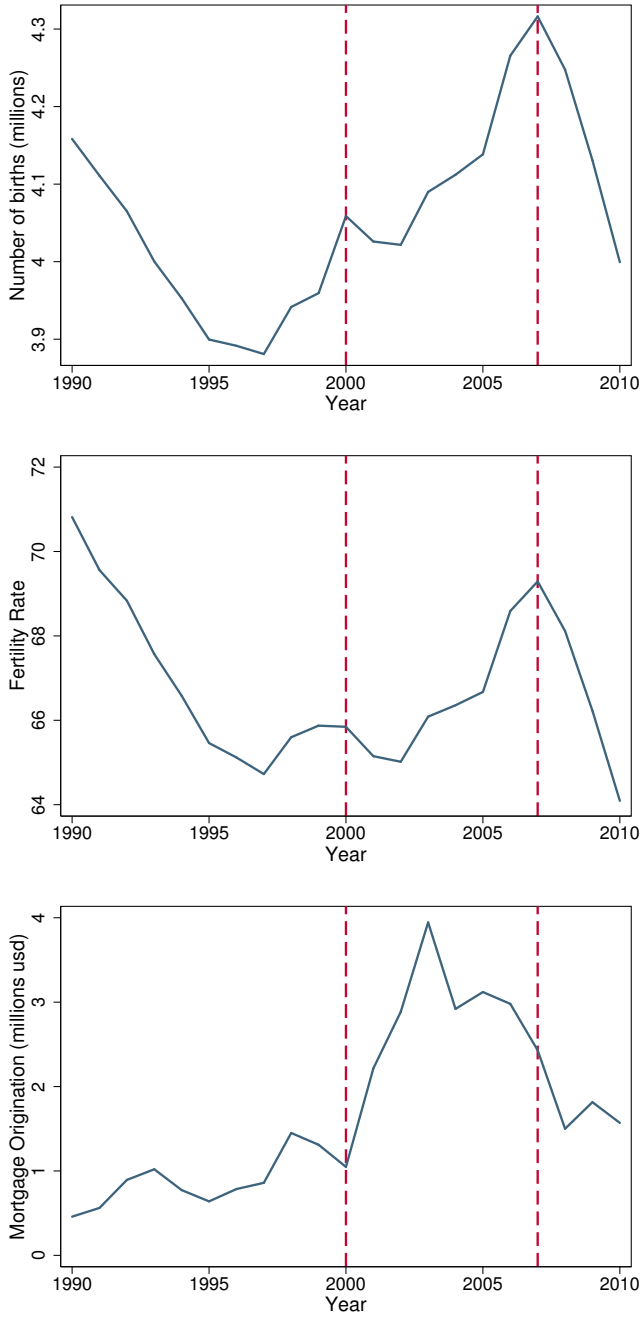

Figure 2: Annual Sales of Newly Constructed and Existing Homes in US

The top panel depicts the annual number of house transactions for newly constructed and the bottom panel reports the annual number of house transactions for existing homes. Both levels are presented in millions. Data was collected from the National Association of Realtors website.

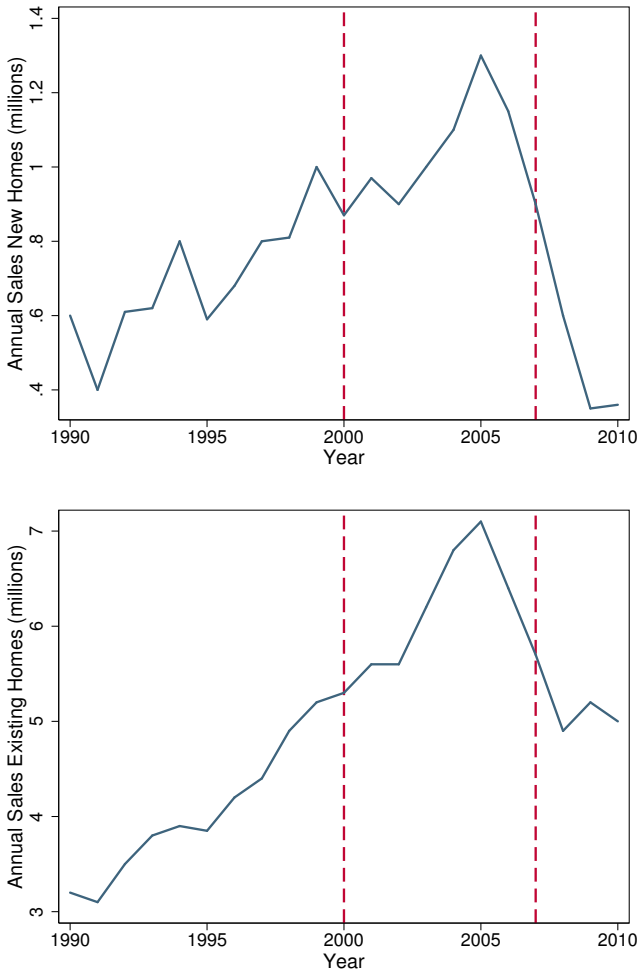

Figure 3: Fertility and Mortgage Origination in the Cross-Section: County-Level

The picture below shows the correlation between the fertility change and the per capita mortgage origination change. Fertility rate is defined as the number of births divided by the number of women (in thousands) of ages between 15 and 44. Per capita mortgage origination change is defined as the mortgage origination for home purchase divided by the population (in thousands) in the county. Each dot represents a county and the size is proportional to the size of the population in the county. Only counties with more than 100,000 people are plotted in the graph. The red line is the fitted regression line. The left panel depicts the relationship between mortgage origination and fertility rates from 1995 to 2000, the middle panel from 2000 to 2006 and the right panel from 2007 and 2010.

