Estimating intergenerational income mobility in New Zealand using data from a birth cohort study

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Aim and rationale

- Estimate degree of intergenerational income mobility/persistence between parents and their offspring in New Zealand

- This presentation:

  - *Quantifies* mobility/persistence (doesn't examine pathways/mechanisms)

  - Estimates mobility for son-father pairs only

- Intergenerational mobility is an (imperfect) indicator of equality of opportunity

Concepts of intergenerational mobility

- Absolute mobility:

  - *Scalar*: change in income amounts (marginal distributions) between parents and offspring, ignoring changes in ranks

- Relative mobility:

  - *Positional*: change in ranks between parents and offspring (the copula), ignoring changes in marginal distributions

Measurement of intergenerational mobility

- Standard approach to measuring association between offspring's and parents' incomes is to apply OLS to

$$Y_{ij}^{\text{offspring}} = \alpha + \beta Y_i^{\text{parent}} + Age^{\text{parent}} + Age^{2\,\text{parent}} + \varepsilon_i \tag{1}$$

$Y_{ij}^{\text{offspring}}$ = log of lifetime average income of offspring j in family i

Y_i^{parent} = log of lifetime average income of parent in family i

ε_i = error term capturing factors $\perp$ to Y_i^{parent}

- β = intergenerational income elasticity (IGE) = 'regression to the (geometric) mean'

Measurement of intergenerational mobility

- The IGE:

  - Is a measure of income *persistence*:

    high IGE = high persistence (low mobility)

    low IGE = low persistence (high mobility)

  - Empirically, usually lies between zero (no relationship between incomes of parents and offspring) and 1 (offspring incomes are determined by parents' incomes)

  - Captures *total* relationship (direct and indirect effects, not causal)

  - Captures changes in marginal distributions *and* changes in ranks (i.e., doesn't distinguish between absolute and relative mobility)

Measurement of intergenerational mobility

- Spearman's rank correlation measures association between parents' position and offspring's position in income distribution:

$$R_{ij}^{\text{offspring}} = \alpha + \rho R_i^{\text{parent}} + \varepsilon_i \qquad (2)$$

$R_{ij}^{\text{offspring}}$ = rank of lifetime average income of offspring j in family i

R_i^{parent} = rank of lifetime average income of parent in family i

ε_i = error term capturing factors $\perp$ to R_i^{parent}

- ρ = rank correlation = 'rank-rank slope'

Empirical evidence

- Vast literature, but consensus on two findings:

  1. Measurement error now better recognised and matters a lot to estimates of intergenerational mobility

     - Attenuation bias from transitory shocks (Solon, 1992; Mazumder, 2005)

     - 'Lifecycle bias' from heterogeneous income profiles (Jenkins, 1987; Haider & Solon, 2006; Nybom & Stuhler, 2016)

  2. Intergenerational mobility higher in Nordic countries (Denmark, Finland, Norway, Sweden) and Canada than UK and US (Björklund & Jäntti, 2009; Blanden, 2013; Corak, 2013; OECD, 2018; Solon, 2002)

- Only two New Zealand studies (Gibbons, 2010; Andrews & Leigh, 2008)

- I estimate intergenerational earnings mobility using data from a longitudinal study tracking sons and fathers over time, and I construct a proxy for their 'permanent earnings'

Christchurch Health and Development Study

- Longitudinal study of birth cohort of 1,265 children (635 males, 630 females, 14 sets of twins) born in 1977 in Christchurch, New Zealand

- Cohort studied on 23 occasions since birth, most recently at ages 35 and 40

- Cohort is mostly New Zealand European (86%)

- Data collected from multiple sources: parent interviews, child assessments, teacher questionnaires, administrative records

- Parent interviews conducted annually from birth to age 16 with the *main custodial parent/caregiver at each age*

- Parent reported their earnings, and those of their spouse, over cohort's childhood

- Offspring reported their own earnings in adulthood

- Attrition: loss to follow-up over time and small but significant under-representation of socially disadvantaged families

