

More Credit, Fewer Babies?

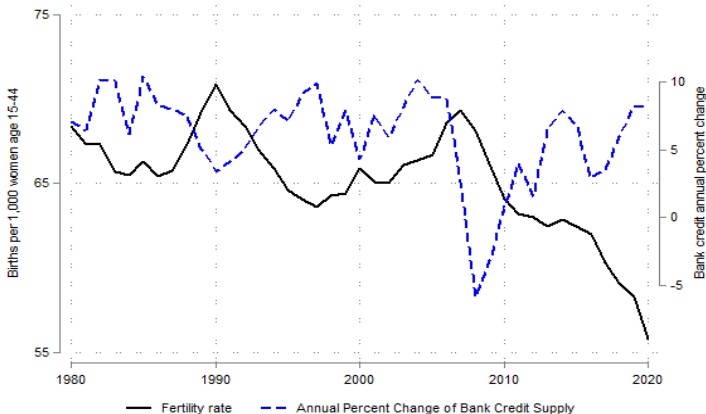
Bank Credit Expansion, House Price, and Fertility

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Motivation



- The national-level declining fertility rate ([Kearney, Levine, and Pardue, 2022](#)) is accompanied by bank credit expansion.

Research Question and Challenge

- **Research Question: Does bank credit expansion cause declines in fertility?**
- **Endogeneity issue:**
 - Omitted Variable: unobserved economic shocks affect credit supply and fertility decisions at the same time.
 - Reverse causality: fertility rate affects bank credit supply (Lisack et al., 2017; Gong and Yao, 2022).

Approach and Main Results

- **Research Design: U.S. interstate bank deregulation (1995-2001)**
 - Exogenous shocks for bank credit expansion which enable staggered DID estimation ([Callaway and Sant'Anna, 2021](#)).
- **Main results: Bank deregulation has reduced and delayed fertility**
 - County-level fertility rate was reduced by 7 percent
 - County-level mean of maternal age was delayed by 0.37 percent
 - Mechanism: a housing cost channel

Contribution

- Literature on Declining Fertility
 - Reviewed in [Kearney, Levine, and Pardue \(2022\)](#) and [Doepke, Hannusch, Kindermann, and Tertilt \(2022\)](#)
 - Widespread usage of contraceptive pill ([Bailey, 2010](#); [Rau et al., 2021](#)); Increase in women's opportunities of accessing higher education and the labor market ([Basu, 2002](#); [Monstad et al., 2008](#); [Cygan-Rehm and Maeder, 2013](#)); Changes in social norms, attitude and preferences for having children ([Fernández and Fogli, 2006, 2009](#); [Stone, 2018](#); [De Silva and Tenreyro, 2020](#); [Boelmann et al., 2021](#)); Rising childcare costs ([Blau and Robins, 1989](#); [Hirazawa and Yakita, 2009](#); [Rindfuss et al., 2010](#); [Bick, 2016](#); [Bar et al., 2018](#)); Rising housing costs ([Dettling and Kearney, 2014](#))
- **Contribution: a new explanation (bank credit expansion) for the puzzle of the recent decline in fertility**

Contribution

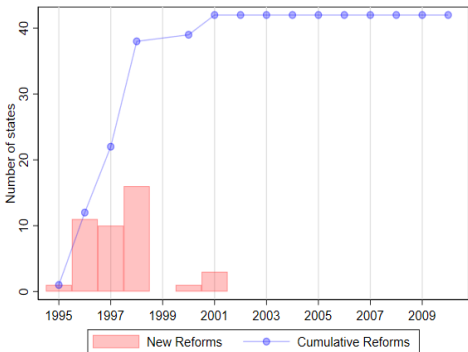
- Literature on Consequences of Bank Credit Expansion
 - Mortgage supply and House price ([Favara and Imbs, 2015](#); [Hoffmann and Stewen, 2020](#)); Financial integration and inclusion ([Landier et al., 2017](#); [C'elierier and Matray, 2019](#)).
- **Contribution: broader consequence (fertility) of bank credit expansion on the real economy**

Background: Bank Deregulation

- Historically, most U.S. states restricted interstate banking and branching, dating back to colonial times
- Phase I: in the 1970s and 1980s, a series of deregulation in the banking sector permits interstate banking
- Phase II: **in 1994, the Interstate Banking and Branching Efficiency Act (IBBEA/Interstate Act) permits interstate branching**