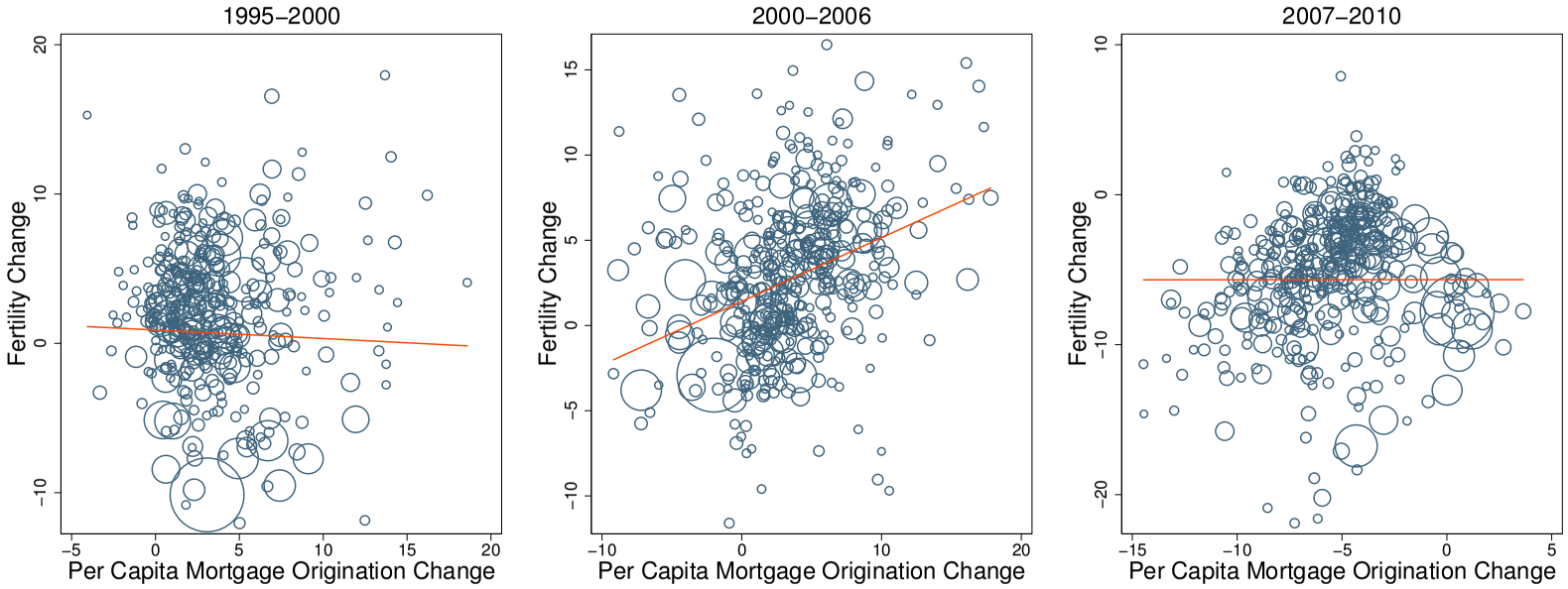

Figure 4: Fertility Rate in Top and Bottom Quintile of Credit Growth

This figure presents the fertility rates for two groups of counties. Counties were sorted by the change in per capita mortgage origination for home purchase. Mortgage credit origination comes from HMDA and is defined as the total number of mortgage loans originated for home purchase. The blue and green lines are the averages for the top and bottom quintiles, respectively. The red dashed lines are the bounds for the 95% confidence intervals. Fertility rate is defined as the total number of births divided by the number of women (in thousands) with ages between 15 and 44.

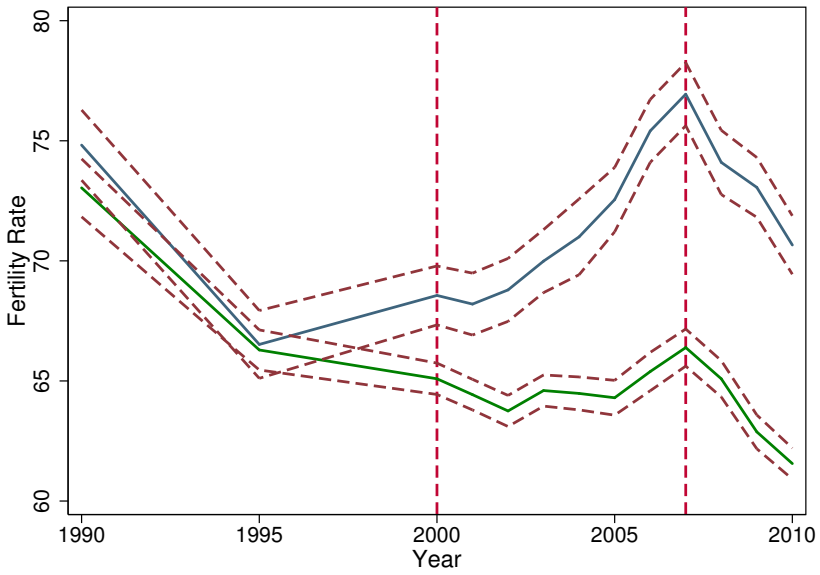

Figure 5: Rent Price by Apartment Size

The picture below shows the asked price per bedroom by apartment size. Apartment size is measured by the number of bedrooms. Asked prices are estimated from 30 million craigslist adds from 2008 to 2013 for all the cities where craigslist is present in the US.

