L'éducation et la transmission intergénérationnelle du revenu au Canada

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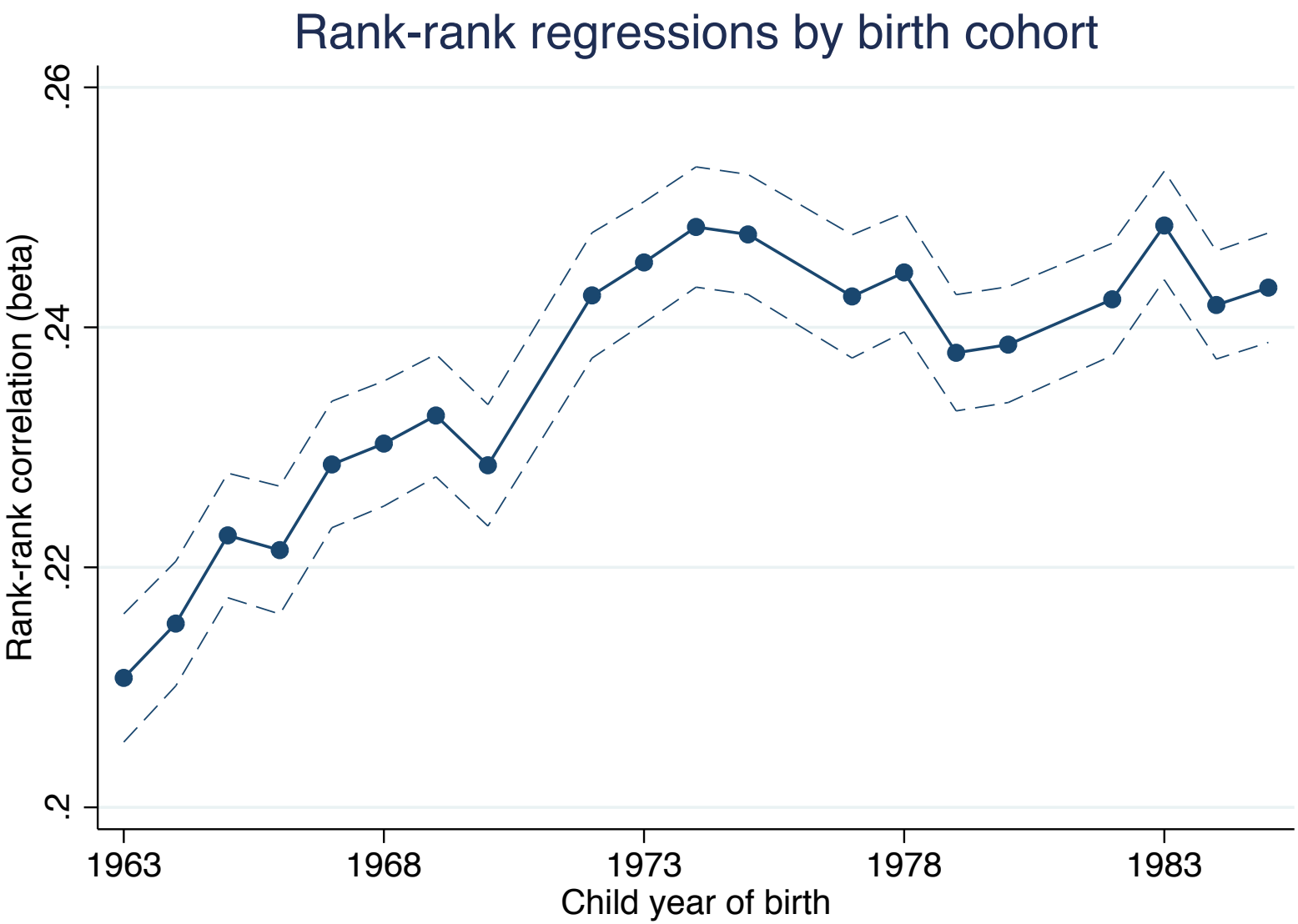
The rising transmission of income in Canada



Main research question

What is the role of parental education in the rising transmission of income in Canada?

What we do:

- Develop data linkages between administrative tax data and Census data
- Describe how income mobility varies by maternal education level (at an aggregate level)
- Use different approaches to get at the role of maternal education

Main findings

1. Parental education is associated with a boost in children income rank above and beyond what would be expected on the basis of parental income alone
2. The reduction in income mobility over time is particularly pronounced for families with low education
3. Increases in the fraction of mothers with a high school diploma reduced the transmission of income between generations
4. No evidence of a causal impact of the fraction of mothers holding a bachelor degree

Literature

- Socioeconomic mobility and intergenerational transmissions
  - Classic economic contributions: Becker and Tomes (1979, 1986) and Loury (1981)
  - In sociology: Blau and Duncan (1967), Featherman et al. (1975), Goldthorpe (1980), Goldthorpe and Hope (1974), and Sewell and Hauser (1975) focus on occupational prestige
  - Parental education also used as a measure of social origins: Blanden (2013), Bradbury et al. (2015), Bukodi and Goldthorpe (2013), Goldthorpe (2013)
- Recent literature exploits administrative tax data and focuses on income
  - Chetty et al. (2014), Corak (2020) and Connolly et al. (2019) all offer correlations between mobility and various covariates
  - Yet few studies try to estimate causal relationships: Biasi (2019) and Rothstein (2019) are exceptions, looking at school finance equalization and quality of schools, respectively
- Social returns to schooling: Heckman et al. (2018), Moretti (2004a, 2004b), Lange and Topel (2006), Aryal et al. (2019), Lochner and Moretti (2004), Lleras-Muney (2005), Black et al. (2005a), Banks and Mazzonna (2012)
- Compulsory schooling laws: Acemoglu and Angrist (2000), Angrist and Krueger (1991), Oreopoulos et al. (2006), Stephens and Yang (2014), Lavecchia et al. (2016), Oreopoulos (2006), Grenet (2013), Pischke and Von Wachter (2008), Black et al. (2005b)

Intergenerational Income Database (IID) & Census Data

- Administrative tax data linking over 6 million pairs of parents and children born between 1963 and 1985

IID cohort	Birth years	IID count	IID weighted count
1982-84	1963 to 1966	1,219,470	1,566,240
1984-86	1967 to 1970	1,158,900	1,555,280
1991	1972 to 1975	1,095,160	1,474,140
1996	1977 to 1980	1,166,440	1,557,800
2001	1982 to 1985	1,349,190	1,633,270

- Matching algorithm: start with T1 Family File, where families are identified using reported spousal SIN and addresses of tax-filing children. Select kids aged 16-19 at the year of the link. Repeat 4 more years for kids not matched
- **NEW** linkage: over 68% matched with one of the six most recent Canadian censuses (1991, 1996, 2001, 2006, 2011, 2016)

Rare examples of linkages include Landerso and Heckman (2017) and Chetty et al. (2019) on income, and Fagereng et al. (2021) and Black et al. (2019) on wealth. BUT none have the same match rate and cover as many birth cohorts.

