Family Peer Effects in Fertility

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Stylized Facts

- The decline in fertility is long and steady (Doepke et al., 2023)

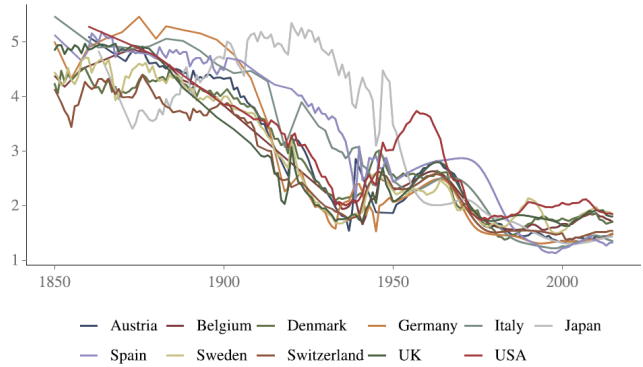


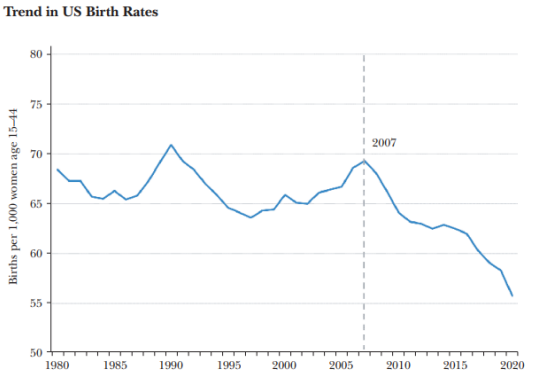
FIGURE 1 Total fertility rates since 1850.

- "The 1950s and the 1960s are a deceptive aberration in fertility history"

-Coleman (2004)

Stylized Facts

- The decline has accelerated recently (Kearney et al., 2022)



- This has both economic growth and fiscal consequences (Kearney et al., 2022)

Why Has Fertility Declined?

- Well, that's why we are here!

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- Housing
- Family Planning
- Norms
- Preferences
- Culture

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- These are all potentially augmented or amplified by **PEERS**

Idea of Peer Effects Not New...

- Early literature documenting correlations (Coale & Watkins, 1986; Bongaarts & Watkins, 1996)
- Qualitative work emphasizes several mechanisms (Bernardi, 2003; Keim, 2011)
  - Social Support—individuals' fertility responds to resources
  - Social Influence (Contagion)—individuals base fertility decisions on total fertility and fertility events in their network
  - Social Learning—individuals update expectations based on others' experiences

Simple Peer Effects Framework

- Couple chooses to try and have children when the following is true

$$U_{it}(X_{it}, \underbrace{\overline{Num.Children_j}}_{Contagion}) - \underbrace{E(Cost_i \mid I_{ij})}_{Support,\ Learning} > 0$$

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- **Learning**: Very little evidence here (Paola et al., 2024)

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- **Contagion**: Registry or detailed surveys evidence
  - Neighbors/Friends/Colleagues in Sweden (Hensvik et al., 2010), US (Add Health) (Balbo & Barban, 2014), Germany (Pink et al., 2014), Denmark (Ciliberto et al., 2016), India (Mishra & Parasnis, 2017), the Netherlands (Buyukkececi et al., 2020), and Italy (Paola et al, 2024)
  - Siblings in US (PSID) (Kuziemko, 2006), Norway (Lyngstad & Prskawetz, 2010), and Netherlands (Buyukkececi et al., 2020)

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- $Child_{j,t}$: Peer network (j) has a child in period t (fertility events)
- $\overline{Num.Children_j}$: Average number of children in peer network (j) (total fertility)
- $E(Cost_i \mid I_{ij})$: Expected cost of having children given information set available to individual i from network j

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- **When we think of peer effects we often think of norms. Is there more?**

- **Different mechanisms could have different causal effects. Their relative importance is unclear, but relevant for both aggregate trends and policy**
- **Can we exploit situations and settings to tease out separate peer effect channels?**
- Today provide *preliminary* exploration of some of these settings

What We Do

1. Focus on sibling peer networks
2. Exploit plausibly exogenous variation in sibling's fertility to see if peer effects
   - Evidence of norms channel
   - Evidence of learning channel
   - Evidence of solidarity channel?
3. Exploit linked family roster and registry data to determine if sibling peers align birth timing
   - Evidence of solidarity channel
4. Do this in two different contexts
   - Early 20th Century America (1910-1930)
   - Late 20th Century Finland (1950-2020)

Data

United States

- Identify sibling groups in 1910 Census
- Use Census Tree (Buckles et al., 2023) to link children 5-15 forward to adult outcomes
- Use 1930 family roster (25-35) to look at point-in-time fertility
- Limited data, measurement error
- $\approx$ 13M sibling pairs

Finland

- High quality registry data
- Individuals born between 1910-1978
- Link to birth registries to construct fertility at 45+ ("completed fertility")
- Resolves data and measurement error problems
- $\approx$ 5M sibling pairs

For most analysis, dataset structured as sibling dyads, individual shows up multiple times

Sibling Fertility Peer Effects?

