

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

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# Finance and Welfare

- Welfare Effects of Finance?
  - Intertemporal consumption smoothing (Jappelli and Pistaferri 2011; Gertler, Levine, and Moretti 2009)
  - Education (Levine and Rubinstein 2013; Shu 2013)
  - Growth in financial industry and economic output (Philippon and Reshef 2013)
- Today: Access to credit can have a large welfare effect, namely in family outcomes.

## Access to Credit and Fertility Outcomes

- The **credit supply shock** in the beginning of the 2000s is associated with a large **increase in home transactions and homeownership**.
- **Transition from renting to homeownership** is associated with an increase in fertility decisions, arguably because of an increase in access to space (Felson and Solaun 1975; Kulu and Vikat 2007).

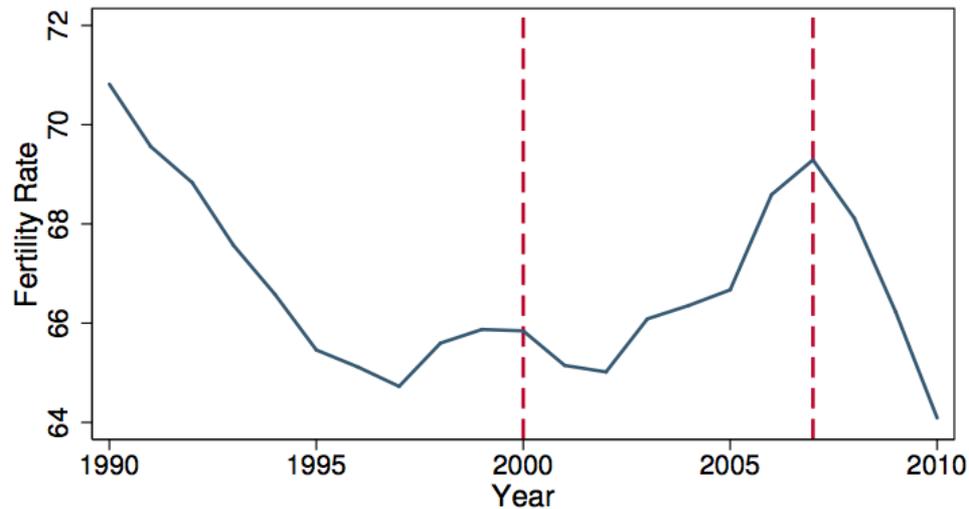
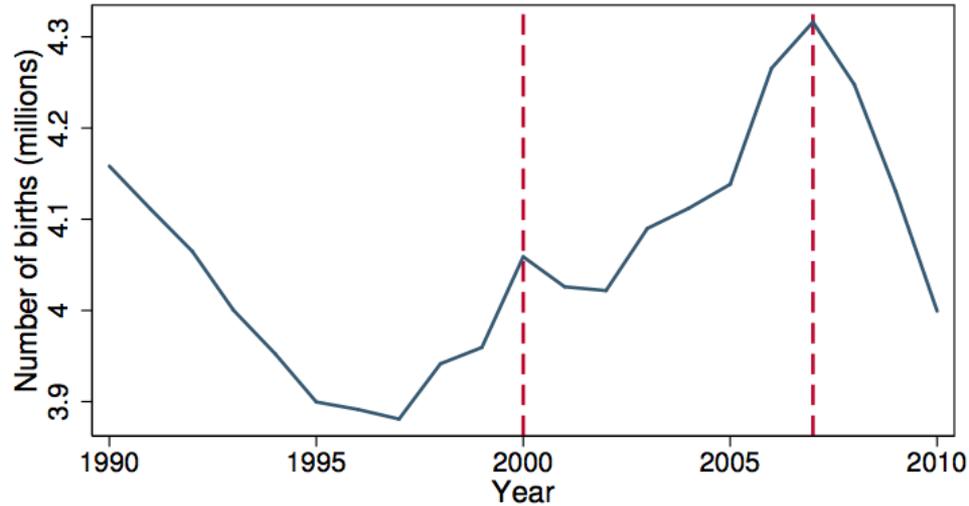
Space is likely to be a **strong complement** to children.



Did access to credit affect households' fertility decisions?