Income definitions and mobility measure

- Income measure used: Canada Revenue Agency's definition of total income. Includes earnings, interest and investment income, self-employment net income, taxable capital gains/losses and dividends, and benefits (in 2016 $)
- Parental income (sum of both parents if present) is averaged when child 15 to 19 years old
- Child income is average total income when aged 30 to 36
- Percentile ranks are measured within birth cohorts for both parents and children
- Rank-rank relationship varies across birth years:

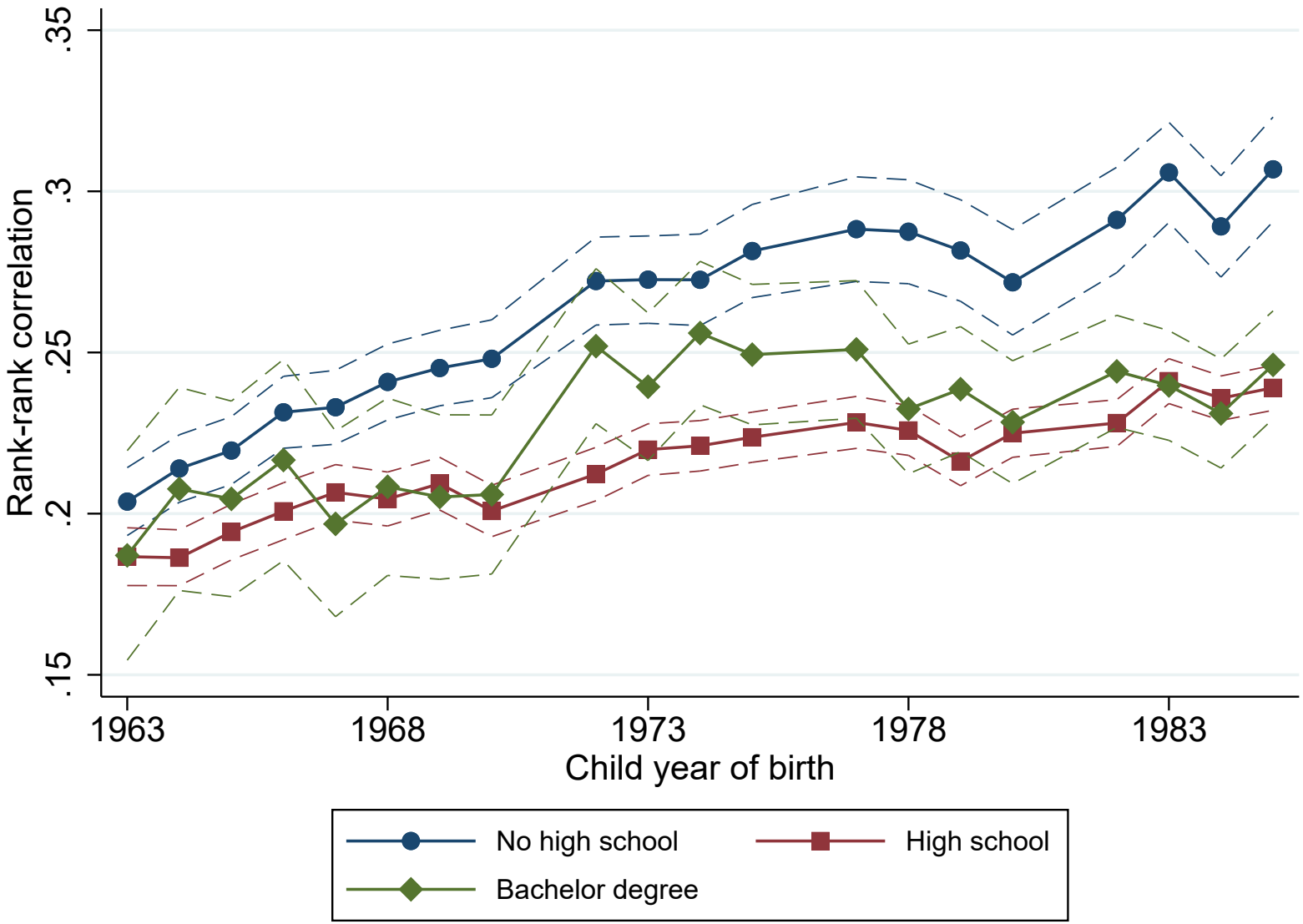
$$y_{it} = \alpha_t + \beta_t x_{it} + \epsilon_{it} \tag{1}$$

y_{it} : child i's income rank; x_{it} : parental income rank
t : birth year of the child; β_t: *relative* mobility
(later, we let β_t vary by province as well)