- What is the correlation between siblings' # children and own # children?

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United States

	Number of Children				
		Sibling is Female		Sibling is Male	
		Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)
Sibling's Number of Children	0.188***	0.270***	0.142***	0.216***	0.157***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Dependent Mean	1.39	1.70	1.17	1.69	1.15
Observations	12,989,626	2,475,978	3,122,652	3,122,652	4,268,344

- Peer Effects+Selection

Sibling Fertility Peer Effects?

- What is the correlation between siblings' # children and own # children?

Finland

	Number of Children				
		Sibling Female		Sibling Male	
		Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)
Sibling's Number of Children	0.252***	0.277***	0.240***	0.214***	0.281***
	(0.004)	(0.006)	(0.004)	(0.004)	(0.005)
Dependent Mean	1.95	2.06	1.87	2.05	1.83
Observations	5,207,613	1,189,574	1,291,028	1,293,520	1,433,491

- Peer Effects+Selection

Strategy 1: Sibling Twinning

- Having twins leads to a conditionally random increase in fertility relative to expectations (Angrist & Evans, 1996)

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Among sibling pair where sibling has at least one child

$$\textit{Number of Children}_i^s = \gamma \textit{First is Twin}_i^s + X_i\Gamma + \theta_y + \eta_i^s$$

$$\textit{Number of Children}_i^o = \beta \textit{First is Twin}_i^s + X_i\Gamma + \theta_y^o + \theta_y^s + \epsilon_i^o$$

Strategy 1: "First Stage" Results (US)

	Number of Children		
	(1)	(2)	(3)
First Child is Twin	0.667***	0.673***	0.665***
	(0.009)	(0.009)	(0.009)
Age Fixed Effects		X	X
Race and Sex Fixed Effects			X
Dependent Mean	2.41	2.41	2.41
Observations	7,488,223	7,488,223	7,488,223

- More children $\rightarrow$ norms $(+)$
- Twins can be challenging $\rightarrow$ learning (-)
- $\Delta \#children < 1$ fewer pregnancies $\rightarrow$ solidarity (-)

Strategy 1: Reduced Form Results (US)

	Number of Children						
		Sibling is Female			Sibling is Male		
		All	Female	Male	All	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sibling's First Child is Twin	-0.030***	-0.047***	-0.042**	-0.056***	-0.015	-0.025	-0.008
	(0.008)	(0.011)	(0.018)	(0.013)	(0.011)	(0.018)	(0.012)
Dependent Mean	1.58	1.61	1.97	1.32	1.56	1.90	1.31
Observations	7,488,223	3,596,883	1,600,275	1,996,608	3,891,340	1,657,127	2,234,213

- Net effect negative, but could be multiple mechanisms

Strategy 1: Timing Matters (US)

	Number of Children				
		Sibling is Female		Sibling is Male	
		No Children	Had Children	No Children	Had Children
	All	When 1st Child Born	When 1st Child Born	When 1st Child Born	When 1st Child Born
	(1)	(2)	(3)	(4)	(5)
Sibling's First Child is Twin	-0.030***	-0.120***	-0.013	-0.076***	-0.028*
	(0.008)	(0.011)	(0.019)	(0.010)	(0.015)
Dependent Mean	1.58	1.03	2.97	0.76	2.84
Observations	7,488,223	2,525,049	1,071,834	2,394,133	1,497,207

- Concentrated among childless at twin birth ▸ Reduction in Any Children
- Learning or forgone solidarity? ▸ Effects Over Time

Strategy 1: "First Stage" Results (Finland)

	Sibling Number of Children		
	(1)	(2)	(3)
Sibling First Child is Twin	0.310***	0.296***	0.296***
	(0.015)	(0.015)	(0.015)
Age		X	X
Sibling Gender			X
Dependent Mean	2.46	2.46	2.46
Observations	4,019,786	4,019,786	4,019,786

Strategy 1: Reduced Form Results (Finland)

		Own Number of Children					
		Sibling Female			Sibling Male		
		All	Female	Male	All	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sibling First Child is Twin	-0.058***	-0.068***	-0.070***	-0.065***	-0.050**	-0.039*	-0.059**
	(0.011)	(0.015)	(0.019)	(0.019)	(0.017)	(0.020)	(0.020)
Dependent Mean	2.02	2.01	2.12	1.90	2.03	2.12	1.95
Observations	4,019,786	2,030,277	972,864	1,057,413	1,989,509	947,382	1,042,127

- Effects larger (different context, measurement error, completed fertility)
- Significant effects for both sisters and brothers
- Similar patterns for childless siblings $\rightarrow$ learning or solidarity ▸ More Finnish Results

Strategy 2: Gender Composition

- The gender composition of your existing children changes the probability of having additional children (Angrist & Evans, 1996)