Background: Bank Deregulation

- The Interstate Act is at the Federal level, but it also allows states some flexibility in determining when and whether to deregulate
- Staggered deregulation across states ranging from 1995 to 2001
- Nine states have never undergone deregulation (never-treated states)



Data: Fertility Outcomes

- Vital Statistics Natality Birth Data (1990-2004):
 - **Fertility Rate (county-year)**: the number of birth counts divided by the number of females aged 15-44.
 - Fertility Rates are defined at state or metropolitan areas in [Dettling and Kearney \(2014\)](#) and [Kearney, Levine, and Pardue \(2022\)](#).
 - **Maternal Age (county-year)**: the mean of maternal ages
 - Timing of Fertility

Other Data Sources

- Following [Kearney, Levine, and Pardue \(2022\)](#), I also consider the following time-varying control variables:
 - **Economic factors:** state-level unemployment rate, generosity of welfare benefits, the state minimum wage, and expenditures on child support enforcement.
 - **Demographic factors:** county-level population shares of women aged 15-29, 30-44, and non-Hispanic white, non-Hispanic black, and Hispanic women aged 15-44
 - **Reproductive policies:** state-level abortion restrictions in the form of parental notification laws or waiting periods

Empirical Method: DID with Two-way Fixed Effects (TWFE)

- Main Effect: α_1

$$F_{ct} = \alpha_1 D_{st} + X_{ct} + \delta_c + \delta_t + \epsilon_{c,t} \quad (1)$$

- Dynamic Effect (Event study estimation): α_{1e}

$$F_{ct} = \sum_e \alpha_{1e} D_{st+e} + X_{ct} + \delta_c + \delta_t + \epsilon_{c,t} \quad (2)$$

- δ_c and δ_t denote county and year fixed effects.
- Standard errors are clustered at the state level.

Empirical Method: Staggered DID

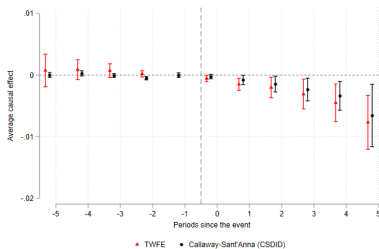
- Staggered setting: Bank deregulation happened in different years and different states (no turning off and on of the policy)
 - TWFE DID estimations are likely to be biased when there are heterogeneous treatment effects across units or overtime (de Chaisemartin, Clément and Xavier D'Haultfoeuille, 2020; Goodman-Bacon, 2021; Backer, Larcker, and Wang, 2022; Roth et. al., 2022)
 - Problematic comparison: already-treated states are used as control groups
- Potential Solution: Callaway and Sant'Anna (2021) (CSDID)
 - Use never-treated or not-yet-treated states as control groups

Table: Bank Deregulation and Fertility: Main Results

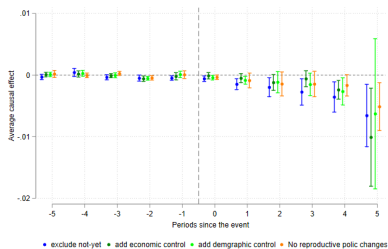
	TWFE		CSDID			
	(1)	(2)	(3)	(4)	(5)	(6)
	baseline	baseline	exclude not-yet	add economics	add demographic	no policy change
County-level Fertility Rate						
Deregulation Dummy	-0.001*** (0.001)	-0.005*** (0.001)	-0.005*** (0.001)	-0.003** (0.001)	-0.005** (0.002)	-0.004*** (0.001)
Sample Mean	0.068					
County-level Maternal Age						
Deregulation Dummy	0.087*** (0.029)	0.101** (0.045)	0.118** (0.046)	0.060* (0.036)	0.132*** (0.036)	0.228*** (0.036)
Sample Mean	27.08					
Observations	6735	6735	6735	6735	6735	4051
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Economic Controls	No	No	No	Yes	Yes	Yes
Demographic Controls	No	No	No	No	Yes	Yes
Policy Controls	No	No	No	No	No	Yes