Maternal education in Canada

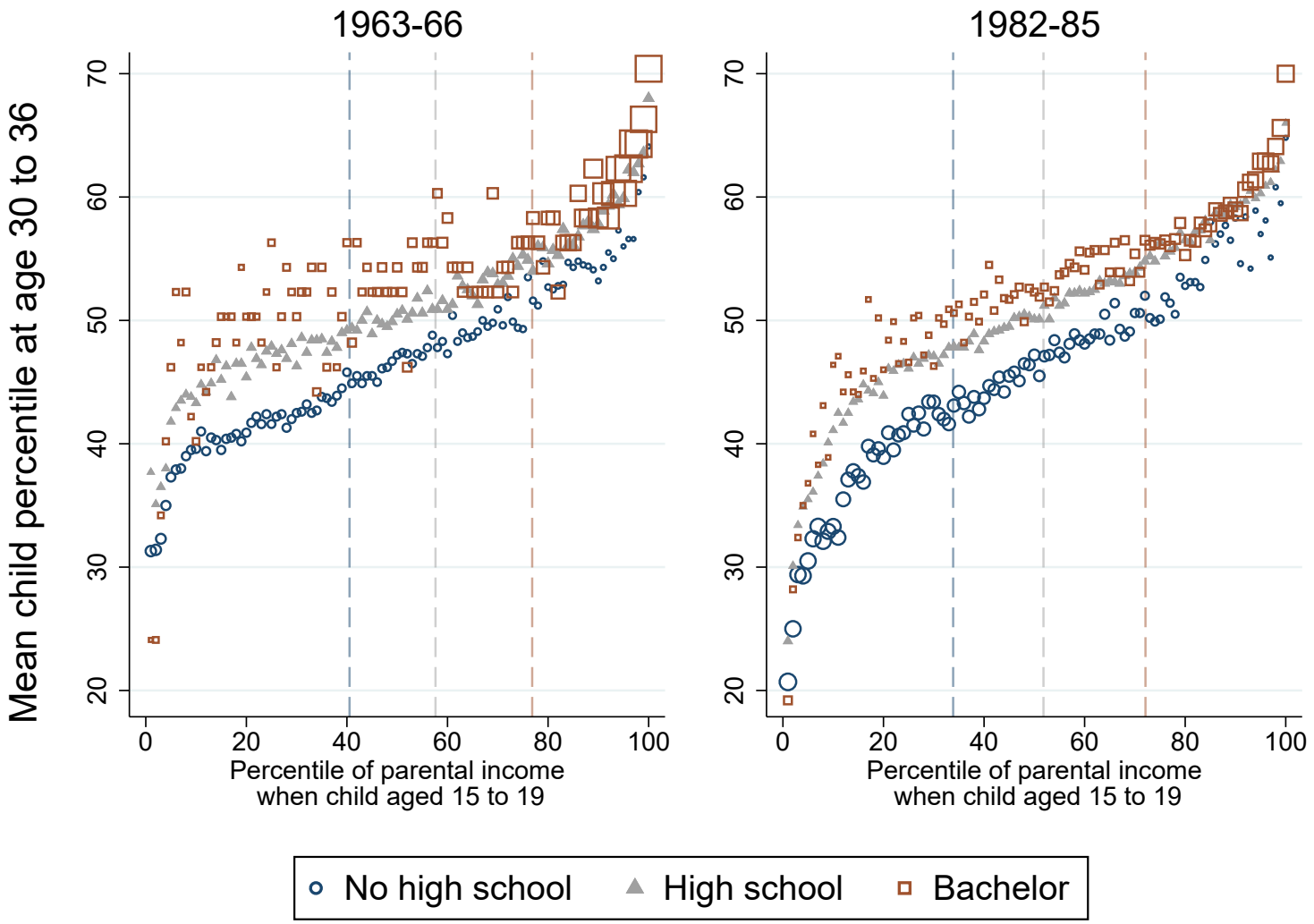
	Maternal educational attainment			
Birth cohort	No high school (%)	High school (%)	Bachelor (%)	Mother's age at birth
1963	40	54	6	26.5
1964	40	54	6	26.6
1965	39	55	6	26.5
...	...	...	...	...
1973	25	65	10	26.1
1974	24	66	10	26.1
1975	22	67	11	26.2
...	...	...	...	...
1983	16	69	14	27.3
1984	16	70	15	27.4
1985	15	70	15	27.7
Variation				
1963 to 1985	-25	$+16$	$+9$	$+1.2$

Income transmission by maternal education level



Note: subset of mothers born in Canada

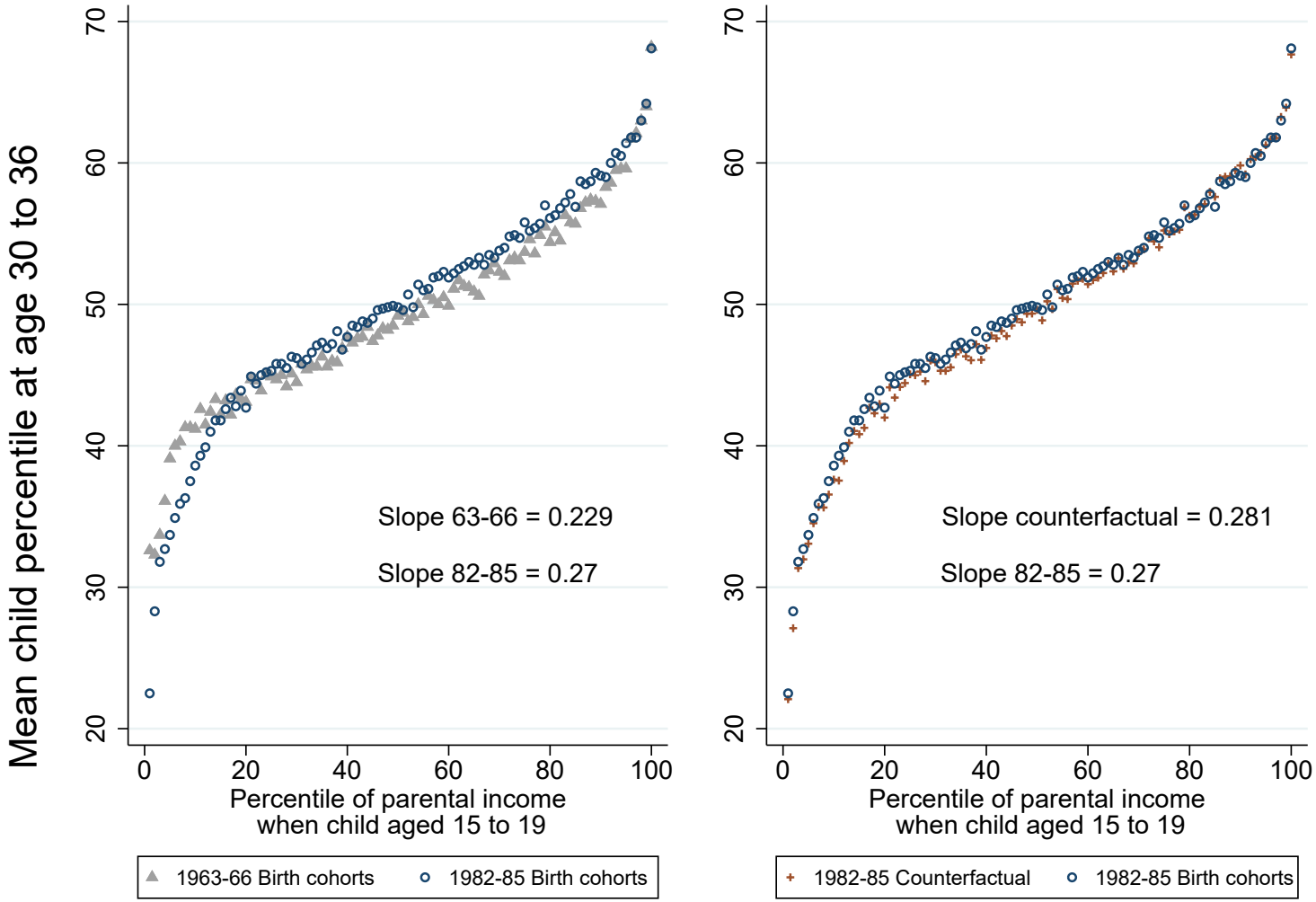
Intergenerational rank mobility within maternal education groups, 1963-66 and 1982-85 birth cohorts