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- The gender composition of your existing children changes the probability of having additional children (Angrist & Evans, 1996)
  - Gender of sibling's first child is as good as random (as is gender of sibling's second child conditional upon gender of first)
  - Like twinning, gender composition of sibling's children affects the sibling's total number of children (**similar "norm" effects**)
  - Unlike twinning, additional children are planned and expected (**different "learning" effects**)
  - Unlike twinning, number of children and number of pregnancies move together (**different "solidarity" effects**)

Strategy 2: "First Stage" and Reduced Form Results (US)

	Sibling Number of Children				Own Number of Children	
	Has 1+ Children		Has 2+ Children		Sibling has 2+ Children	
			First is Girl	First is Boy	First is Girl	First is Boy
	(1)	(2)	(3)	(4)	(5)	(6)
First Child is Girl	0.006***	0.007***				
	(0.002)	(0.002)				
Second Child is Girl			0.046***	-0.020***	0.005**	0.003
			(0.002)	(0.002)	(0.002)	(0.002)
Age, Race, Sex Fixed Effects		X	X	X	X	X
Dependent Mean	2.41	2.41	3.08	3.08	1.68	1.68
Observations	7,488,223	7,488,223	2,495,575	2,591,166	2,495,575	2,591,166

- Having a second child depends on gender of first
- Gender composition affects sibling's # children, but not own
- **This suggests sibling peer effects driven by more than just norms**

Strategy 2: "First Stage" and Reduced Form Results (Finland)

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	Has 1+ Children		Has 2+ Children		Sibling has 2+ Children	
			First is Girl	First is Boy	First is Girl	First is Boy
	(1)	(2)	(3)	(4)	(5)	(6)
First Child is Girl	0.017***	0.018***				
	(0.004)	(0.004)				
Second Child is Girl			0.098***	-0.065***	-0.004	-0.002
			(0.006)	(0.006)	(0.005)	(0.005)
Age and Sex Fixed Effects		X	X	X	X	X
Dependent Mean	2.47	2.47	2.84	2.83	2.08	2.09
Observations	3,952,567	3,952,567	1,503,953	1,567,355	1,503,953	1,567,355

- First stage effects similar, but larger, no peer effect
- **More evidence that sibling peer effects driven by more than just norms**

Strategy 3: Does Sibling Fertility Affect Birth Timing?

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Consider the following thought experiment

Mary and Martha

- Mary was born in 1900 (30 in 1930)
- Mary had one child in 1925
- Martha was born in 1902 (28 in 1930)

Agnes and Anna

- Agnes was born in 1900 (30 in 1930)
- Agnes had one child in 1925
- Anna was born in 1904 (26 in 1930)

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If siblings DO NOT match timing

$\Pr(\text{Birth}|\ \textit{Martha; age23}) \approx \Pr(\textit{Birth} \mid \textit{Anna; age23})$ and $\Pr(\textit{Birth} \mid \textit{Martha; age21}) \approx \Pr(\textit{Birth} \mid \textit{Anna; age21})$

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If siblings DO match timing

$\Pr(\text{Birth} \mid \textit{Martha; age23}) \geq Pr(\textit{Birth} \mid \textit{Anna; age23})$ and $Pr(\textit{Birth} \mid \textit{Martha; age21}) \leq Pr(\textit{Birth} \mid \textit{Anna; age21})$

Strategy 3: Estimation Equation

$$b^o_{i,a} = \beta_0 b^s_{i,a} + \theta_y + \phi_s + \varepsilon_{ia}$$

- $b^o_{i,a}$: outcome individual (o) had a child at age *a*
- $b^s_{i,a}$: sibling had a child *when outcome individual* was age *a*
- θ_y: birth cohort fixed effect (aggregate life cycle timing of childbirth)
- ϕ_s: Sibling birth year*sibling gender*own gender*sibling childbirth at age dummies
- cluster at the sibling group (family) level

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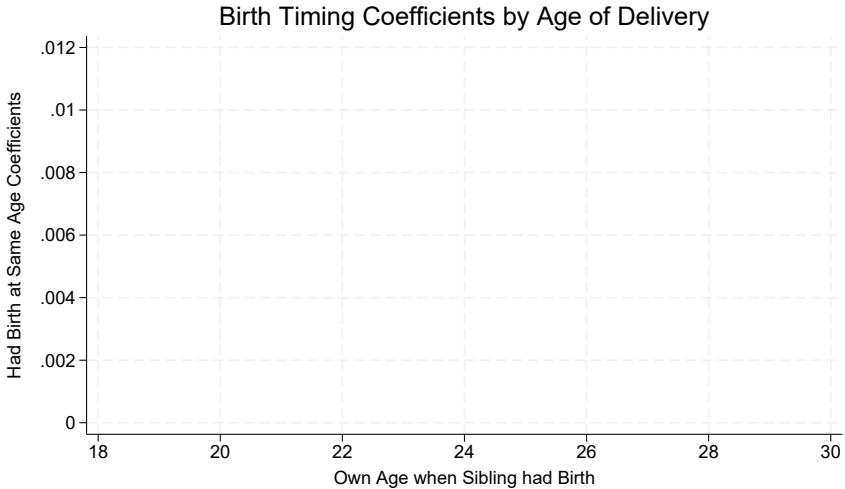
- θ_y: birth cohort fixed effect (aggregate life cycle timing of childbirth)
- ϕ_s: Sibling birth year*sibling gender*own gender*sibling childbirth at age dummies
- cluster at the sibling group (family) level
- **Between same sex individuals with a sibling of the same sex, age, and with the same birth history, exploit differences in age at sibling's pregnancy, after partialling out aggregate life cycle trends in fertility**
- Why not estimate as event study?
  - Event timing endogenous. Cannot pin down who moves first, only identify matching