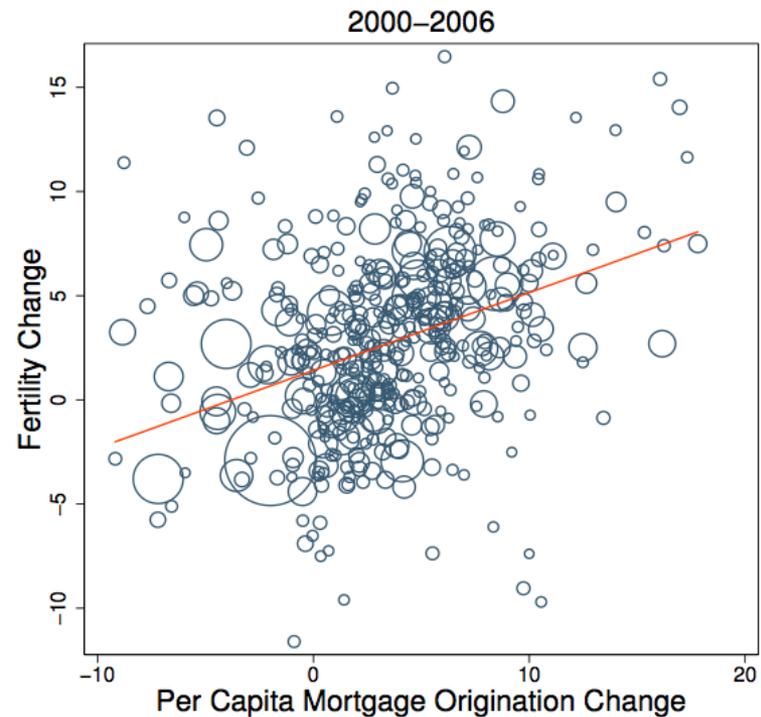
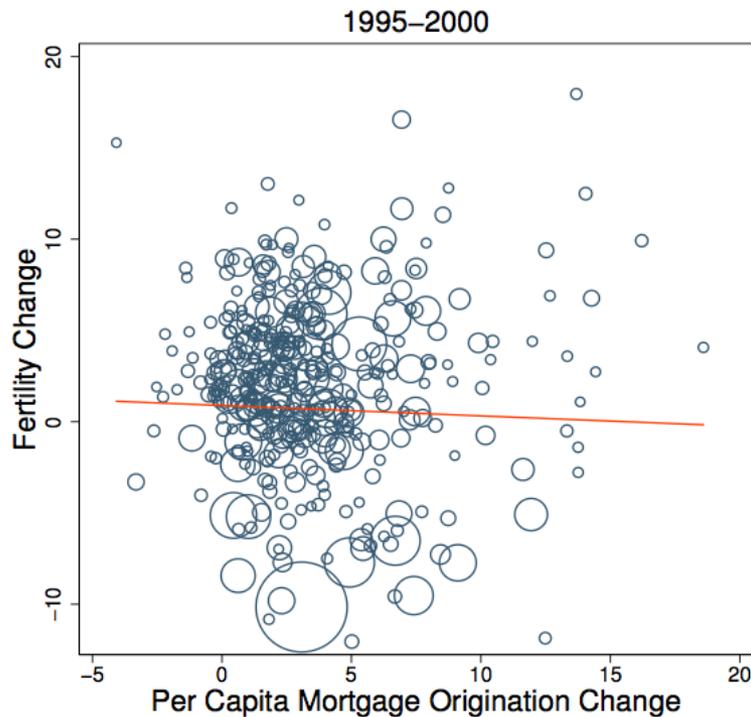
# Motivation: Times Series Evidence

Total number of US births exhibits an uptrend between 1997 and 2007, and aggregate U.S. Fertility rate exhibits an uptrend between 2000 and 2007.