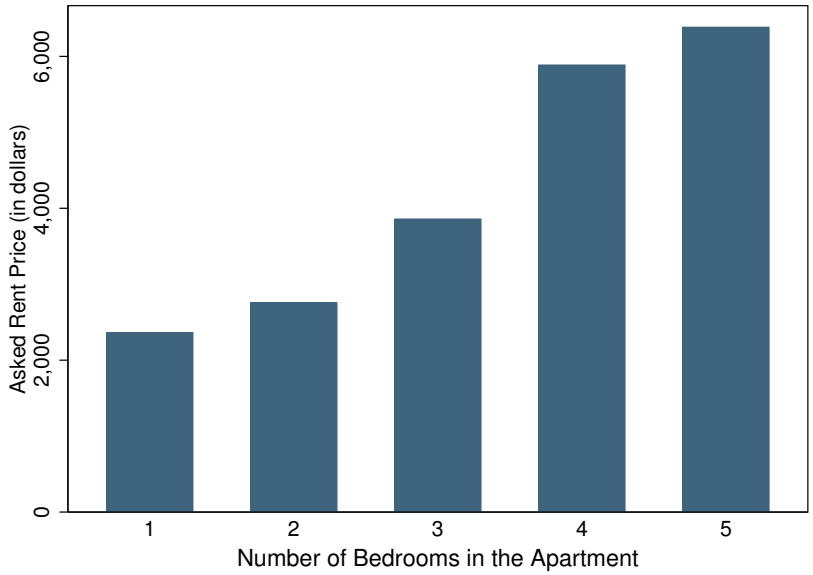

Figure 6: Changes in Homeownership Rate by Age Group during the Housing Boom

In the picture below each bar represents the change in percentage points of homeownership rate by age group. The blue bars report the changes from 2000 to 2005 and the light yellow the changes from 1990-1995. Homeownership rate is defined as the proportion of owner households to the total number of occupied households. The estimates are based on the Current Population Survey and Housing Vacancy Survey.

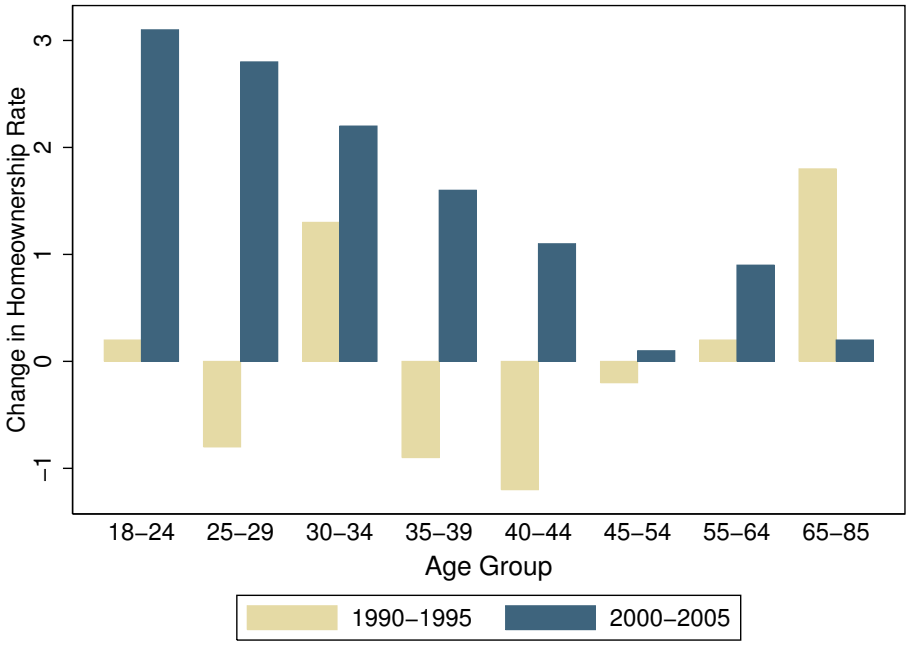

Table 1: Summary of Statistics

This table presents the summary of statistics of the variables used in the empirical analysis. Total Origination/Pop is defined as the mortgage origination for home purchase divided by the population (in thousands) in the zip code. (Originated & Sold)/Pop is defined as the total number of mortgages originated and sold divided by the population (in thousands) in the zip code. (Originated & Non-Sold)/Pop is defined as the total number of mortgages originated and not sold divided by the population (in thousands) in the zip code. Fertility rate is defined as the number of births divided by the number of women (in thousands) with ages between 15 and 44. IRS Income growth is computed using the adjust gross income from the IRS data. Income and Capital Gains are reported in thousands of dollars. HP is house price growth from Zillow. Female College is the fraction of women in the zip code who have at least a bachelor's degree. Demographics and Unemployment are from the Census and the American Community Survey (ACS). House units growth is computed using the number of house units per zip code as reported by the Census and ACS. Old-Homeowners is the instrumental variable that measures fraction of homeowners who are older than 65 years-old and live alone, while 75-Homeowners measures the fraction of homeowners who are older than 75 years-old and live alone, both described and discussed in section III.c.2. School Score is the reading score from Global Report Card for the school district where the zip code is located. Hospitals is the number of hospital facility from the County of Business Patterns.

	N	Mean	Std	10th	50th	90th
HP Growth$_{\{00\to06\}}$	2717	1.07	0.55	0.35	1.06	1.79
House Units Growth$_{\{00\to06\}}$	2717	0.13	0.26	-0.014	0.068	0.32
(Originated)/Pop$_{\{00\to06\}}$	2717	0.64	9.52	-8.20	0.74	9.01
(Originated & Sold)/Pop$_{\{00\to06\}}$	2717	1.71	7.10	-4.50	1.33	7.91
(Originated & Non-Sold)/Pop$_{\{00\to06\}}$	2717	-1.07	3.16	-4.56	-0.65	1.74
Male Unemployment$_{\{00\to06\}}$	2717	0.016	0.036	-0.021	0.019	0.053
Female Unemployment$_{\{00\to06\}}$	2717	0.011	0.036	-0.026	0.014	0.047
Female Unemployment$_{\{2000\}}$	2717	0.064	0.046	0.024	0.051	0.12
Per Capita Inc. Growth$_{\{00\to06\}}$	2717	0.22	0.17	0.075	0.19	0.40
Log Per Capita Income$_{\{2000\}}$	2717	3.83	0.47	3.34	3.75	4.42
Fraction of Hisp.$_{\{00\to06\}}$	2717	0.029	0.041	-0.0082	0.021	0.084
Fraction of Black.$_{\{00\to06\}}$	2717	0.0034	0.033	-0.022	0.0022	0.034
Fertility$_{\{2000\}}$	2717	62.2	17.8	41.6	60.5	84.7
Fertility$_{\{2006\}}$	2717	65.6	22.0	40.9	63.6	92.5
Fertility$_{\{2010\}}$	2717	52.4	26.6	0	56.5	80.9
Fertility$_{\{00\to06\}}$	2717	3.34	14.4	-11.6	2.25	19.1
Fertility$_{\{06\to10\}}$	2717	-13.2	24.3	-53.0	-7.28	7.46
School Score$_{\{2004\}}$	2717	48.7	15.2	26.9	48.1	69.7
Hospitals/Pop$_{\{2000\}}$	2717	0.017	0.044	0	0	0.059
Old-Homeowners$_{\{2000\}}$	2717	0.018	0.010	0.0064	0.016	0.030
75-Homeowners$_{\{2000\}}$	2717	0.0088	0.0059	0.0024	0.0079	0.016
% Pop w/ Age>65$_{\{2000\}}$	2717	0.14	0.078	0.068	0.12	0.22
Population$_{\{2000\}}$	2717	24846.9	18146.3	5077	21396	48674