Christchurch Health and Development Study
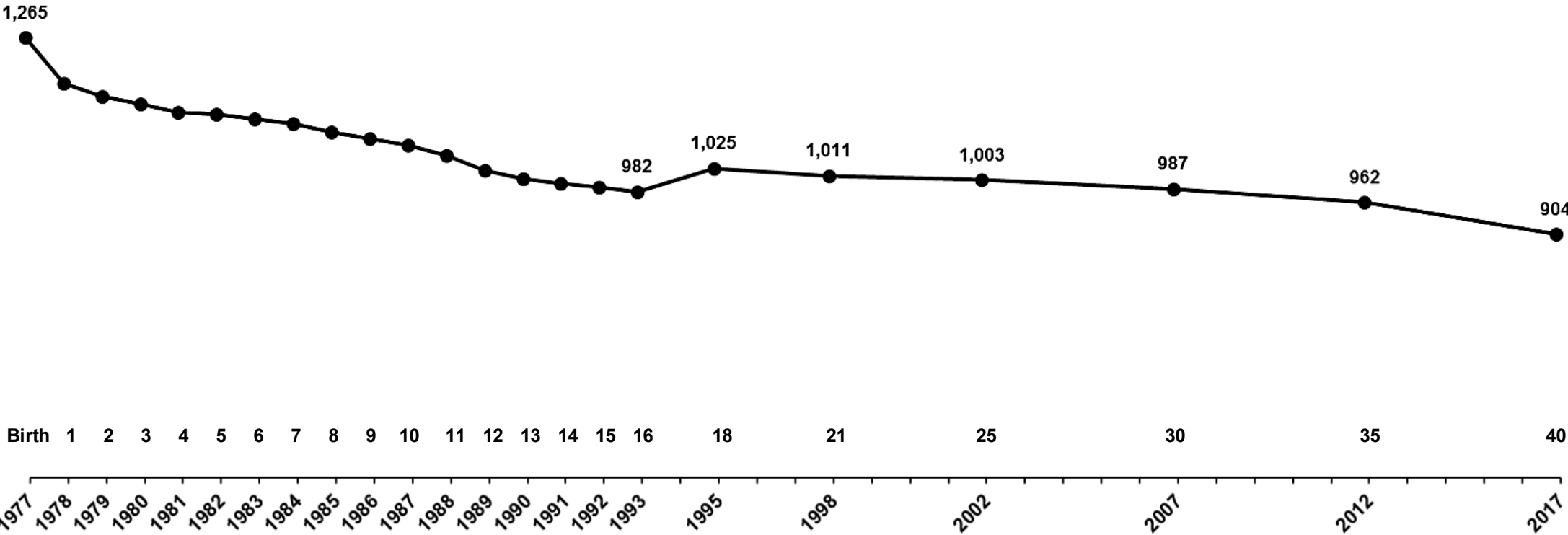
Christchurch Health and Development Study
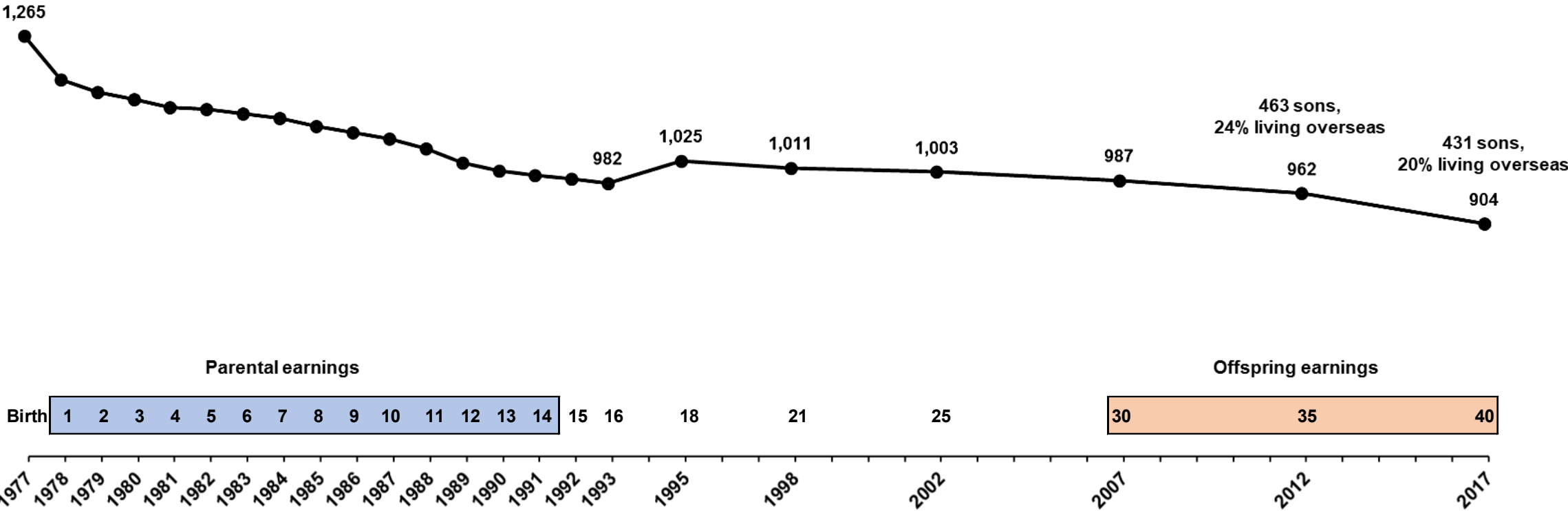
Earnings data in CHDS