- Bank deregulation reduces fertility rate by 0.005 pp. (7 percent)
- Bank deregulation delays maternal age by 0.101 years (0.37 percent)

Figure: Bank Deregulation and Fertility Rate: Event Study Estimators

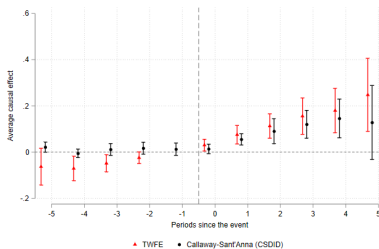


(a) TWFE and CSDID

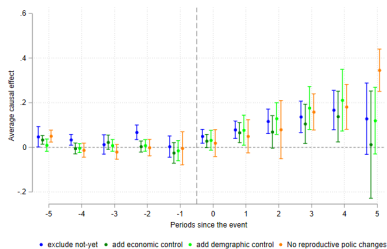


(b) CSDID: Robustness Checks

Figure: Bank Deregulation and Maternal Age: Event Study Estimators



(a) TWFE and CSDID



(b) CSDID: Robustness Checks

Mechanism: a housing cost channel

- Why does credit supply expansion reduce and delay fertility?
- One possible explanation is a **housing cost channel**:

- Credit supply expansion



Increases in housing price/costs (Favara and Imbs, 2015)



Decreases in demand for children

- For renters: pay rent and expect to buy a house
- For homeowners: expect to buy a larger house

Mechanism Test I (Sub-sample)

Table: Effect of Bank Deregulation on Fertility Rate, Maternal Age, and House Price by Land Availability

	Fertility Rate		Maternal Age		House Price	
	Less Land (1)	More Land (2)	Less Land (3)	More Land (4)	Less Land (5)	More Land (6)
	-0.009*** (0.001)	-0.003* (0.002)	0.164*** (0.055)	0.084 (0.058)	0.042*** (0.015)	0.005 (0.004)
Observations	6735	6735	6735	6735	25755	25755
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Economic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: Counties of less land are defined as counties with developable land that are less than 70% of the total areas based on satellite data collected by textcolorblue Lutz and Sand (2019).

Mechanism test II (Instrumental Variable)

Table: Effect of House Price on Fertility Rate and Maternal Age
(Bank Deregulation as IV)

	Fertility Rate				Maternal Age			
	OLS (1)	OLS (2)	IV (3)	IV (4)	OLS (5)	OLS (6)	IV (7)	IV (8)
House Price	-0.041*** (0.007)	-0.037*** (0.008)	-0.105*** (0.032)	-0.190** (0.092)	1.262*** (0.221)	0.993*** (0.221)	3.044*** (1.029)	4.711* (2.696)
R^2	0.60	0.60	-0.03	-0.19	0.97	0.97	-0.02	-0.11
Efficient F			43.43	9.35			43.43	9.35
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Economic	No	Yes	No	Yes	No	Yes	No	Yes
Demographic	No	Yes	No	Yes	No	Yes	No	Yes
Observations	6137	6137	6137	6137	6137	6137	6137	6137

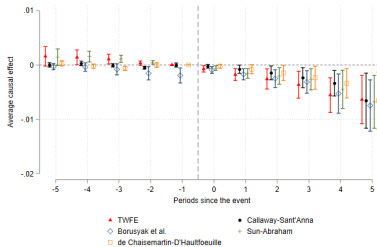
Conclusion

- **Main results:**
 - Bank deregulation has reduced and delayed fertility
 - Mechanism: a housing cost channel
- **Implications:**
 - Current fertility rate is not at an optimal level
 - Important role of financial market policy and affordable housing in addressing the issue of declining fertility
- **Next Steps:**
 - Explore post-2008 credit expansion and its connection with the decline of fertility
 - Use the geo-coded Survey of Income and Program Participation (SIPP) to explore how credit supply expansion affects the timing of employment, fertility, marriage, and homeownership at the individual level (ongoing RDC project)

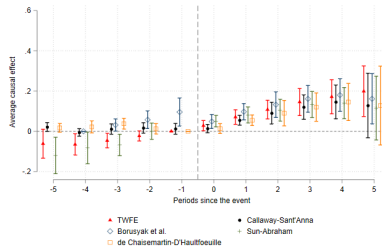
- Additional Tables and Figures

- Alternative Staggered DID methods [link1](#)
- Heterogeneous Effects [link2](#)
- Discussion of Alternative Mechanisms [link3](#)