Strategy 3: Results (US)



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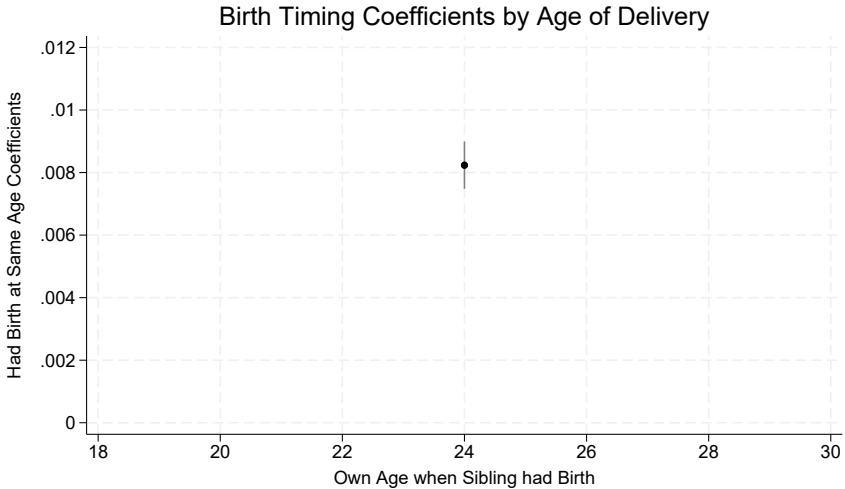

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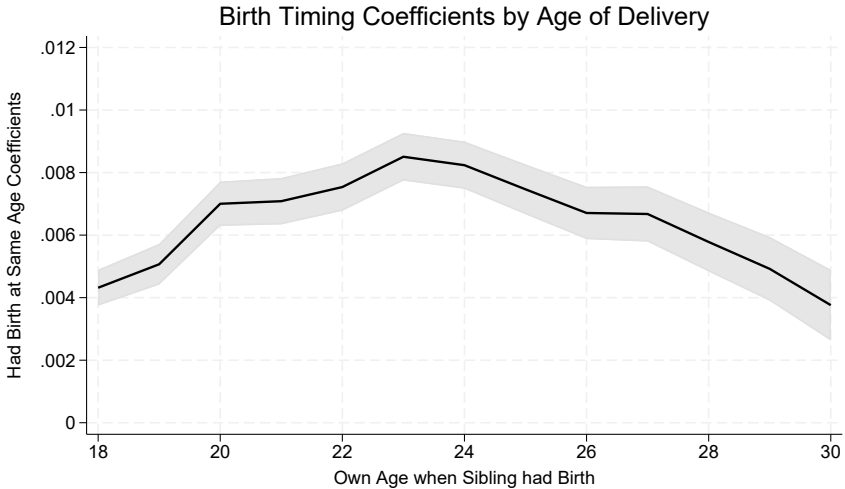
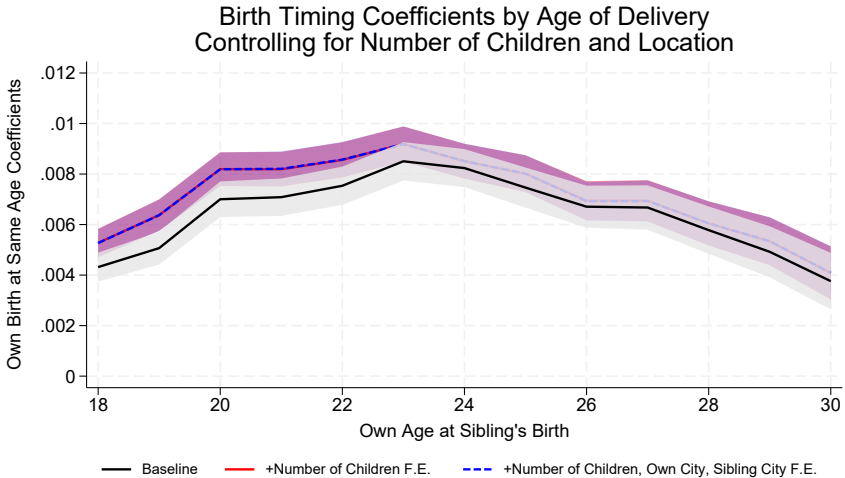
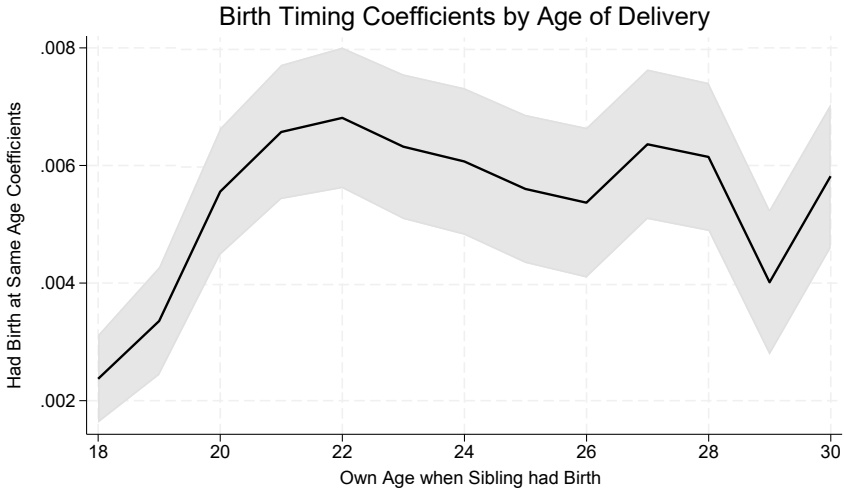