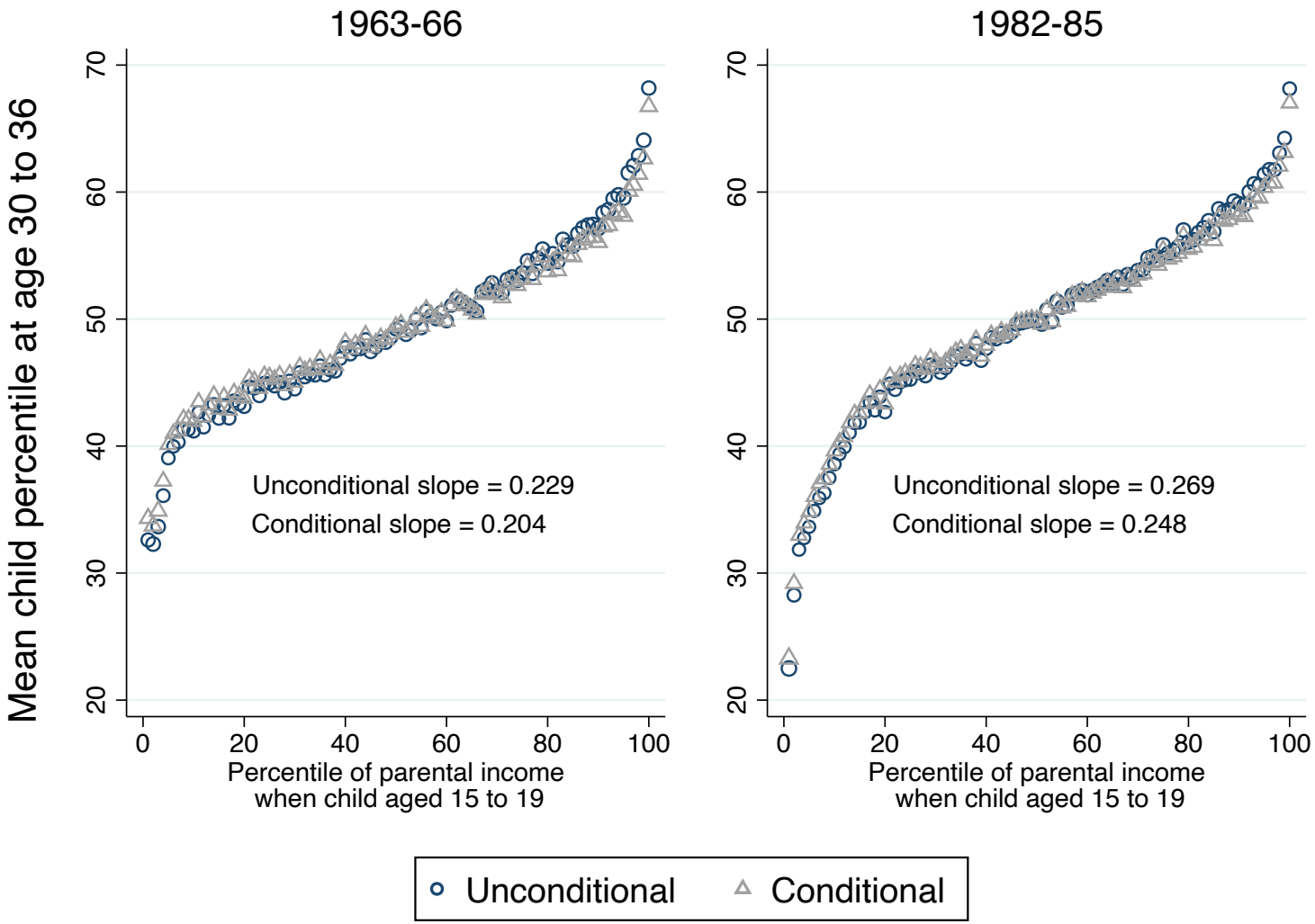
Five methods to look at role of education

1. Counterfactual: 1982-85 mean child percentiles using parental education distribution from 1963-66
   - What would rank-rank relationship have looked like had parental education stayed the same, but mean child percentile by education level had gone to 1982-85 levels?
2. Unconditional vs. conditional rank-rank regressions
   - When the rank-rank regression controls for parental education level, is the increase in the slope over time larger?
3. Decomposition
4. OLS with fixed effects
   - Explaining β_{pt} by the percentage of mothers with a given education level, using child birth cohort and province of residence fixed effects
5. (preliminary–not shown here) IV: using compulsory schooling laws to instrument the education levels