Table 2: Mortgage Origination and Fertility During The Boom: OLS

This table reports the OLS betas of the model presented in section III.c.1 when the reallocation measure is based on the mortgages originated and sold. (Originated & Sold)/Pop is defined as the total number of mortgages originated and sold divided by the population (in thousands) in the zip code. Fertility rate is defined as the number of births divided by the number of women (in thousands) with ages between 15 and 44. IRS Income growth is computed using the adjust gross income from the IRS data. Income and Capital Gains are reported in thousands of dollars. HP is house price growth from Zillow. Female College is the fraction of women in the zip code who have at least a bachelor's degree. Demographics and Unemployment are from the Census and the American Community Survey (ACS). House units growth is computed using the number of house units per zip code as reported by the Census and ACS. Old-Homeowners is the instrumental variable that measures fraction of homeowners who are older than 65 years-old and live alone, while 75-Homeowners measures the fraction of homeowners who are older than 75 years-old and live alone, both described and discussed in section III.c.2. School Score is the reading score from Global Report Card for the school district where the zip code is located. Hospitals is the number of hospital facility from the County of Business Patterns. ***,**,* coefficient estimate statistically distinct from 0 at the 1%, 5% and 10% levels, respectively; p-values in parentheses. All regressions are weighted by the county population. This table continues in the next page.

	Fertility Change from 2000 to 2006					
	OLS	OLS	OLS	OLS	OLS	OLS
(Originate & Sold)/Pop$_{\{00\to06\}}$	0.155***				0.140***	0.140***
	(0.00)				(0.00)	(0.00)
HP Growth$_{\{00\to06\}}$		-0.017	0.030	-0.017	-0.072	-0.072
		(0.77)	(0.18)	(0.77)	(0.20)	(0.21)
House Units Growth$_{\{00\to06\}}$		-0.055*	-0.064	-0.055*	-0.076**	-0.083***
		(0.08)	(0.14)	(0.08)	(0.01)	(0.01)
Male Unemployment$_{\{00\to06\}}$		-0.031		-0.031	-0.039	-0.040*
		(0.17)		(0.17)	(0.11)	(0.09)
Female Unemployment$_{\{00\to06\}}$		0.084***		0.084***	0.084***	0.083***
		(0.00)		(0.00)	(0.00)	(0.00)
Female Unemployment$_{\{2000\}}$		0.007		0.007	-0.007	-0.007
		(0.82)		(0.82)	(0.79)	(0.78)
Per Capita Inc. Growth$_{\{00\to06\}}$		0.079**		0.079**	0.070**	0.071**
		(0.02)		(0.02)	(0.02)	(0.02)
Log Per Capita Income$_{\{2000\}}$		-0.042		-0.042	-0.037	-0.014
		(0.45)		(0.45)	(0.48)	(0.75)
School Score$_{\{2004\}}$		-0.030		-0.030	-0.016	-0.019
		(0.20)		(0.20)	(0.42)	(0.25)
Hospitals/Pop$_{\{2000\}}$		0.001		0.001	0.003	0.007
		(0.94)		(0.94)	(0.86)	(0.69)
75-Homeowners$_{\{2000\}}$						0.036
						(0.12)
% Pop w/ Age>65$_{\{2000\}}$						-0.045
						(0.25)
County Effects	Yes	Yes	Yes	Yes	Yes	Yes
Age-Demo Controls	No	Yes	No	Yes	Yes	Yes
#Zip Codes	2717	2717	2717	2717	2717	2717
R-squared	0.119	0.146	0.101	0.146	0.160	0.161

Table 3: Mortgage Origination and Fertility During Boom. ***(Continuation)***

This table is the continuation from the table in the previous page. Fem(a,b) is the number of females (in thousands) in the zip code with ages between a and b. Demographics are from the Census and the American Community Survey (ACS). Fertility rate is defined as the number of births divided by the number of women with ages between 15 and 44. Standard errors are robust and clustered at the state level. ***,**,* coefficient estimate statistically distinct from 0 at the 1%, 5% and 10% levels, respectively; p-values in parentheses. All regressions are weighted by the county population.