Strategy 3: Results (US) - Robustness



Strategy 3: Results (Finland)



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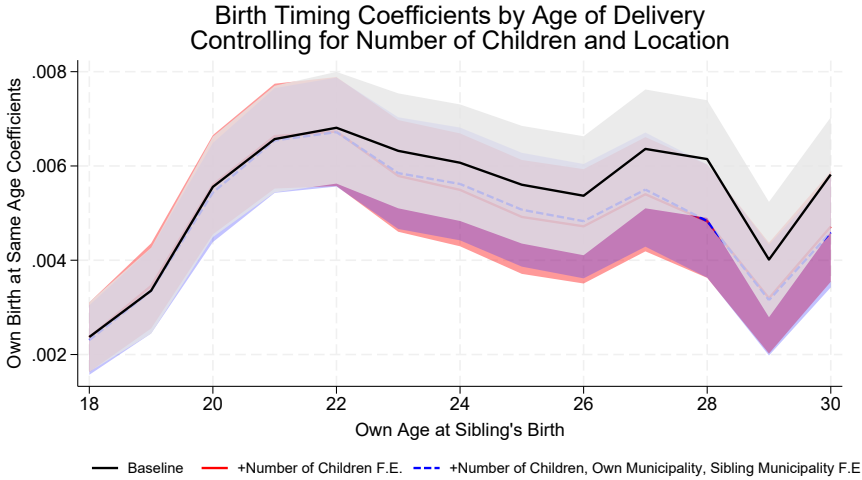

- With Finnish data can isolate contemporaneous employment, family, health shocks

Strategy 3: Is the Exact Year of Birth Special?

$$b^o_{i,a} = \beta_0 b^s_{i,a} + \beta_{-1} b^s_{i,a-1} + \beta_{+1} b^s_{1,a+1} + \theta_y + \phi_s + \varepsilon_{ia}$$

- $b^o_{i,a-1}$: sibling had a child *when outcome individual* was age $a-1$
- $b^s_{i,a+1}$: sibling had a child *when outcome individual* was age $a+1$

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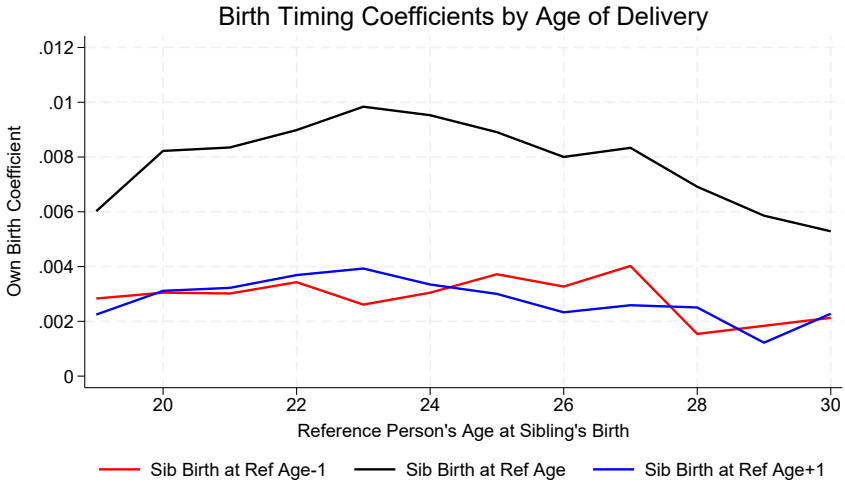
- $b^o_{i,a-1}$: sibling had a child *when outcome individual* was age $a-1$
- $b^s_{i,a+1}$: sibling had a child *when outcome individual* was age $a+1$
- Explore heterogeneity by sex pairing, age differences, geographic location