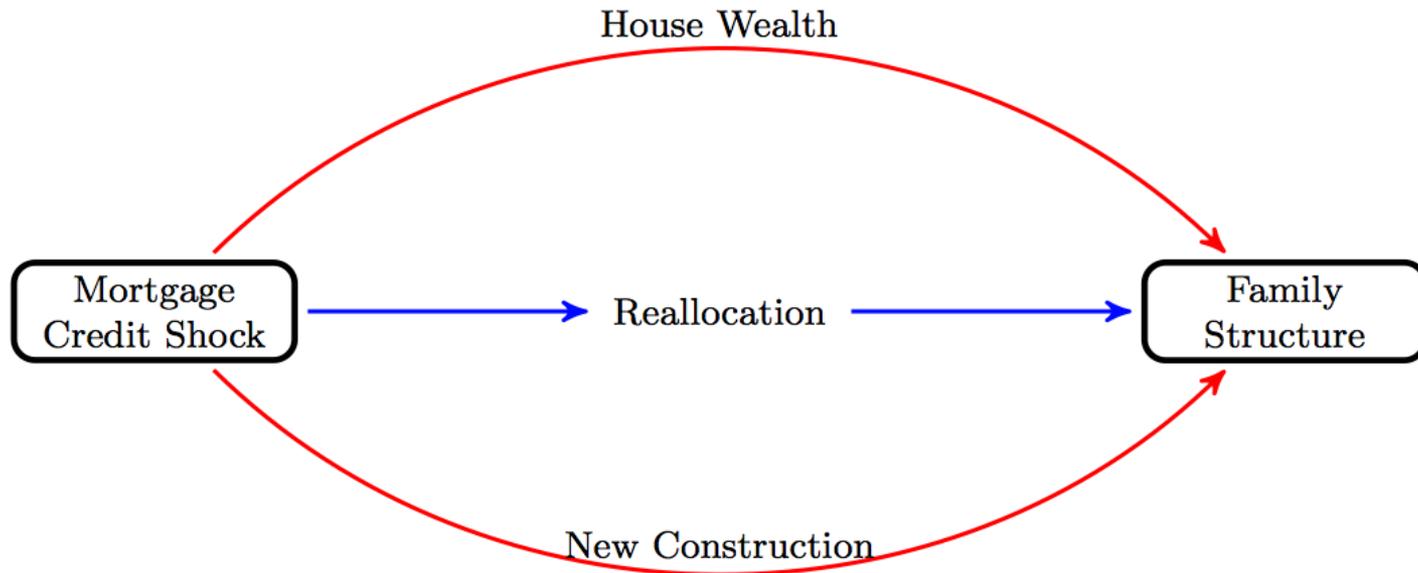
# Motivation: Cross-section Evidence

The county cross-sectional correlation suggests that the increase in mortgage credit might have led to an increase in fertility rates between 2000 and 2006.



# Mechanism: Housing Channels

- House wealth channel: Growth in houses prices creates a wealth effect for homeowners and negative effect for renters. (Dettling and Kearney 2014)
- New construction channel: It affects the supply of homes, which creates access to space at a better price.
- Reallocation channel: Relaxation of credit standards allows credit constrained households to purchase larger homes or become first-time homeowners.



# Mechanism: Reallocation and Access to Space



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**The Smiths**



**Mrs. Linda**



# Mechanism: Reallocation and Access to Space

**The Smiths**



**Mrs. Linda**



# Mechanism: Reallocation and Access to Space

- The transaction between the Smiths and Linda exemplifies the reallocation mechanism.
- The novel instrument that I introduce in this paper is roughly defined by the fraction of Lindas who live in a given zip code.
- The reasons why Linda wants to exit her house are the sources of variation of the instrument. I will discuss the validity of the instrument in a few slides.

# Overview of the Empirical Exercise

- Using zip level data, I exploit within-county variation and estimate effect of the access to credit on fertility outcomes.
- First, I estimate the effect using **OLS** and measuring reallocation with the change in mortgage origination per capita, after controlling for the other housing channels (house prices and new construction) and the observable traditional determinants of fertility (income, unemployment, race, etc.).
- Second, to address endogeneity issues, I use an **IV approach**, introducing a instrument roughly defined as the fraction of Lindas in the zip code. By using the fraction of Lindas as instrument, I also isolate the mortgages originated that are associated with reallocation.
- Third, I estimate the **aggregate number of births** that occurred between 2000 and 2006 because of credit induced reallocation channel.
- Finally, I differentiate the **life-time versus life-cycle** effect — how many births happened earlier in the life-cycle versus how many would not have happened in the absence of the credit supply.

