The Birth Order Effect: A Modern Phenomenon?

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What is the birth order effect?

- Large *negative* differences in adult outcomes by order of birth

- Important source of within family inequality

- In a variety of outcomes
    - Education - Kantarevic and Mechoulan (2006)
    - Wages - Behrman and Taubman (1986)
    - IQ - Black et al (2005)

- Consistent across developed countries
    - US - Kantarevic and Mechoulan (2006), Black et al (2018)
    - UK - Booth and Kee (2009)
    - Norway - Black et al. (2005)

Is the birth order effect a modern phenomenon?

- ▸ What about developing countries?

- ▸ Mixed results for birth order
  - ★ *Positive* birth order effect - De Haan et al. (2014), Ejrnæs and Pötner (2004)
  - ★ First born effect & gender of siblings matters – Jayachandran and Pande (2017); Congdon Fors and Lindskog (2022)

- ▸ Historical evidence? – family mattered!

- ▸ Clear(er) quantity-quality trade-off estimates
  - ★ Bleakley and Lange (2009), Tan (2019) – early twentieth and nineteenth century US
  - ★ Becker et al (2010) - mid-nineteenth century Prusia
  - ★ Fernihough (2017) - early twentieth century Ireland

Is the birth order effect a modern phenomenon?

- ▶ Does the birth order play a role in modulating quality along the development path?

- ▶ Historical context with
    - ★ growth
    - ★ changes to structural composition
    - ★ fertility transition

- ▶ Within-family inequality
    - ★ family background
    - ★ location
    - ★ time – Cools et al. (2024)

- ▶ A birth order puzzle
    - ★ developed v. developing countries

Data: Historical Sample of the Netherlands

- Dutch civil registries
  - ⋆ births
  - ⋆ marriages
  - ⋆ [deaths only partially digitalised]

- Representative sample of "reserach persons"
  - ⋆ born between 1812 - 1922
  - ⋆ linked relatives (parents, siblings, children, spouses, etc)
  - ⋆ ∼ 85,000 people in total

- Family-linked information
  - ⋆ parents linked with all their children
  - ⋆ within-family study
    - ♦ comparison between adult brothers

Data: Historical Sample of the Netherlands

- Sample selection:
  - ⋆ Born after 1838 (Dutch civil code)
  - ⋆ Individuals in families with at least 2 brothers
  - ⋆ Brothers & father with valid adult occupation
  - ⋆ Missing if died before reaching adulthood/unmarried/childless/missing occupation

- Available information:
  - ⋆ year of birth
  - ⋆ gender
  - ⋆ municipality
  - ⋆ religion
  - ⋆ occupation
    - ◆ self-reported
    - ◆ if multiple, best is chosen

Occupations

- ► Occupations are linked to HISCO classification
    - ⋆ HISCO linked to several classifications/rankings

- ► HISCAM (Historical CAMSIS)
    - ⋆ Widely used occupational rank based on a range of historical records
    - ⋆ Uses relatives & friends to estimate social distance between occupations

- ► Our approach:
    - ⋆ use the ranking but not the distance
    - ⋆ calculate the share of an individual's cohort with occupation ranked below their own

        ⇒ **occupation rank**

    - ⋆ partially account for changing occupational composition

Descriptive statistics

	Mean	Std. Dev.	Min.	Max.
Birth order	4.168	2.576	1	10
Number of older brothers	1.737	1.596	0	6
Year of birth	1891.859	15.828	1,838	1,922
Family size (# of Children)	8.246	2.887	2	15
Age difference from immediately preceding sibling	1.849	1.309	0	5
Age at highest occupation	20.493	7.930	0	50
Born in a city	0.406	0.491	0	1
Protestant	0.446	0.497	0	1
Catholic	0.367	0.482	0	1
Occupation				
Occupation rank	0.440	0.273	0	1
Father occupation rank	0.473	0.261	0	0.998
Region by economic development				
Industrial region	0.411	0.492	0	1
Modern agricultural region	0.138	0.345	0	1
Rural region	0.451	0.498	0	1
Number of Observations	27,389			

Baseline estimation strategy

$$y_{ifcr} = \alpha + \beta \text{Birth order}_{ifcr} + \gamma X_{ifcr} + \mu_f + \delta_c + \nu_r + \varepsilon_{ifcr}$$

where

- $y_{ifcr} \equiv$ Occupational percentile
- Birth order$_{ifcr} \equiv$ measure of order of birth
- $X_{ifcr} \equiv$ age gap with sibling, year occupation was measured
- $\mu_f, \delta_c, \nu_r \equiv$ family (father), cohort and region fixed effects
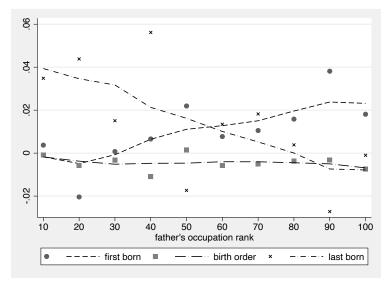- standard errors clustered at the family level

Baseline results

	OLS	FE	OLS	FE	OLS	FE
Birth order	-0.002***	-0.006***			-0.003***	-0.004*
	(0.001)	(0.002)			(0.001)	(0.002)
No. older brothers			-0.003*	-0.008***		
			(0.001)	(0.002)		
No. older sisters			-0.002	-0.003		
			(0.001)	(0.003)		
First born child					0.006	0.010*
					(0.006)	(0.006)
Last born child					0.050***	0.011**
					(0.005)	(0.005)
N	27389	27389	27389	27389	27389	27389
F-stat	17.554	6.482	17.448	6.480	18.081	6.431