Strategy 3: Results (US)



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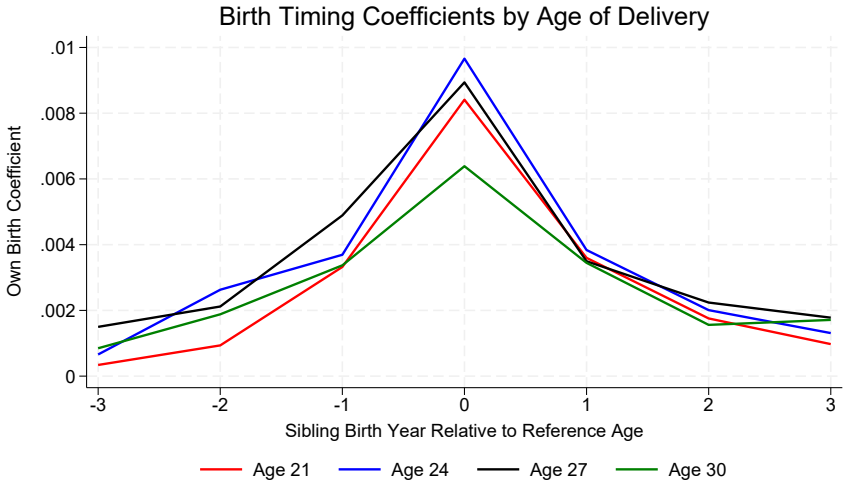

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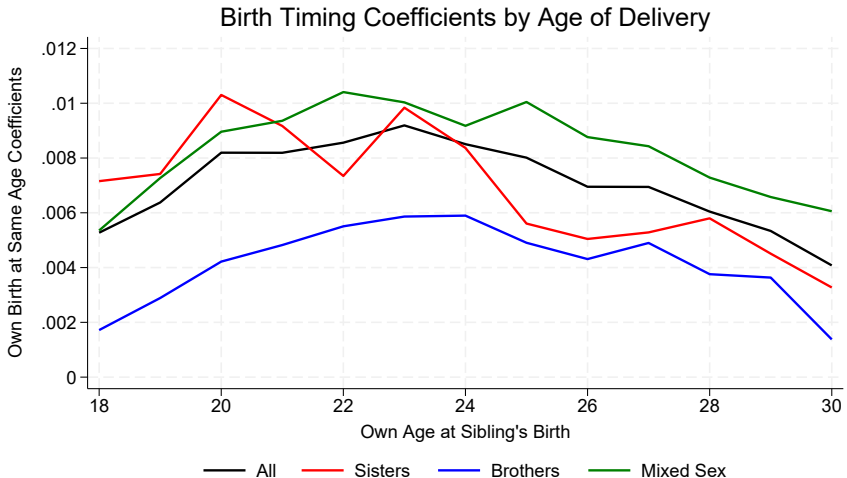

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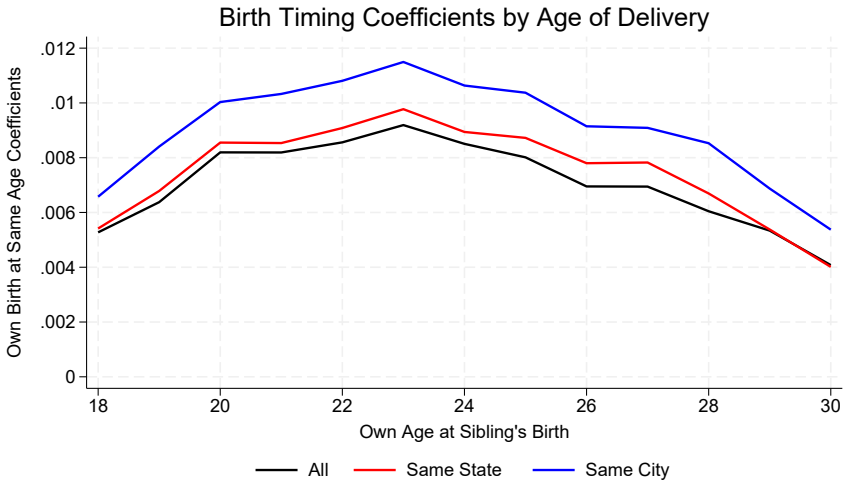

▸ Finland

Strategy 3: Takeaways

- Siblings match birth timing
- Matching with sister stronger, stronger for geographically close pairs
- Match effects are meaningful (5% increase)
- How much of trend could spillover explain? ▸ Concurrent Children

Conclusions

Fertility peer effects are nuanced and multi-faceted

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1. Unexpected, challenging birth events (twinning) has a negative spillover on siblings
   - Social Learning channel should not be discounted, could be timing
   - Potential applications to current context
2. Sex composition of children affect own future fertility, but not siblings
   - Effect of "wanted" additional birth different from surprise additional birth
   - We should move beyond Norms as the main mechanism for peer effects in fertility
3. Siblings time births
   - Strong patterns of Solidarity, shared birthing experience not just Norms at play
   - As people have fewer children, forgone Solidarity amplifies trend

Thank you!