	Fertility Change from 2000 to 2006					
	OLS	OLS	OLS	OLS	OLS	OLS
Fraction of Hisp.$_{\{00\rightarrow06\}}$		0.200***		0.200***	0.169***	0.163***
		(0.00)		(0.00)	(0.00)	(0.00)
Fraction of Black.$_{\{00\rightarrow06\}}$		0.055***		0.055***	0.045**	0.053**
		(0.00)		(0.00)	(0.02)	(0.01)
Fem (15,24)/Fem (15,45)$_{\{00\rightarrow06\}}$		-0.099*		-0.099*	-0.094*	-0.096*
		(0.06)		(0.06)	(0.08)	(0.07)
Fem (25,34)/Fem (15,45)$_{\{00\rightarrow06\}}$		0.059***		0.059***	0.047**	0.051**
		(0.01)		(0.01)	(0.02)	(0.02)
County Effects	Yes	Yes	Yes	Yes	Yes	Yes
Age-Demo Controls	No	Yes	No	Yes	Yes	Yes
#Zip Codes	2717	2717	2717	2717	2717	2717
R-squared	0.119	0.146	0.101	0.146	0.160	0.161

Table 4: Mortgage Origination and Fertility During The Boom: OLS

This table reports the OLS betas of the model presented in section III.c.1 when the reallocation measure is based on the total mortgages originated and the difference between mortgages originated and sold and mortgages originated but not sold. Total Origination/Pop is defined as the mortgage origination for home purchase divided by the population (in thousands) in the zip code. 'Sold minus NonSold' is the difference between the mortgages originated and sold and mortgages originated but not sold and kept in the balance sheet of the lender. Fertility rate is defined as the number of births divided by the number of women (in thousands) with ages between 15 and 44. IRS Income growth is computed using the adjust gross income from the IRS data. Income and Capital Gains are reported in thousands of dollars. HP is house price growth from Zillow. Female College is the fraction of women in the zip code who have at least a bachelor's degree. Demographics and Unemployment are from the Census and the American Community Survey (ACS). House units growth is computed using the number of house units per zip code as reported by the Census and ACS. Old-Homeowners is the instrumental variable that measures fraction of homeowners who are older than 65 years-old and live alone, while 75-Homeowners measures the fraction of homeowners who are older than 75 years-old and live alone, both described and discussed in section III.c.2. School Score is the reading score from Global Report Card for the school district where the zip code is located. Hospitals is the number of hospital facility from the County of Business Patterns. Standard errors are robust and clustered at the state level. ***,**,* coefficient estimate statistically distinct from 0 at the 1%, 5% and 10% levels, respectively; p-values in parentheses. All regressions are weighted by the county population.

	Fertility Change from 2000 to 2006					
	OLS	OLS	OLS	OLS	OLS	OLS
(Sold minus Nonsold)/Pop$_{\{00\to06\}}$	0.161***	0.149***	0.148***			
	(0.00)	(0.00)	(0.00)			
(Total Origination)/Pop$_{\{00\to06\}}$				0.141***	0.124***	0.124***
				(0.00)	(0.00)	(0.00)
HP Growth$_{\{00\to06\}}$		-0.068	-0.068		-0.065	-0.065
		(0.22)	(0.22)		(0.26)	(0.26)
House Units Growth$_{\{00\to06\}}$		-0.080***	-0.085***		-0.071**	-0.077**
		(0.01)	(0.00)		(0.02)	(0.01)
Male Unemployment$_{\{00\to06\}}$		-0.042*	-0.043*		-0.036	-0.037
		(0.08)	(0.07)		(0.14)	(0.12)
Female Unemployment$_{\{00\to06\}}$		0.076***	0.075***		0.087***	0.086***
		(0.00)	(0.00)		(0.00)	(0.00)
Female Unemployment$_{\{2000\}}$		-0.017	-0.017		-0.000	-0.000
		(0.50)	(0.49)		(1.00)	(0.99)
Per Capita Inc. Growth$_{\{00\to06\}}$		0.064**	0.064**		0.074**	0.075**
		(0.03)	(0.02)		(0.02)	(0.01)
Log Per Capita Income$_{\{2000\}}$		-0.063	-0.041		-0.026	-0.004
		(0.25)	(0.37)		(0.62)	(0.94)
School Score$_{\{2004\}}$		-0.014	-0.016		-0.019	-0.022
		(0.50)	(0.34)		(0.34)	(0.19)
Hospitals/Pop$_{\{2000\}}$		0.004	0.008		0.002	0.006
		(0.78)	(0.64)		(0.91)	(0.74)
75-Homeowners$_{\{2000\}}$			0.038*			0.036
			(0.09)			(0.12)
% Pop w/ Age>65$_{\{2000\}}$			-0.043			-0.045
			(0.31)			(0.24)
County Effects	Yes	Yes	Yes	Yes	Yes	Yes
Age-Demo Controls	No	Yes	Yes	No	Yes	Yes
#Zip Codes	2717	2717	2717	2717	2717	2717
R-squared	0.120	0.163	0.165	0.115	0.156	0.158

Table 5: Mortgage Origination and Fertility During The Boom: IV

This table reports the first stage and the IV betas of the model presented in section III.c.2 when the reallocation measure is based on the mortgages originated and sold. (Originated & Sold)/Pop is defined as the total number of mortgages originated and sold divided by the population (in thousands) in the zip code. Fertility rate is defined as the number of births divided by the number of women (in thousands) with ages between 15 and 44. IRS Income growth is computed using the adjust gross income from the IRS data. Income and Capital Gains are reported in thousands of dollars. HP is house price growth from Zillow. Female College is the fraction of women in the zip code who have at least a bachelor's degree. Demographics and Unemployment are from the Census and the American Community Survey (ACS). House units growth is computed using the number of house units per zip code as reported by the Census and ACS. Old-Homeowners is the instrumental variable that measures fraction of homeowners who are older than 65 years-old and live alone, while 75-Homeowners measures the fraction of homeowners who are older than 75 years-old and live alone, both described and discussed in section III.c.2. School Score is the reading score from Global Report Card for the school district where the zip code is located. Hospitals is the number of hospital facility from the County of Business Patterns. Standard errors are robust and clustered at the state level. ***,**,* coefficient estimate statistically distinct from 0 at the 1%, 5% and 10% levels, respectively; p-values in parentheses. All regressions are weighted by the county population.