# Ordinary Least Squares

Exploiting within county zip-code level variation, the **OLS** regression model for zip-code  $i$  is:

$$\begin{aligned}\Delta\text{Fertility}_{i,\{00\rightarrow 06\}} &= \beta_0 + \beta_1 \times \Delta\text{Reallocation}_{i,\{00\rightarrow 06\}} \\ &+ \beta_2 \times \Delta\text{Construction}_{i,\{00\rightarrow 06\}} \\ &+ \beta_3 \times \Delta\text{House Prices}_{i,\{00\rightarrow 06\}} \\ &+ \Gamma \times \text{Controls}_i + \text{County Effects} + \varepsilon_i.\end{aligned}$$

$$\Delta\text{Reallocation}_{i,\{00\rightarrow 06\}} = \begin{cases} \Delta\{\text{Total Mortgage Origination}\}_{i,\{00\rightarrow 06\}} \\ \Delta\{\text{Originated \& Sold}\}_{i,\{00\rightarrow 06\}} \\ \Delta\{\text{Orig. \& Sold} - \text{Orig. \& Not Sold}\}_{i,\{00\rightarrow 06\}} \end{cases}$$

$$\Delta\text{House Prices}_{i,\{00\rightarrow 06\}} = \frac{\text{House Prices}_{\{2006\}} - \text{House Prices}_{\{2000\}}}{\text{House Prices}_{\{2000\}}}$$

$$\Delta\text{Construction}_{i,\{00\rightarrow 06\}} = \frac{\text{House Units}_{\{2006\}} - \text{House Units}_{\{2000\}}}{\text{House Units}_{\{2000\}}}$$

# Ordinary Least Squares Results

|   | Fertility Change from 2000 to 2006 |                    |                  |                    |                    |
|---|------------------------------------|--------------------|------------------|--------------------|--------------------|
|   | OLS                                | OLS                | OLS              | OLS                | OLS                |
| (Originate & Sold)/Pop <sub>{00→06}</sub> | 0.155***<br>(0.00)                 |                    |                  |                    | 0.140***<br>(0.00) |
| HP Growth <sub>{00→06}</sub>              |                                    | -0.017<br>(0.77)   | 0.030<br>(0.18)  | -0.017<br>(0.77)   | -0.072<br>(0.20)   |
| House Units Growth <sub>{00→06}</sub>     |                                    | -0.055*<br>(0.08)  | -0.064<br>(0.14) | -0.055*<br>(0.08)  | -0.076**<br>(0.01) |
| Male Unemployment <sub>{00→06}</sub>      |                                    | -0.031<br>(0.17)   |                  | -0.031<br>(0.17)   | -0.039<br>(0.11)   |
| Female Unemployment <sub>{00→06}</sub>    |                                    | 0.084***<br>(0.00) |                  | 0.084***<br>(0.00) | 0.084***<br>(0.00) |
| Female Unemployment <sub>{2000}</sub>     |                                    | 0.007<br>(0.82)    |                  | 0.007<br>(0.82)    | -0.007<br>(0.79)   |
| Per Capita Inc. Growth <sub>{00→06}</sub> |                                    | 0.079**<br>(0.02)  |                  | 0.079**<br>(0.02)  | 0.070**<br>(0.02)  |
| Log Per Capita Income <sub>{2000}</sub>   |                                    | -0.042<br>(0.45)   |                  | -0.042<br>(0.45)   | -0.037<br>(0.48)   |
| School Score <sub>{2004}</sub>            |                                    | -0.030<br>(0.20)   |                  | -0.030<br>(0.20)   | -0.016<br>(0.42)   |
| Hospitals/Pop <sub>{2000}</sub>           |                                    | 0.001<br>(0.94)    |                  | 0.001<br>(0.94)    | 0.003<br>(0.86)    |
| County Effects                            | Yes                                | Yes                | Yes              | Yes                | Yes                |
| Age & Demo Controls                       | No                                 | Yes                | No               | Yes                | Yes                |
| #Zip Codes                                | 2717                               | 2717               | 2717             | 2717               | 2717               |
| R-squared                                 | 0.119                              | 0.146              | 0.101            | 0.146              | 0.160              |

Table reports beta coefficients and, in parenthesis, the p-values.

# OLS Endogeneity and Reallocation Problems

- **Potential problems of the OLS specification:**
  1. Change in mortgage origination per capita might not be a good proxy for reallocation. Many mortgages are given to households who reallocate not for space-related reasons.
  2. Endogeneity. Unobservable determinants of fertility can simultaneously drive loan origination and fertility decisions. Take the case of the Permanent Income Hypothesis. Changes in expected future income can lead both mortgage origination and demand for children.

How to address these problems? I propose a new instrument.