1: counterfactual 1963-66 distribution with 1982-85 means



2: unconditional vs. conditional



Unconditional slope increases 18%, conditional slope increases 23%

3: Decomposition of β_t

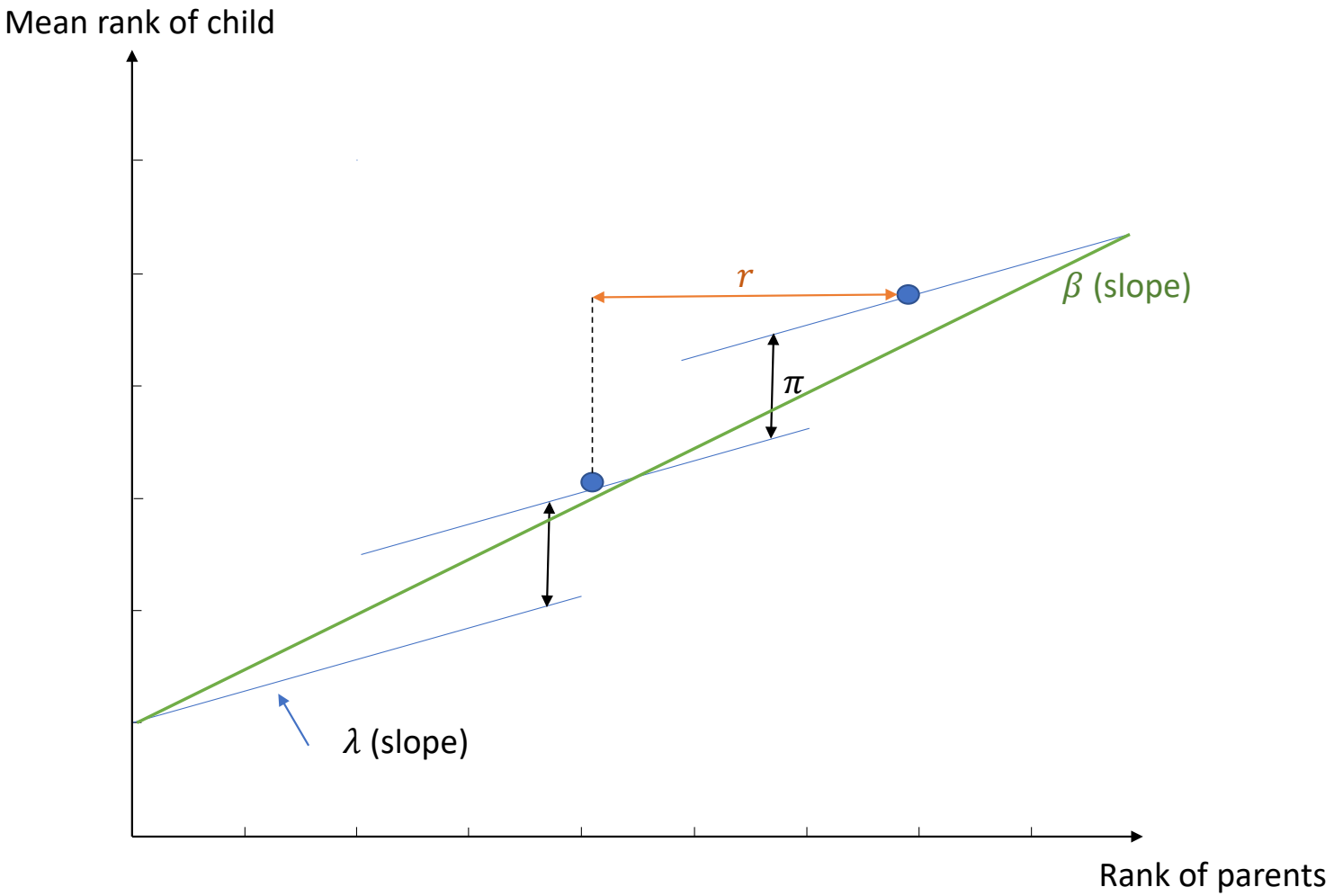
$$\beta_t = \lambda_t + \sum_j \pi_{j,t} R_{j,t} \tag{2}$$

where
λ_t: conditional rank-rank coefficient
$\pi_{j,t}$: increase in child outcomes associated with maternal education level $j \in \{HighSchool, Bachelor\}$ (relative to not completing high school) conditional on parental income
$R_{j,t}$: regression coefficient from projection of maternal education e_{it} onto x_{it} (the "reverse" of a standard returns to education estimating equation)

$\rightarrow$ λ_t and $\pi_{j,t}$ are obtained from the "long" regression of children income on parental income and parental education:

$$y_{it} = a_t + \lambda_t x_{it} + \sum_j \pi_{j,t} 1\{e_{it} = j\} + \varepsilon_{it}$$

Visual representation of the decomposition



Decomposition of Rank Mobility Changes

Panel A: Intergenerational mobility terms	**1963-66**	**1982-85**	**% Change**
Unconditional rank-rank slope (β)	0.229	0.269	18%
Conditional rank-rank slope (λ)	0.203	0.249	23%
High school returns: $\pi_{HS} \times R_{HS}$	0.015	0.000	-103%
R_{HS}	0.003	0.000	-103%
π_{HS}	4.217	4.815	14%
Bachelor returns: $\pi_{BA} \times R_{BA}$	0.012	0.021	84%
R_{BA}	0.002	0.004	101%
π_{BA}	6.390	5.825	-9%
Panel B: Average parental income percentile by education			
No high school diploma	40.512	33.857	-16%
High school diploma	57.611	51.817	-10%
Bachelor degree	76.844	72.106	-6%
Panel C: Maternal educational attainment (shares)			
No high school diploma	0.388	0.159	-59%
High school diploma	0.549	0.695	27%
Bachelor degree	0.063	0.146	133%

4: OLS relationship b/w relative mobility and aggregate education

$$\beta_{pt} = \theta_{HS}\overline{HighSchool}_{pt} + \theta_{BA}\overline{Bachelor}_{pt} + \delta_t + \delta_p + \upsilon_{pt} \qquad (3)$$