	(Originated & Sold)/Pop$_{\{00\to06\}}$			Change in Fertility 00-06			
	OLS	OLS	OLS	IV	IV	IV	IV
(Originated & Sold)/Pop$_{\{00\to06\}}$				0.191***	0.181**	0.324***	0.330***
				(0.00)	(0.01)	(0.00)	(0.00)
Old-Homeowners$_{\{2000\}}$	0.186***	0.173***	0.127***				
	(0.00)	(0.00)	(0.00)				
% Pop w/ Age>65$_{\{2000\}}$		-0.092***	0.072	-0.001	-0.048	0.021	-0.048
		(0.00)	(0.20)	(0.99)	(0.14)	(0.64)	(0.12)
75-Homeowners$_{\{2000\}}$		0.021	-0.013	0.042**	0.034**		
		(0.26)	(0.62)	(0.01)	(0.05)		
Male Unemployment$_{\{00\to06\}}$			0.053*		-0.042**		-0.048**
			(0.08)		(0.02)		(0.02)
Female Unemployment$_{\{2000\}}$			0.116***		-0.011		-0.029
			(0.00)		(0.62)		(0.14)
Per Capita Inc. Growth$_{\{00\to06\}}$			0.070**		0.068***		0.061***
			(0.01)		(0.00)		(0.01)
Log Per Capita Income$_{\{2000\}}$			-0.035		-0.012		-0.013
			(0.31)		(0.74)		(0.73)
HP Growth$_{\{00\to06\}}$			0.396***		-0.088		-0.149*
			(0.00)		(0.16)		(0.06)
Female Unemployment$_{\{00\to06\}}$			0.007		0.082***		0.080***
			(0.74)		(0.00)		(0.00)
House Units Growth$_{\{00\to06\}}$			0.174***		-0.090***		-0.116***
			(0.00)		(0.00)		(0.00)
School Score$_{\{2004\}}$			-0.076***		-0.015		-0.003
			(0.00)		(0.36)		(0.86)
Hospitals/Pop$_{\{2000\}}$			-0.013		0.007		0.009
			(0.66)		(0.61)		(0.47)
County Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age-Demo Controls	No	No	Yes	No	Yes	No	Yes
#Zip Codes	2717	2717	2717	2717	2717	2717	2717
R-squared	0.135	0.141	0.333	0.119	0.160	0.094	0.137

Table 6: Mortgage Origination and Fertility During The Boom: IV

This table reports the first stage and the IV beta estimates of the model presented in section III.c.2 when the reallocation measure is based on total mortgages originated. Total Origination/Pop is defined as the mortgage origination for home purchase divided by the population (in thousands) in the zip code. Fertility rate is defined as the number of births divided by the number of women (in thousands) with ages between 15 and 44. IRS Income growth is computed using the adjust gross income from the IRS data. Income and Capital Gains are reported in thousands of dollars. HP is house price growth from Zillow. Female College is the fraction of women in the zip code who have at least a bachelor's degree. Demographics and Unemployment are from the Census and the American Community Survey (ACS). House units growth is computed using the number of house units per zip code as reported by the Census and ACS. Old-Homeowners is the instrumental variable that measures fraction of homeowners who are older than 65 years-old and live alone, while 75-Homeowners measures the fraction of homeowners who are older than 75 years-old and live alone, both described and discussed in section III.c.2. School Score is the reading score from Global Report Card for the school district where the zip code is located. Hospitals is the number of hospital facility from the County of Business Patterns. Standard errors are robust and clustered at the state level. ***,**,* coefficient estimate statistically distinct from 0 at the 1%, 5% and 10% levels, respectively; p-values in parentheses. All regressions are weighted by the county population.

	(Total Origination)/Pop$_{\{00\to06\}}$			Change in Fertility 00-06			
	OLS	OLS	OLS	IV	IV	IV	IV
(Total Origination)/Pop$_{\{00\to06\}}$				0.195***	0.214**	0.306***	0.363***
				(0.00)	(0.01)	(0.00)	(0.00)
Old-Homeowners$_{\{2000\}}$	0.197***	0.170***	0.107***				
	(0.00)	(0.00)	(0.00)				
% Pop w/ Age>65$_{\{2000\}}$		-0.124***	0.076	0.006	-0.051*	0.027	-0.054*
		(0.00)	(0.24)	(0.90)	(0.09)	(0.54)	(0.06)
75-Homeowners$_{\{2000\}}$		0.045***	0.003	0.037**	0.031*		
		(0.01)	(0.90)	(0.03)	(0.07)		
Male Unemployment$_{\{00\to06\}}$			0.037		-0.040**		-0.044**
			(0.15)		(0.04)		(0.04)
Female Unemployment$_{\{2000\}}$			0.074**		-0.006		-0.018
			(0.01)		(0.79)		(0.39)
Per Capita Inc. Growth$_{\{00\to06\}}$			0.043		0.072***		0.068***
			(0.11)		(0.00)		(0.00)
Log Per Capita Income$_{\{2000\}}$			-0.130**		0.009		0.023
			(0.02)		(0.79)		(0.49)
HP Growth$_{\{00\to06\}}$			0.391***		-0.100		-0.160*
			(0.00)		(0.13)		(0.05)
Female Unemployment$_{\{00\to06\}}$			-0.020		0.088***		0.090***
			(0.37)		(0.00)		(0.00)
House Units Growth$_{\{00\to06\}}$			0.155***		-0.091***		-0.114***
			(0.01)		(0.00)		(0.00)
School Score$_{\{2004\}}$			-0.064***		-0.015		-0.005
			(0.00)		(0.35)		(0.77)
Hospitals/Pop$_{\{2000\}}$			-0.007		0.007		0.007
			(0.80)		(0.63)		(0.51)
County Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age-Demo Controls	No	No	Yes	No	Yes	No	Yes
#Zip Codes	2717	2717	2717	2717	2717	2717	2717
R-squared	0.144	0.155	0.371	0.114	0.153	0.091	0.121