## Instrument: Old homeowners

- **Instrument:** Measured in 2000, the zip code fraction of households who are homeowners older than 65 years old and live alone — the fraction of Linda's in a given zip code — henceforth, *old homeowners*.

$$\text{Old Homeowners} = \frac{\# \text{Homeowners who live alone and age} > 65 \text{ in 2000}}{\# \text{Households}}$$

- Additionally, to make sure that the instrument is not capturing the differences between old and new neighborhoods, I control for the zip code fraction of population older than 65.
- What is the **source of variation** of the instrument? Given a shock in the supply of credit and the subsequent increase in housing demand, **Old Homeowners, relative to other homeowners, are more likely to want to leave their houses** because: 1) They could cash in the home price; 2) In some states, they could not afford to pay the increasing property taxes; 3) They had health-related issues.

# Instrument: First-stage and Reallocation

What can we test in the data?

- **Mortgage Origination.** Between 2000 and 2006, within the same county, in zip codes with high fraction of *old homeowners* there is a higher increase in mortgage origination per capita relative to the zip codes with low fraction of old homeowners. F-test in the first-stage varies between 15 and 16. **Effect stronger with mortgages originated and sold, and with the difference between sold and non-sold.**
- **Reallocation.** Between 2000 and 2006, **young households** (age<44) experience **higher gains** in homeownership in zip codes with high fraction of old homeowners relative to zip codes with low fraction of old homeowners. In old homeowners zip codes there are also **larger decreases** in homeownership for **older households** (age>65).

# Instrument: First-Stage

|   | (Ori. & Sold)/Pop <sub>{00→06}</sub> |                     |                     |
|---|--------------------------------------|---------------------|---------------------|
|   | OLS                                  | OLS                 | OLS                 |
| Old-Homeowners <sub>{2000}</sub>          | 0.186***<br>(0.00)                   | 0.173***<br>(0.00)  | 0.127***<br>(0.00)  |
| % Pop w/ Age>65 <sub>{2000}</sub>         |                                      | -0.092***<br>(0.00) | 0.072<br>(0.20)     |
| 75-Homeowners <sub>{2000}</sub>           |                                      | 0.021<br>(0.26)     | -0.013<br>(0.62)    |
| Male Unemployment <sub>{00→06}</sub>      |                                      |                     | 0.053*<br>(0.08)    |
| Female Unemployment <sub>{2000}</sub>     |                                      |                     | 0.116***<br>(0.00)  |
| Per Capita Inc. Growth <sub>{00→06}</sub> |                                      |                     | 0.070**<br>(0.01)   |
| Log Per Capita Income <sub>{2000}</sub>   |                                      |                     | -0.035<br>(0.31)    |
| HP Growth <sub>{00→06}</sub>              |                                      |                     | 0.396***<br>(0.00)  |
| Female Unemployment <sub>{00→06}</sub>    |                                      |                     | 0.007<br>(0.74)     |
| House Units Growth <sub>{00→06}</sub>     |                                      |                     | 0.174***<br>(0.00)  |
| School Score <sub>{2004}</sub>            |                                      |                     | -0.076***<br>(0.00) |
| Hospitals/Pop <sub>{2000}</sub>           |                                      |                     | -0.013<br>(0.66)    |
| County Effects                            | Yes                                  | Yes                 | Yes                 |
| Age-Demo Controls                         | No                                   | No                  | Yes                 |
| #Zip Codes                                | 2717                                 | 2717                | 2717                |
| R-squared                                 | 0.135                                | 0.141               | 0.333               |

Table reports beta coefficients and, in parenthesis, the p-values.

# Instrument: Exclusion Restriction

Could instrument be related to fertility through another channel?

## Potential problems:

1. Unobserved characteristics of zip codes with high fraction of *Old Homeowners* that lead to higher changes in fertility.
2. Households who decided to have a child for other reasons unrelated to the credit supply shock self-select to buy a house from an *Old Homeowner*. Some level of reallocation must always be happening in the economy regardless of the credit supply shock.

## Solutions:

- a. Since reallocation always happens in the economy, add control for homeowners who live alone and are older than 75 (*75-homeowners*) to **absorb all the relocation that would have happen anyways.**
- b. Use the 1995-2000 to test if credit induced reallocation happens in *old homeowners* zip codes. **If first-stage fails, is the channel still active?** Do we see differences in fertility when there are no differences in credit induced reallocation?