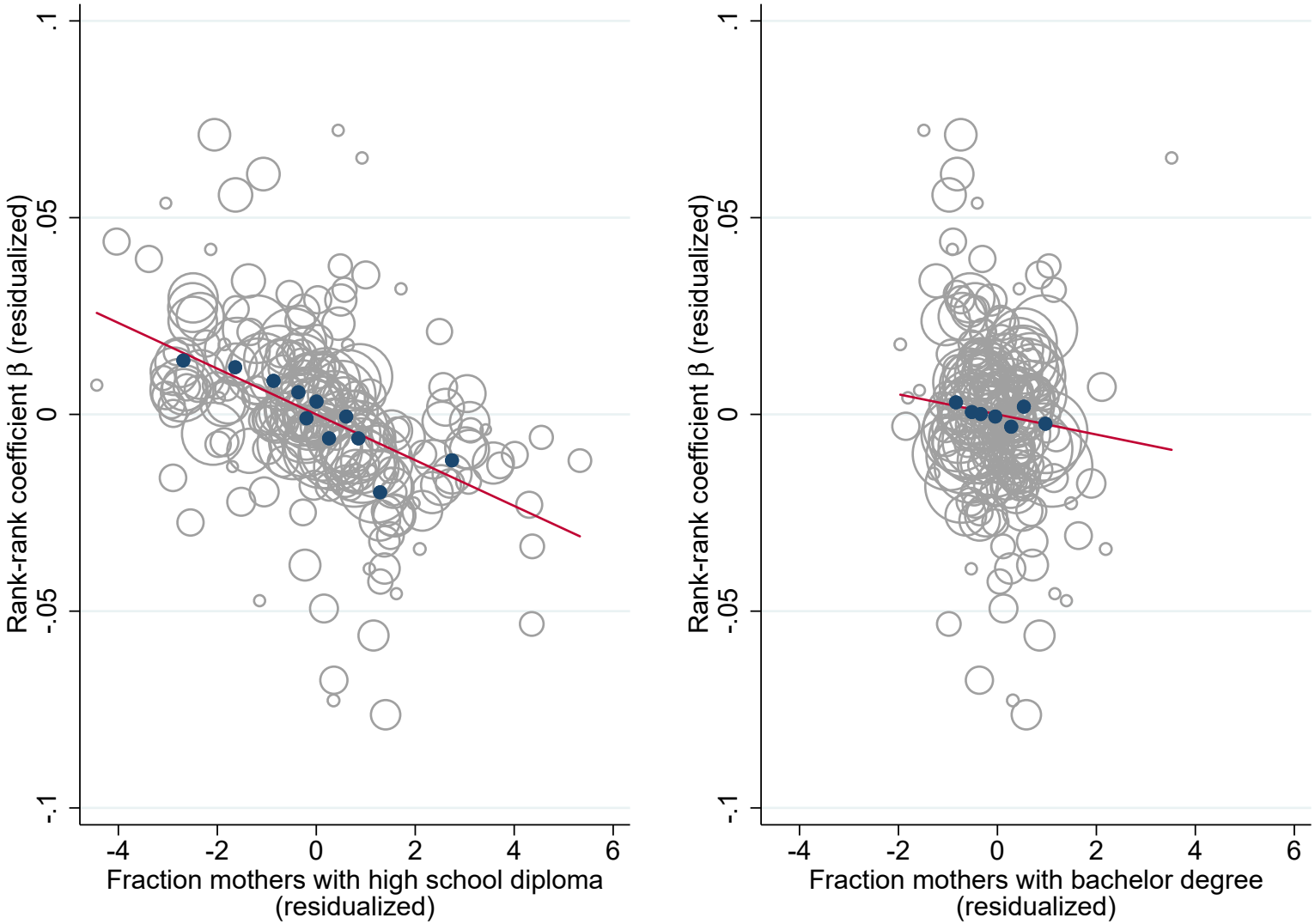
β_{pt}: Relative rank-rank mobility for province p and birth cohort t β_{pt}

$\overline{HighSchool}_{pt}$: fraction of mothers of children born in province p in year t who completed high school (including those that further pursued higher education)

$\overline{Bachelor}_{pt}$: fraction that completed a bachelor degree or more

θ_{BA} represents incremental effect of increasing university completion rates, over and above that of increasing high school completion

θ_{HS} & θ_{BA}: OLS relation b/w mobility and aggregate education



Binscatter method by Cattaneo, Crump, Farrell and Feng (2019)

Decomposition of Rank Mobility Changes

	Dependent variable:			
	Uncond. rank-rank slope (β)	Cond. rank-rank slope (λ)	High school returns ($\pi_{HS}R_{HS}$)	Bachelor returns ($\pi_{BA}R_{BA}$)
	(1)	(2)	(3)	(4)
Maternal education				
% high school diploma	-0.0058	-0.0045	-0.0014	0.0001
	(0.0014)	(0.0012)	(0.0005)	(0.0001)
	[0.0000]	[0.0090]	[0.0020]	[0.1892]
% bachelor degree	-0.0026	-0.0054	0.0012	0.0016
	(0.0044)	(0.0042)	(0.0007)	(0.0006)
	[0.6176]	[0.2753]	[0.2292]	[0.1672]
N	200	200	200	200
Adjusted R^2	0.840	0.827	0.790	0.627
Mean dependent variable	0.252	0.227	0.021	0.005
Controls				
Province fixed effects	x	x	x	x
Birth-year fixed effects	x	x	x	x

Standard errors clustered at the province level reported in parentheses.
p-values from wild cluster bootstrap F-tests reported in square brackets.

End of our first paper

To be published as

Connolly, M., Haeck, C., & Laliberté, J.W. (forthcoming), "Parental Education and the Rising Transmission of Income between Generations," in *Measuring Distribution and Mobility of Income and Wealth* (chapter 11), R. Chetty, J. N. Friedman, J. C. Gornick, B. Johnson, & A. Kennickell (eds.). National Bureau of Economic Research.

Concluding remarks

1. Income ranks of children born to more educated groups of mothers are less dependent on parental financial resources
2. Only high school education significantly increases unconditional income mobility ($\downarrow \beta_{pt}$)
3. The supply of college-educated mothers also affects educational inequality and private returns to education in a way that tends to reduce unconditional rank mobility ($\uparrow \beta_{pt}$)
4. From a policy standpoint, our results suggest reducing high school dropout rates would promote equality of opportunity
5. Still to be done: IV analysis at the Census division level, instrument for college

Merci!