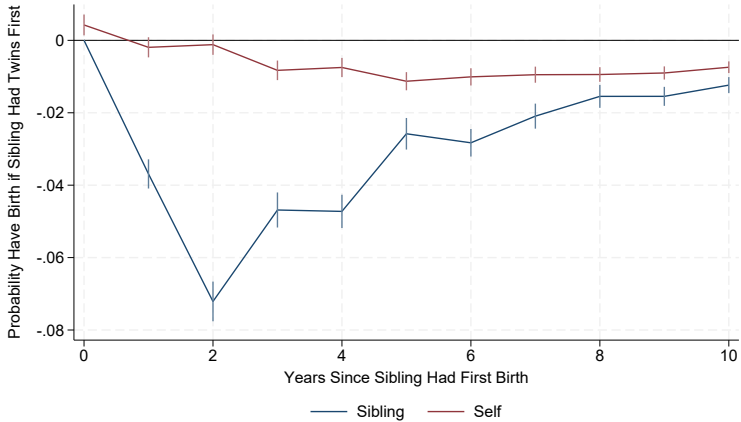
contact: riley_wilson@byu.edu

Strategy 1: Timing Matters (US)

	All	Any Children Sibling is Female No Children When 1st Child Born	Sibling is Male No Children When 1st Child Born
	(1)	(2)	(3)
Sibling's First Child is Twin	-0.014***	-0.047***	-0.035***
	(0.002)	(0.004)	(0.004)
Dependent Mean	0.64	0.49	0.40
Observations	7,488,223	2,525,049	2,394,133

Back

Strategy 1: Effect of Sibling's Twinning Over Time (US)



$$U_{it}(X_{it}, \underbrace{Child_{j,t}}_{Solidarity}, \underbrace{\overline{Num.Children_j}}_{Norms}) - \underbrace{E(Cost_i \mid I_{ij})}_{Support,\ Learning} > 0$$

Strategy 1: Timing Matters (Finland)

		Number of Children			
		Sibling is Female		Sibling is Male	
		No Children	Had Children	No Children	Had Children
	All	When Sibling First Child Born	When Sibling First Child Born	When Sibling First Child Born	When Sibling First Child Born
	(1)	(2)	(3)	(4)	(5)
Sibling's First Child is Twin	-0.058***	-0.166***	-0.104***	-0.127***	-0.093***
	(0.011)	(0.017)	(0.021)	(0.019)	(0.022)
Dependent Mean	2.02	1.54	2.69	1.47	2.67
Observations	4,019,786	1,205,891	824,386	1,059,623	929,886

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Strategy 1: Timing Matters (Finland)

	Any Children		
	All	Sibling is Female No Children When Sibling First Child Born	Sibling is Male No Children When Sibling First Child Born
	(1)	(2)	(3)
Sibling's First Child is Twin	-0.005*	-0.053***	-0.043***
	(0.002)	(0.005)	(0.005)
Dependent Mean	0.80	0.66	0.63
Observations	4,019,786	1,205,891	1,059,623

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Strategy 2: "First Stage" Results (US)

	Number of Children				
	Have at Least One Child			Have at Least Two Children	
			Under 30	First is Girl	First is Boy
	(1)	(2)	(3)	(4)	(5)
First Child is Girl	0.006***	0.007***	0.009***		
	(0.002)	(0.002)	(0.002)		
Second Child is Girl				0.046***	-0.020***
				(0.002)	(0.002)
Age, Race, Sex Fixed Effects		X	X	X	X
Dependent Mean	2.41	2.41	2.05	3.08	3.08
Observations	7,488,223	7,488,223	2,895,406	2,495,575	2,591,166

- Having a second child depends on gender of first
- Have to condition on both

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Strategy 2: "Reduced Form" Results (US)

	Number of Children						
		Sibling is Female			Sibling is Male		
		All	Female	Male	All	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sibling's First Child is Girl	0.001	-0.001	0.000	-0.001	0.003*	0.006*	0.003
	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
Dependent Mean	1.58	1.61	1.97	1.32	1.56	1.90	1.31
Observations	7,488,223	3,596,883	1,600,275	1,996,608	3,891,340	1,657,127	2,234,213

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Strategy 2: "Reduced Form" Results (US)

	Number of Children									
	Sibling is Female						Sibling is Male			
Focal Person			Female		Male		Female		Male	
Siblings First Child	Girl	Boy	Girl	Boy	Girl	Boy	Girl	Boy	Girl	Boy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sibling's Second Child is Girl	0.005**	0.003	0.005	0.009*	0.000	0.002	0.010*	0.001	0.004	0.002
	(0.002)	(0.002)	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)
Dependent Mean	1.68	1.68	2.10	2.10	1.38	1.38	2.02	2.02	1.39	1.39
Observations	2,495,575	2,591,166	572,486	596,443	713,555	743,456	516,046	535,543	693,488	715,724

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Sibling Children Correlations and Timing (US)