# What Happen Before the Housing Boom?

- When comparing zip codes with high and low fraction of Lindas in 2000, **there is no difference between mortgages originated and sold and mortgages originated and not sold from 1995 and 2000**. Large contrast with period from 2000 and 2006. Between 1995 and 2000 the first stage fails.
- When comparing zip codes with high and low fraction of Lindas in 2000, **there is no difference between changes in fertility from 1995 and 2000**.
- When the reallocation channel is not active, there is no reduce form effect of the instrument on fertility.

# Instrumental Variable Empirical Design

- Exploiting within county zip-code level variation, I use a 2SLS approach. In the first-stage the regression model for zip-code  $i$  is:

$$\begin{aligned}\Delta\text{Originated \& Sold}_{i,\{00\rightarrow 06\}} &= \theta_1 \times \text{Old Homeowners}_{i,\{2000\}} \\ &+ \alpha_2 \times \Delta\text{Construction}_{i,\{00\rightarrow 06\}} \\ &+ \alpha_3 \times \Delta\text{House Prices}_{i,\{00\rightarrow 06\}} \\ &+ \beta_4 \times \% \text{ Pop Age} > 65_{i,\{2000\}} \\ &+ \theta_0 + \Theta \times \text{Controls}_i \\ &+ \text{County Effects} + \eta_i,\end{aligned}$$

where Old Homeowners is the fraction of homeowners who live alone and age > 65 in 2000. In the second-stage the regression model is:

$$\begin{aligned}\Delta\text{Fertility}_{i,\{00\rightarrow 06\}} &= \beta_0 + \beta_1 \times \widehat{\Delta\text{Originated \& Sold}_{i,\{00\rightarrow 06\}}} \\ &+ \beta_2 \times \Delta\text{Construction}_{i,\{00\rightarrow 06\}} \\ &+ \beta_3 \times \Delta\text{House Prices}_{i,\{00\rightarrow 06\}} \\ &+ \beta_4 \times \% \text{ Pop Age} > 65_{i,\{2000\}} \\ &+ \Gamma \times \text{Controls}_i + \text{County Effects} + \varepsilon_i.\end{aligned}$$

# Instrumental Variable Results

|   | Fertility <sub>{00→06}</sub> |                     |                    |                     |
|---|------------------------------|---------------------|--------------------|---------------------|
|   | IV                           | IV                  | IV                 | IV                  |
| (Originate & Sold)/Pop <sub>{00→06}</sub> | 0.324***<br>(0.00)           | 0.330***<br>(0.00)  | 0.191***<br>(0.00) | 0.181**<br>(0.01)   |
| Old-Homeowners <sub>{2000}</sub>          |                              |                     |                    |                     |
| % Pop w/ Age>65 <sub>{2000}</sub>         | 0.021<br>(0.64)              | -0.048<br>(0.12)    | -0.001<br>(0.99)   | -0.048<br>(0.14)    |
| 75-Homeowners <sub>{2000}</sub>           |                              |                     | 0.042**<br>(0.01)  | 0.034**<br>(0.05)   |
| Male Unemployment <sub>{00→06}</sub>      |                              | -0.048**<br>(0.02)  |                    | -0.042**<br>(0.02)  |
| Female Unemployment <sub>{2000}</sub>     |                              | -0.029<br>(0.14)    |                    | -0.011<br>(0.62)    |
| Per Capita Inc. Growth <sub>{00→06}</sub> |                              | 0.061***<br>(0.01)  |                    | 0.068***<br>(0.00)  |
| Log Per Capita Income <sub>{2000}</sub>   |                              | -0.013<br>(0.73)    |                    | -0.012<br>(0.74)    |
| HP Growth <sub>{00→06}</sub>              |                              | -0.149*<br>(0.06)   |                    | -0.088<br>(0.16)    |
| Female Unemployment <sub>{00→06}</sub>    |                              | 0.080***<br>(0.00)  |                    | 0.082***<br>(0.00)  |
| House Units Growth <sub>{00→06}</sub>     |                              | -0.116***<br>(0.00) |                    | -0.090***<br>(0.00) |
| School Score <sub>{2004}</sub>            |                              | -0.003<br>(0.86)    |                    | -0.015<br>(0.36)    |
| Hospitals/Pop <sub>{2000}</sub>           |                              | 0.009<br>(0.47)     |                    | 0.007<br>(0.61)     |
| County Effects                            | Yes                          | Yes                 | Yes                | Yes                 |
| Age-Demo Controls                         | No                           | Yes                 | No                 | Yes                 |
| #Zip Codes                                | 2717                         | 2717                | 2717               | 2717                |
| R-squared                                 | 0.094                        | 0.137               | 0.119              | 0.160               |

Table reports beta coefficients and, in parenthesis, the p-values.