Vos commentaires sont les bienvenus :

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5: Instrumental variable strategy

We leverage temporal and geographic differences in compulsory education laws (Acemoglu and Angrist 2000) and use two-stage least squares (2SLS):

$$\beta_{pt} = \theta_{HS}^{IV} \overline{HighSchool}_{pt} + \theta_{BA}^{IV} \overline{Bachelor}_{pt} + \delta_t + \delta_p + \upsilon_{pt} \quad (4)$$

$$HighSchool_{i,pt} = \pi_{HS} CL_{i(by)} + \chi_{HS} \boldsymbol{X}_{ipt} + u_{HS,ipt} \quad (5)$$

$$Bachelor_{i,pt} = \pi_{BA} CL_{i(by)} + \chi_{BA} \boldsymbol{X}_{ipt} + u_{BA,ipt} \quad (6)$$

$CL_{i(by)}$: legal school-entry age and school-leaving age for the parent of child i (vary across mother's province of birth b and year of birth y)

$\boldsymbol{X}_{ipt}$: full sets of fixed effects for province of residence p and child birth cohort t and other child-level controls

Compulsory schooling laws in Canada

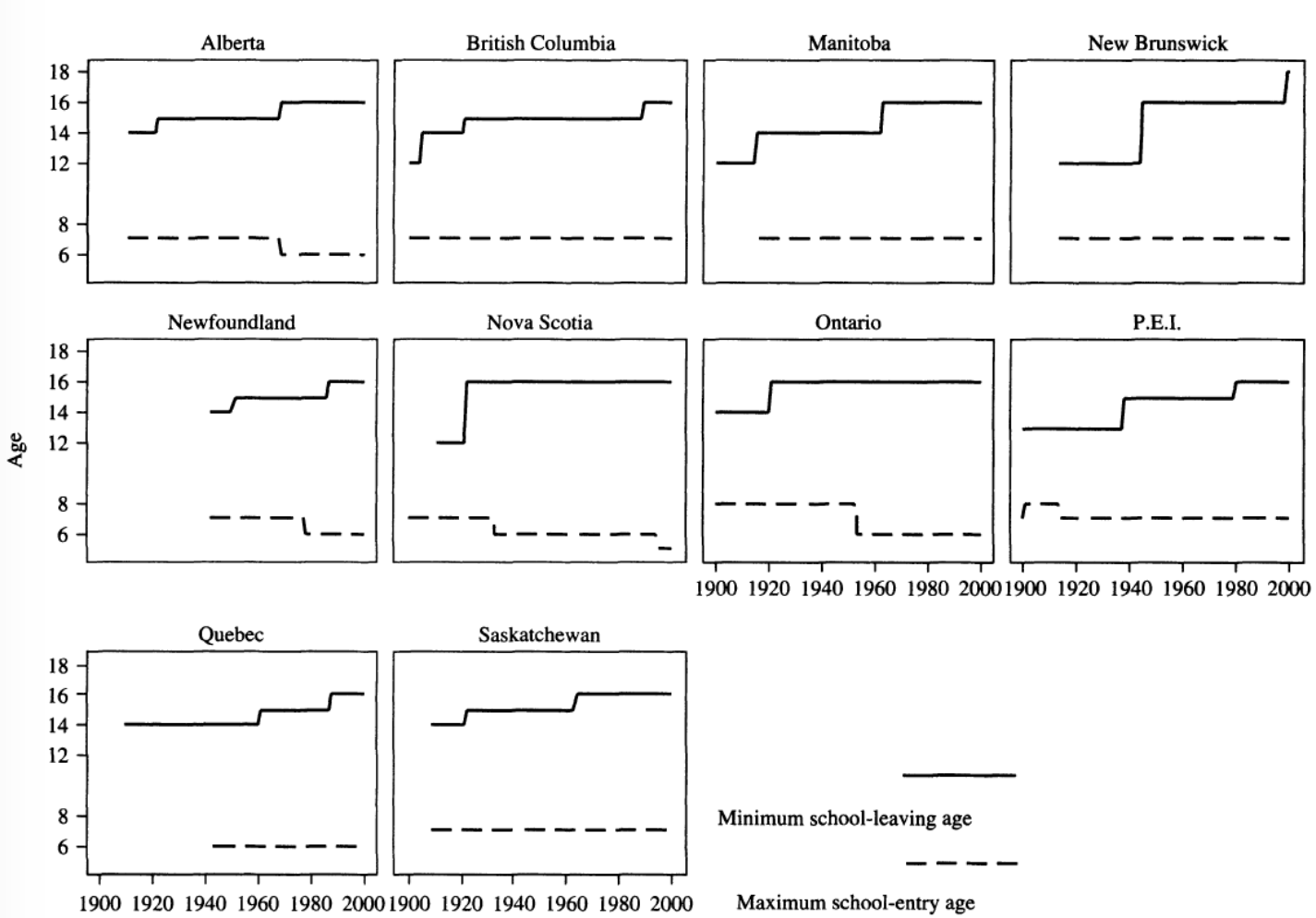


FIGURE 1 Minimum school-leaving ages and maximum school-entry ages by province, 1900–2000
NOTES: See data appendix for details.

Source: Oreopoulos (2006) Note: Mothers in our data are born between 1913 and 1971

OLS and IV main results

Dep. var: rank-rank slope	OLS	IV: dummies legal instruction time		
	(2)	(3)	(4)	(5)
Percent high school	-0.0059***	-0.0083**	-0.0085**	-0.0077**
	(0.0009)	(0.0027)	(0.0029)	(0.0027)
Percent bachelor	-0.0027	-0.0079	-0.0078	-0.0076
	(0.0036)	(0.0063)	(0.006)	(0.0066)
		IV: dummies legal dropout age & entry age		
		(6)	(7)	(8)
Percent high school		-0.012***	-0.012***	-0.012***
		(0.0034)	(0.0032)	(0.0028)
Percent bachelor		-0.0077*	-0.0086*	-0.0071*
		(0.0041)	(0.004)	(0.0032)
Prov. and birth year FE	yes	yes	yes	yes
Mother age at birth & single family & gender FE	yes	no	yes	yes
Time trend	no	no	no	yes

Note: Child income at ages 30 to 36, parental income when child is 15 to 19
Two-way clustered (mother year of birth and place of birth) standard errors in parentheses
***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$

Robustness checks

First stage (1/2): dummies for legal entry & dropout ages

Dependent variables: % of mothers with education level	High school (1)	Bachelor (2)	High school (3)	Bachelor (4)
Legal entry age = 6	0.9525**	-0.1585	0.9279***	-0.313***
	(0.4096)	(0.1219)	(0.3514)	(0.115)
Legal entry age = 7	0.5032*	-0.2477	0.2326*	-0.2399
	(0.289)	(0.1858)	(0.1327)	(0.1632)
Legal entry age = 8	1.0604***	-0.6862***	0.7617	-0.9046***
	(0.2778)	(0.108)	(0.4865)	(0.1821)
Legal dropout age = 14	0.5877	0.0075	1.19812	0.0210
	(0.447)	(0.0534)	(0.7642)	(0.1772)
Legal dropout age = 15	1.8424***	-0.4583***	2.8768***	-0.5222**
	(0.5335)	(0.1587)	(0.6474)	(0.2103)
Legal dropout age = 16	0.7063	-0.3231	0.96301	-0.5583*
	(0.655)	(0.217)	(0.8924)	(0.3204)
Fixed effects				
Child year of birth & province match	yes	yes	yes	yes
Mother age at birth & single family & child gender	no	no	yes	yes
F-stat: test of excluded instruments	233.05	.	.	41.88
F-stat: Sanderson-Windmeijer multivariate	50.51	8.42	13.93	24.23