	Number of Children		
	Total	In Same Years	In Different Years
	(1)	(2)	(3)
Sibling's Number of Children	0.188***	0.141***	0.047***
	(0.000)	(0.000)	(0.000)
Dependent Mean	1.39	0.18	1.21
Observations	12,989,626	12,989,626	12,989,626

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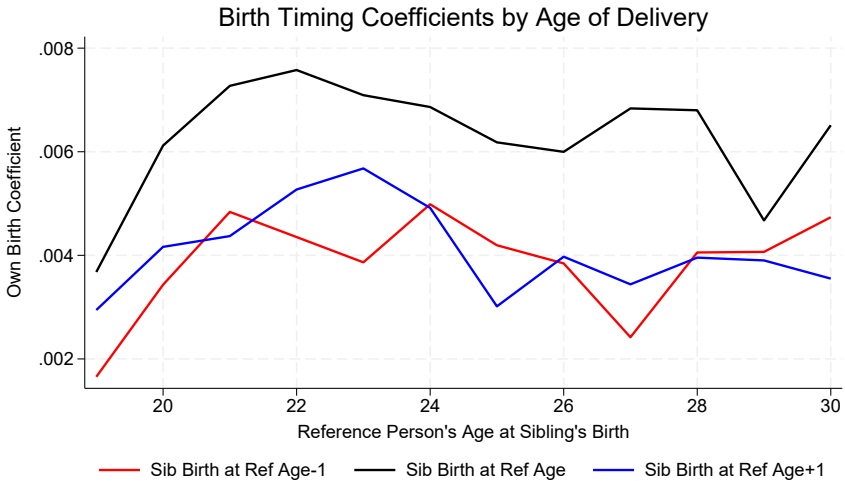
Sibling Children Correlations and Timing (Finland)

	Number of Children		
	Total	In Same Years	In Different Years
	(1)	(2)	(3)
Sibling's Number of Children	0.252***	0.137***	0.115***
	(0.004)	(0.002)	(0.002)
Dependent Mean	1.95	0.17	1.78
Observations	5,207,613	5,207,613	5,207,613

Strategy 3: Results (Finland)



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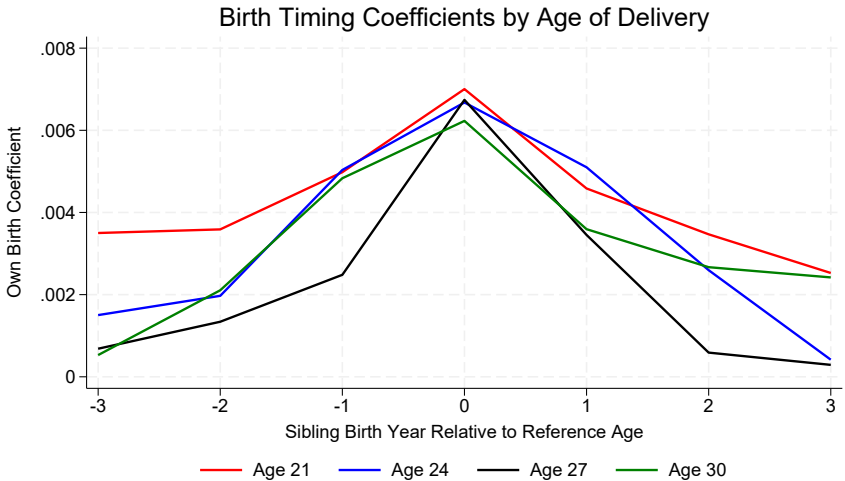
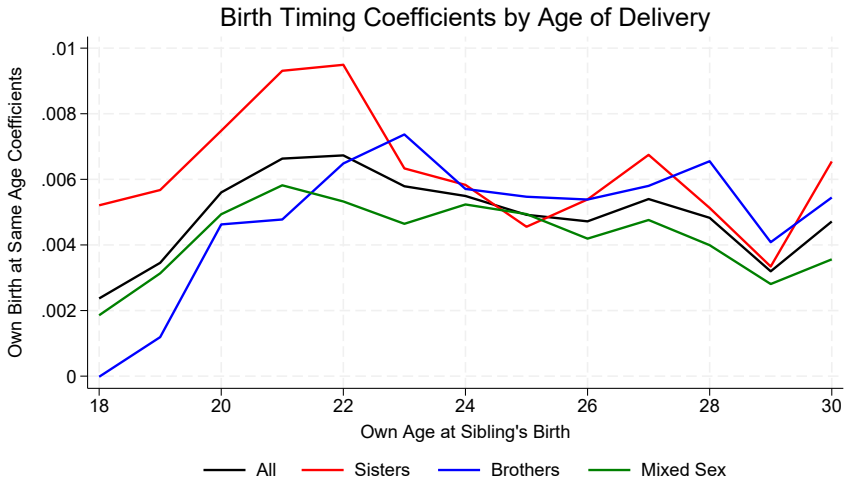
Strategy 3: Results (Finland)



Strategy 3: Results (Finland)



Strategy 3: Results (Finland)