Figure: Bank Deregulation and Fertility: Alternative Staggered DID Methods



(a) Fertility Rate



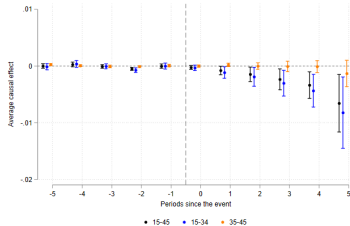
(b) Maternal Age

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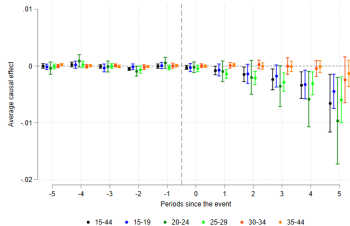
Heterogeneity Effects

- Mother's age:
15-34 vs. 35-45
- Mother's birth cohort:
1965-1980 (Millennial) vs. 1965-1980 (Generation X)
- Mother's race and ethnicity:
Hispanic vs. Non-Hispanic White vs. Non-Hispanic Black
- Mother's marital status:
Not Married vs. Married
- Birth order:
similar negative effects on fertility rate across different birth orders

Figure: Fertility Rate: by Mother's Age

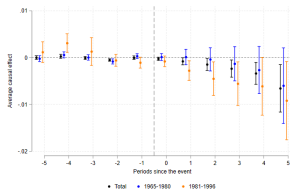


(a) Two Age Groups

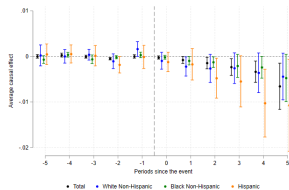


(b) Five Age Groups

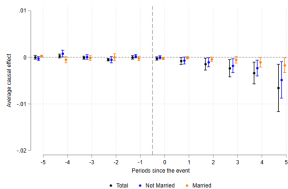
Figure: Fertility Rate: Heterogeneous Effects



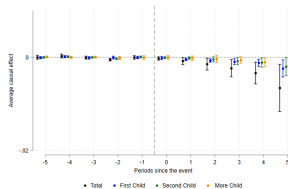
(a) Birth Cohort



(b) Race and Ethnicity

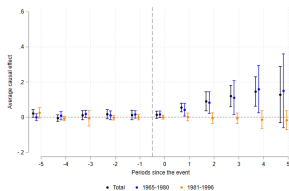


(c) Marital Status

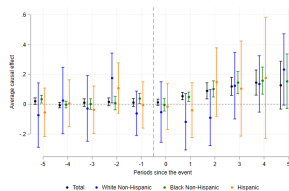


(d) Birth Order

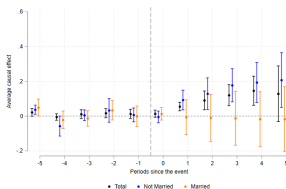
Figure: Maternal Age: Heterogeneous Effects



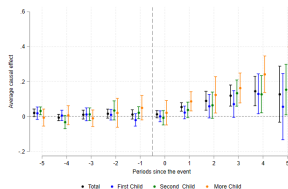
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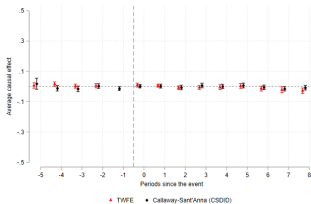


(d) Birth Order

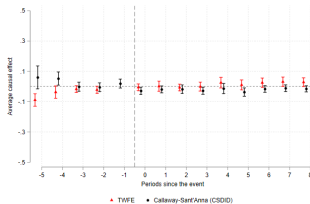
Alternative Mechanisms

- Housing Wealth Effect (+)
- Relaxation of Liquidity Constraint (+)
- Labor Market Channel (−)
 - Credit supply expansion reduces and delays fertility by stimulating local economic and job growth which increases the mother's opportunity costs

Figure: County-level Labor Market Outcomes (QCEW)



(a) $\log(\text{Wage})$



(b) $\log(\text{Employment})$

back