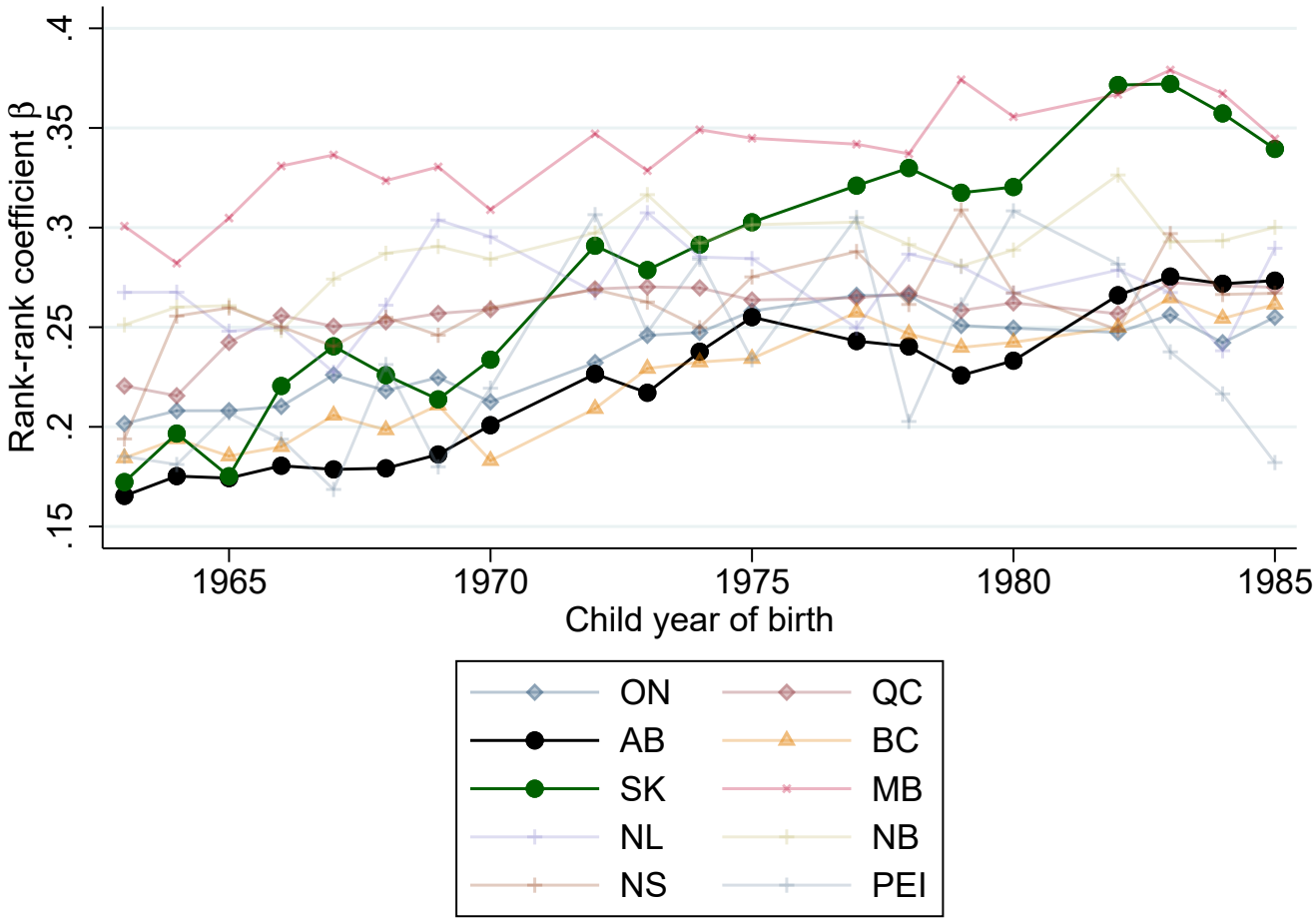
Note: Child income at ages 30 to 36, parental income when child is 15 to 19
Two-way clustered (mother year of birth and place of birth) standard errors in parentheses
***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$

First stage (2/2): dummies for legal instruction time

Dependent variables: % of mothers with education level	High school (1)	Bachelor (2)	High school (3)	Bachelor (4)
Legal instruction time = 7	1.9242***	-0.5146***	2.6026***	-0.8175***
	(0.5951)	(0.1754)	(0.6138)	(0.2244)
Legal instruction time = 8	1.6332***	-0.3599***	2.3063***	-0.2732***
	(0.6354)	(0.1406)	(0.6804)	(0.0704)
Legal instruction time = 9	1.7561***	-0.7424***	2.3757**	-0.8718***
	(0.5335)	(0.2205)	(0.9402)	(0.1618)
Legal instruction time = 10	1.4969	-0.0265	2.1909*	0.2960
	(0.9471)	(0.2479)	(1.2788)	(0.1942)
Fixed effects				
Child year of birth & province match	yes	yes	yes	yes
Mother age at birth & single family & child gender	no	no	yes	yes
F-stat: test of excluded instruments	159.35	15.2	16.02	35.55
F-stat: Sanderson-Windmeijer multivariate	31.92	3.57	15.11	.

Note: Child income at ages 30 to 36, parental income when child is 15 to 19
Two-way clustered (mother year of birth and place of birth) standard errors in parentheses
***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$

Variation in beta by province



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Robustness checks

Previous results robust to

- changes in parental income definition
  - child 15 to 19 years old (main)
  - child 10 to 19 years old
  - mother aged 45 to 49
  - mother aged 40 to 49
- changes in child income definition
  - 30 to 36 (main)
  - 25 to 29
  - 27 to 31
  - 30 to 34
- using linear instruments
- clustering by child year of birth and province of match

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