Non-linear

Birth order effect and family background

	(1)	(2)	(3)
Birth order	-0.002		-0.003
	(0.002)		(0.003)
Birth order*Father occupation rank	-0.008***		-0.002
	(0.003)		(0.003)
No. older brothers		-0.002	
		(0.003)	
No. older brothers*Father occupation rank		-0.012**	
		(0.005)	
No. older sisters		-0.002	
		(0.004)	
No. older sisters*Father occupation rank		-0.002	
		(0.008)	
First born child			-0.008
			(0.009)
First born*Father occupation rank			0.036**
			(0.016)
Last born child			0.035***
			(0.011)
Last born*Father occupation rank			-0.048**
			(0.019)
N	27389	27389	27389
F-stat	6.491	6.450	6.451

Birth order effect and family background

Birth order effect and family background

	P(same occupation as father)		
Birth order	-0.012***		-0.009**
	(0.004)		(0.004)
No. older brothers		-0.017***	
		(0.004)	
No. older sisters		-0.006	
		(0.004)	
First born child			0.019**
			(0.009)
Last born			0.001
			(0.008)
N	27389	27389	27389
Birth order	-0.016***		-0.011**
	(0.004)		(0.005)
Birth order*Father occupation rank	0.007		0.002
	(0.004)		(0.005)
No. older brothers		-0.025***	
		(0.006)	
No. older brothers*Father occupation rank		0.016*	
		(0.009)	
No. older sisters		-0.002	
		(0.007)	
No. older sisters*Father occupation rank		-0.007	
		(0.012)	
First born child			0.031*
			(0.017)
First born*Father occupation rank			-0.025
			(0.027)
Last born			-0.019
			(0.018)
Last born*Father occupation rank			0.041
			(0.030)
N	27389	27389	27389

Birth order effect and location

Birth order effect and location

	(1)	(2)
Birth order	-0.006***	-0.003
	(0.002)	(0.002)
Birth order*Modern agricultural	0.000	-0.003
	(0.002)	(0.003)
Birth order*Rural region	0.000	-0.001
	(0.001)	(0.002)
First born child		0.024***
		(0.008)
First born*Modern agricultural		-0.026*
		(0.015)
First born*Rural region		-0.024**
		(0.010)
Last born child		0.013
		(0.008)
Last born*Modern agricultural		0.007
		(0.016)
Last born*Rural region		-0.007
		(0.011)
N	27389	27389
F-stat	6.388	6.208

Birth order effect and location

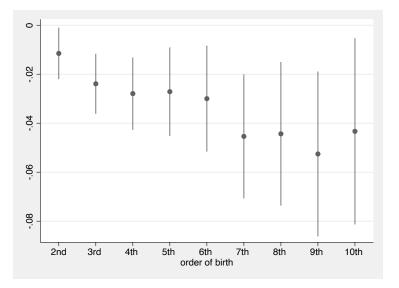|	(1)	(2)
Birth order	-0.005**	-0.004*
	(0.002)	(0.002)
Birth order*city	-0.003**	-0.001
	(0.001)	(0.002)
First born child		-0.002
		(0.006)
First born*city		0.031***
		(0.009)
Last born child		0.012*
		(0.007)
Last born*city		-0.003
		(0.010)
N	27389	27389
F-stat	6.388	6.330

Conclusions

- ▶ The birth order effect appears not to be only a modern phenomenon
  - ⋆ decreases in occupation quality for individuals of higher order of birth
  - ⋆ fully driven by brothers
  - ⋆ strong first born effect
  - ⋆ relevant last born effect

- ▶ Birth order and first born effects driven by families with a more favourable background
  - ⋆ as measured by father's occupation
  - ⋆ not driven by inheritance (of occupation)

- ▶ More developed regions experience a stronger birth order effect
  - ⋆ urban regions
  - ⋆ cities

- ▶ Limited evidence of changes to the birth order effect over time

Non-linear results - birth order dummies

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Family size

	≤ 5 (1)	6 to 8 (2)	> 8 (3)
Birth order	-0.016***	-0.006	-0.004
	(0.006)	(0.004)	(0.003)
N	5116	9756	12517
F-stat	3.622	2.893	3.909
No. older brothers	-0.013*	-0.009**	-0.006*
	(0.007)	(0.004)	(0.003)
No. older sisters	-0.025***	-0.001	0.000
	(0.010)	(0.005)	(0.004)
N	5116	9756	12517
F-stat	3.078	2.894	4.108
First born child	-0.010	0.011	0.013
	(0.014)	(0.010)	(0.009)
Birth order	-0.020**	-0.003	-0.001
	(0.008)	(0.004)	(0.003)
Last born	0.004	0.015	0.016
	(0.011)	(0.010)	(0.010)
N	5116	9756	12517
F-stat	5.467	2.894	4.455

Saxon region

Birth order effect and inheritance

	Excluding Saxon regions	Excluding farmers
Birth order	-0.007***	-0.007***
	(0.002)	(0.002)
N	24394	22715
F-stat	5.894	5.737
No. older brothers	-0.008***	-0.008***
	(0.003)	(0.003)
No. older sisters	-0.003	-0.005
	(0.003)	(0.003)
N	24394	22715
F-stat	5.895	5.710
First born child	0.012**	0.011*
	(0.006)	(0.006)
Birth order	-0.004*	-0.005*
	(0.002)	(0.003)
Last born child	0.010*	0.010*
	(0.006)	(0.006)
N	24394	22715
F-stat	5.853	5.690

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