Table 7: Mortgage Origination and Fertility During The Boom: IV

This table reports the first stage and the IV beta estimates of the model presented in section III.c.2 when the reallocation measure is based on difference between mortgages sold minus non-sold. 'Sold minus NonSold' is the difference between the mortgages originated and sold and mortgages originated but not sold and kept in the balance sheet of the lender. Fertility rate is defined as the number of births divided by the number of women (in thousands) with ages between 15 and 44. IRS Income growth is computed using the adjust gross income from the IRS data. Income and Capital Gains are reported in thousands of dollars. HP is house price growth from Zillow. Female College is the fraction of women in the zip code who have at least a bachelor's degree. Demographics and Unemployment are from the Census and the American Community Survey (ACS). House units growth is computed using the number of house units per zip code as reported by the Census and ACS. Old-Homeowners is the instrumental variable that measures fraction of homeowners who are older than 65 years-old and live alone, while 75-Homeowners measures the fraction of homeowners who are older than 75 years-old and live alone, both described and discussed in section III.c.2. School Score is the reading score from Global Report Card for the school district where the zip code is located. Hospitals is the number of hospital facility from the County of Business Patterns. Standard errors are robust and clustered at the state level. ***,**,* coefficient estimate statistically distinct from 0 at the 1%, 5% and 10% levels, respectively; p-values in parentheses. All regressions are weighted by the county population.

	(Sold minus Non-Sold)/Pop$_{\{00\to06\}}$			Change in Fertility 00-06			
	OLS	OLS	OLS	IV	IV	IV	IV
(Sold minus Non-Sold)/Pop$_{\{00\to06\}}$				0.216***	0.159***	0.439***	0.323***
				(0.01)	(0.01)	(0.00)	(0.00)
Old-Homeowners$_{\{2000\}}$	0.137***	0.153***	0.145***				
	(0.00)	(0.00)	(0.00)				
% Pop w/ Age>65$_{\{2000\}}$		-0.017	0.052	-0.014	-0.043	0.003	-0.039
		(0.16)	(0.11)	(0.75)	(0.23)	(0.94)	(0.28)
75-Homeowners$_{\{2000\}}$		-0.027	-0.042	0.052***	0.038**		
		(0.31)	(0.17)	(0.00)	(0.03)		
Male Unemployment$_{\{00\to06\}}$			0.074**		-0.044**		-0.054***
			(0.03)		(0.01)		(0.00)
Female Unemployment$_{\{2000\}}$			0.178***		-0.018		-0.048**
			(0.00)		(0.42)		(0.01)
Per Capita Inc. Growth$_{\{00\to06\}}$			0.111***		0.063***		0.049**
			(0.00)		(0.00)		(0.04)
Log Per Capita Income$_{\{2000\}}$			0.148***		-0.042		-0.074
			(0.00)		(0.36)		(0.15)
HP Growth$_{\{00\to06\}}$			0.347***		-0.072		-0.130*
			(0.00)		(0.21)		(0.06)
Female Unemployment$_{\{00\to06\}}$			0.056**		0.075***		0.064***
			(0.01)		(0.00)		(0.00)
House Units Growth$_{\{00\to06\}}$			0.184***		-0.087***		-0.117***
			(0.00)		(0.00)		(0.00)
School Score$_{\{2004\}}$			-0.087***		-0.015		-0.000
			(0.00)		(0.37)		(0.99)
Hospitals/Pop$_{\{2000\}}$			-0.021		0.009		0.011
			(0.44)		(0.59)		(0.42)
County Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age-Demo Controls	No	No	Yes	No	Yes	No	Yes
#Zip Codes	2717	2717	2717	2717	2717	2717	2717
R-squared	0.127	0.128	0.266	0.120	0.164	0.052	0.141

Table 8: Mortgage Origination and Fertility in Normal Times: OLS

This tables shows that the credit induced reallocation was inexistent in Old-Homeowners zip codes between 1995 and 2000. 'Sold minus NonSold' is the difference between the mortgages originated and sold and mortgages originated but not sold and kept in the balance sheet of the lender. Fertility rate is defined as the number of births divided by the number of women (in thousands) with ages between 15 and 44. Old-Homeowners is the instrumental variable that measures fraction of homeowners who are older than 65 years-old and live alone, while 75-Homeowners measures the fraction of homeowners who are older than 75 years-old and live alone, both described and discussed in section III.c.2. The bottom row indicates which regressions have county effects. Standard errors are robust and clustered at the state level. ***,**,* coefficient estimate statistically distinct from 0 at the 1%, 5% and 10% levels, respectively; p-values in parentheses. All regressions are weighted by the county population.

Panel A

	Ori. Sold minus Non-Sold (95-00)			Ori. Sold minus Non-Sold (00-06)		
	OLS	OLS	OLS	OLS	OLS	OLS
Old-Homeowners$_{\{2000\}}$	0.008		0.040	0.144***		0.171***
	(0.80)		(0.20)	(0.00)		(0.00)
75-Homeowners$_{\{2000\}}$		-0.027	-0.053**		0.065***	-0.045
		(0.35)	(0.02)		(0.01)	(0.16)
% Pop w/ Age>65$_{\{2000\}}$	0.025	0.031	0.037*	-0.009	-0.024	0.002
	(0.21)	(0.13)	(0.06)	(0.60)	(0.26)	(0.86)
County Effects	Yes	Yes	Yes	Yes	Yes	Yes
Age-Demo Controls	Yes	Yes	Yes	Yes	Yes	Yes
#Zip Codes	2361	2361	2361	2360	2360	2360
R-squared	0.243	0.244	0.245	0.124	0.108	0.125

Panel B

	Fertility Change from 1995 to 2000		
	OLS	OLS	OLS
Old-Homeowners$_{\{2000\}}$	-0.102***		-0.015
	(0.00)		(0.65)
75-Homeowners$_{\{2000\}}$		-0.149***	-0.139**
		(0.00)	(0.02)
% Pop w/ Age>65$_{\{2000\}}$	0.301*	0.336*	0.334*
	(0.06)	(0.06)	(0.07)
County Effects	Yes	Yes	Yes
Age-Demo Controls	Yes	Yes	Yes
#Zip Codes	1778	1778	1778
R-squared	0.188	0.198	0.198