# Lifetime Changes versus Life-cycle Behavior

- Is the effect a **lifetime change** in fertility or just a change in the fertility behavior along the **life-cycle**? How many babies were born who would never had been born in the absence of the credit supply shock?
- **Same IV exercise**, but the in the second-stage I change the dependent variable to change in fertility from 2006 to 2010:

$$\begin{aligned}\Delta\text{Fertility}_{i,\{06\rightarrow10\}} &= \beta_0 + \beta_1 \times \widehat{\Delta\text{Originated \& Sold}}_{i,\{00\rightarrow06\}} \\ &+ \beta_2 \times \Delta\text{Construction}_{i,\{00\rightarrow06\}} \\ &+ \beta_3 \times \Delta\text{House Prices}_{i,\{00\rightarrow06\}} \\ &+ \beta_4 \times \% \text{ Pop Age} > 65_{i,\{2000\}} \\ &+ \beta_5 \times 75\text{-homeowners}_{i,\{2000\}} \\ &+ \Gamma \times \text{Controls}_i + \text{County Effects} + \varepsilon_i.\end{aligned}$$

# Lifetime Changes versus Life-cycle Behavior

|                                | Fertility {06→10} |                    |                     |                    |
|--------------------------------|-------------------|--------------------|---------------------|--------------------|
|                                | OLS               | OLS                | IV                  | IV                 |
| (Originated & Sold)/Pop{00→06} | -0.064<br>(0.17)  | 0.004<br>(0.89)    | -0.298***<br>(0.00) | -0.240*<br>(0.07)  |
| Old-Homeowners{2000}           |                   |                    |                     |                    |
| % Pop w/ Age>65{2000}          |                   | 0.144***<br>(0.00) | 0.166***<br>(0.00)  | 0.159***<br>(0.00) |
| 75-Homeowners{2000}            |                   | -0.062*<br>(0.05)  | -0.045<br>(0.12)    | -0.048<br>(0.16)   |
| Male Unemployment{00→06}       |                   | -0.003<br>(0.85)   |                     | 0.008<br>(0.64)    |
| Female Unemployment{2000}      |                   | -0.089<br>(0.19)   |                     | -0.063<br>(0.30)   |
| Per Capita Inc. Growth{00→06}  |                   | 0.022<br>(0.12)    |                     | 0.037**<br>(0.01)  |
| Log Per Capita Income{2000}    |                   | 0.026<br>(0.58)    |                     | 0.014<br>(0.74)    |
| HP Growth{00→06}               |                   | -0.102<br>(0.19)   |                     | -0.004<br>(0.95)   |
| Female Unemployment{00→06}     |                   | -0.049<br>(0.17)   |                     | -0.047<br>(0.18)   |
| House Units Growth{00→06}      |                   | 0.035<br>(0.13)    |                     | 0.077**<br>(0.02)  |
| School Score{2004}             |                   | 0.041**<br>(0.03)  |                     | 0.020<br>(0.40)    |
| Hospitals/Pop{2000}            |                   | -0.004<br>(0.69)   |                     | -0.008<br>(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 reports beta coefficients and, in parenthesis, the p-values.

# Lifetime Changes versus Life-cycle Behavior

- What can we learn from this last empirical exercise?
  - Zip codes that experience large increases in credit induced reallocation from 2000 to 2006 experienced **large decreases in fertility from 2006 to 2010**. Current evidence points to a **strong life-cycle change**. Young households chose to have **children earlier**.
- **What are the limitations of the above estimation?**
  - Other shocks may have occurred during the crisis.
  - Households may have moved, in particular, the ones who had their houses foreclosed.

# Conclusions

- **Contribution:** I conduct within-county analysis with zip code level data and introduce a novel instrument to causally identify the effect of access to credit on fertility outcomes through a channel associated with a more efficient reallocation of the existing housing stock among households.
  - Reallocation channel allows young households to access space by either moving to larger homes or achieving homeownership earlier in their life-cycle.
- **Result:** I estimate that between 330,000 children to 480,000 were born between 2000 and 2006 because of the reallocation channel. Using data from 2006 to 2010, I present suggestive evidence of a major life-cycle change.