Table 9: Mortgage Origination and Fertility During the Crisis: IV

This table reports the first stage and the IV beta estimates of the model presented in section III.c.2 when the explanatory variable is the reallocation measure is based on total mortgages originated, and the dependent variable is the change in fertility between 2006 and 2010. (Originated & Sold)/Pop is defined as the total number of mortgages originated and sold divided by the population (in thousands) in the zip code. Fertility rate is defined as the number of births divided by the number of women (in thousands) with ages between 15 and 44. IRS Income growth is computed using the adjust gross income from the IRS data. Income and Capital Gains are reported in thousands of dollars. HP is house price growth from Zillow. Female College is the fraction of women in the zip code who have at least a bachelor's degree. Demographics and Unemployment are from the Census and the American Community Survey (ACS). House units growth is computed using the number of house units per zip code as reported by the Census and ACS. Old-Homeowners is the instrumental variable that measures fraction of homeowners who are older than 65 years-old and live alone, while 75-Homeowners measures the fraction of homeowners who are older than 75 years-old and live alone, both described and discussed in section III.c.2. School Score is the reading score from Global Report Card for the school district where the zip code is located. Hospitals is the number of hospital facility from the County of Business Patterns. Standard errors are robust and clustered at the state level. ***,**,* coefficient estimate statistically distinct from 0 at the 1%, 5% and 10% levels, respectively; p-values in parentheses. All regressions are weighted by the county population.

	Fertility Change from 2000 to 2006			
	OLS	OLS	IV	IV
(Originated & Sold)/Pop$_{\{00\to06\}}$	-0.064	0.004	-0.298***	-0.240*
	(0.17)	(0.89)	(0.00)	(0.07)
% Pop w/ Age>65$_{\{2000\}}$		0.144***	0.166***	0.159***
		(0.00)	(0.00)	(0.00)
75-Homeowners$_{\{2000\}}$		-0.062*	-0.045	-0.048
		(0.05)	(0.12)	(0.16)
Male Unemployment$_{\{00\to06\}}$		-0.003		0.008
		(0.85)		(0.64)
Female Unemployment$_{\{2000\}}$		-0.089		-0.063
		(0.19)		(0.30)
Per Capita Inc. Growth$_{\{00\to06\}}$		0.022		0.037**
		(0.12)		(0.01)
Log Per Capita Income$_{\{2000\}}$		0.026		0.014
		(0.58)		(0.74)
HP Growth$_{\{00\to06\}}$		-0.102		-0.004
		(0.19)		(0.95)
Female Unemployment$_{\{00\to06\}}$		-0.049		-0.047
		(0.17)		(0.18)
House Units Growth$_{\{00\to06\}}$		0.035		0.077**
		(0.13)		(0.02)
School Score$_{\{2004\}}$		0.041**		0.020
		(0.03)		(0.40)
Hospitals/Pop$_{\{2000\}}$		-0.004		-0.008
		(0.69)		(0.56)
County Effects	Yes	Yes	Yes	Yes
Age-Demo Controls	Yes	Yes	Yes	Yes
#Zip Codes	2717	2717	2717	2717
R-squared	0.605	0.656	0.577	0.616

Table 10: Homeownership Change by Age and the Old-Homeowners Instrument

This table presents the regression coefficients of the instrument defined by the fraction of homeowners living alone and older than 65 years-old, as explained in section III.c.2, with the change in homeownership for different age groups. Demographics are from the Census and the American Community Survey (ACS). All regressions have county effects. Standard errors are robust and clustered at the state level. ***,**,* coefficient estimate statistically distinct from 0 at the 1%, 5% and 10% levels, respectively; t-statistics in parentheses. All regressions are weighted by the county population.

	Ownership Change from 2000 to 2006						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	25< age <34	35< age <44	45< age <54	55< age <59	60< age <64	65< age <74	age >75
Old-Homeowners$_{\{2000\}}$	0.34***	0.46***	0.06	0.05*	0.00	-0.35***	-0.49***
	(4.81)	(9.43)	(0.69)	(2.30)	(0.09)	(-6.47)	(-11.07)
County Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
#Zip Codes	2753	2753	2753	2753	2753	2753	2753
R-squared	0.218	0.232	0.144	0.122	0.123	0.237	0.319

Table 11: Change in Homeownership and New Construction.

This table shows that old households experienced gains in homeownership in zip codes that experienced higher growth in new construction. Each column reports the correlation coefficient of the zip code growth in housing units with the change in homeownership from 2000 to 2006 by age group. Construction growth is defined as the growth in number of housing units in the zip code. The bottom row indicates which regressions have county effects. Standard errors are robust and clustered at the state level. ***,**,* coefficient estimate statistically distinct from 0 at the 1%, 5% and 10% levels, respectively; t-values in parentheses. All regressions are weighted by the county population.

	Ownership Change from 2000 to 2006		
	(1)	(2)	(3)
	25< age <44	45< age <59	60< age <74
House Units Growth$_{\{00\to06\}}$	-0.01	-0.08***	0.10***
	(-0.43)	(-3.59)	(4.80)
County Effects	Yes	Yes	Yes
#Zip Codes	2753	2753	2753
R-squared	0.173	0.126	0.166

Table 12: House Prices and Fertility

This table shows that changes fertility and house price growth were strongly correlated between 1995 and 2000, but not between 2000 and 2006. Fertility rate is defined as the number of births divided by the number of women (in thousands) with ages between 15 and 44. HP is house price growth from Zillow. Standard errors are robust and clustered at the state level. ***,**,* coefficient estimate statistically distinct from 0 at the 1%, 5% and 10% levels, respectively; p-values in parentheses. All regressions are weighted by the county population.

	Fertility$_{\{95\to00\}}$	Fertility$_{\{00\to06\}}$	
	OLS	OLS	OLS
HP Growth$_{\{96\to00\}}$	0.338***		
	(0.00)		
HP Growth$_{\{00\to06\}}$		0.024	0.027
		(0.33)	(0.31)
County Effects	Yes	Yes	Yes
Age-Demo Controls	No	No	No
#Zip Codes	1693	2717	1693
R-squared	0.138	0.098	0.093