- Data collected on parents' and offspring's weekly earnings:

  - 'Average' weekly earnings after-tax from all sources of employment

  - Parents' earnings banded (25 to 31 bands) with open-ended top category

  - Offspring's earnings collected in actual amounts and, for the overseas-resident, converted to NZD using purchasing power parity conversion

  - Self-reported (mother-reported in the case of fathers)

- Parents assigned mid-point of their band

- Then deflate earnings to 2012 Q3 dollars using the CPI

- Then recode zero earnings to $1

Proxying for permanent earnings

- I use Mazumder's (2016) method of taking a time average centred on an age at which current income is known to be representative of lifetime average income

- No New Zealand studies estimating this age, but studies in other countries have found:

Country	Age window	Study
USA	"between early thirties and mid-forties"	Haider and Solon (2006)
Canada	"early forties"	Chen et al. (2017)
Norway	"late thirties and early forties"	Nilsen et al. (2012)
Germany	30-40	Brenner (2010)
Sweden	34-40	Böhlmark and Lindquist (2006)
Sweden	"around age 33"	Nybom and Stuhler (2016)

- My proxy for permanent earnings will take a multiyear average of earnings (else, for son's only, a single-year observation) *centred on age 35*

Proxying for fathers' permanent earnings

Proxy for permanent earnings:

9 observations (31-39 years)

else

7 observations (32-38 years)

else

5 observations (33-37 years)

else

3 observations (34-36 years)

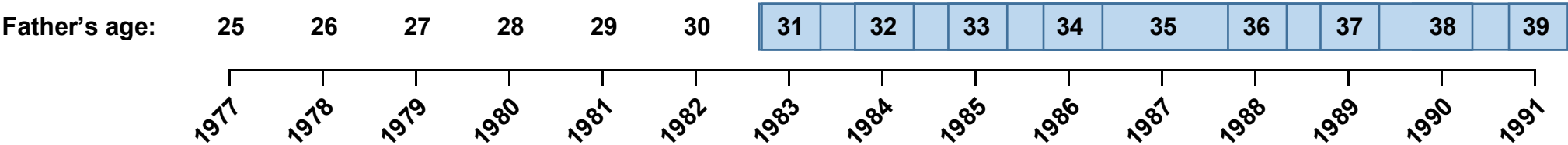*else*

2 observations (31+39 years)

else

2 observations (32+38 years)

else

2 observations (33+37 years)

else

2 observations (34+36 years)

Father's age: 25   26   27   28   29   30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 |

1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991

Proxying for fathers' permanent earnings

Year father born	Proportion (%) born in each year	Father's age	Year of follow-up and son's age															
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
			1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
1960			17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1959			18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1958	7.2		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1957			20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1956			21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1955	3.4		22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1954	5.8		23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
1953	4.9		24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
1952	6.6		25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
1951	8.3	Father's age	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1950	8.2		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
1949	8.4		28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
1948	7.9		29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
1947	7.0		30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
1946	6.2		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
1945	5.6		32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
1944	3.5		33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
1943			34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
1942			35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
1941			36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
….	17.0		….														
1918			59	60	61	62	63	64	65	66	67	68	69	70	71	72	73
1917			60	61	62	63	64	65	66	67	68	69	70	71	72	73	74
1916			61	62	63	64	65	66	67	68	69	70	71	72	73	74	75

- On average, fathers' proxies are averaged over 6.2 observations

Proxying for sons' permanent earnings

- On average, sons' proxies are averaged over 2.8 observations

Proxy for permanent earnings:
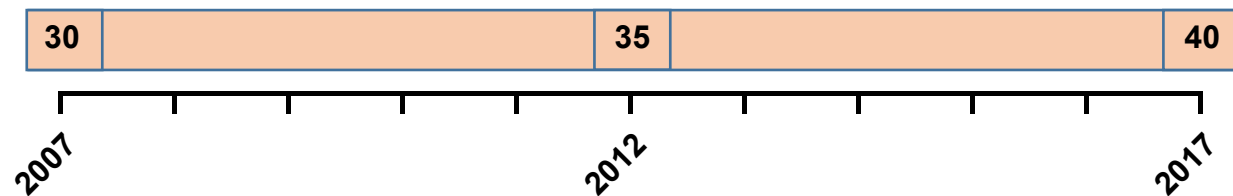
3 observations (30-40 years)
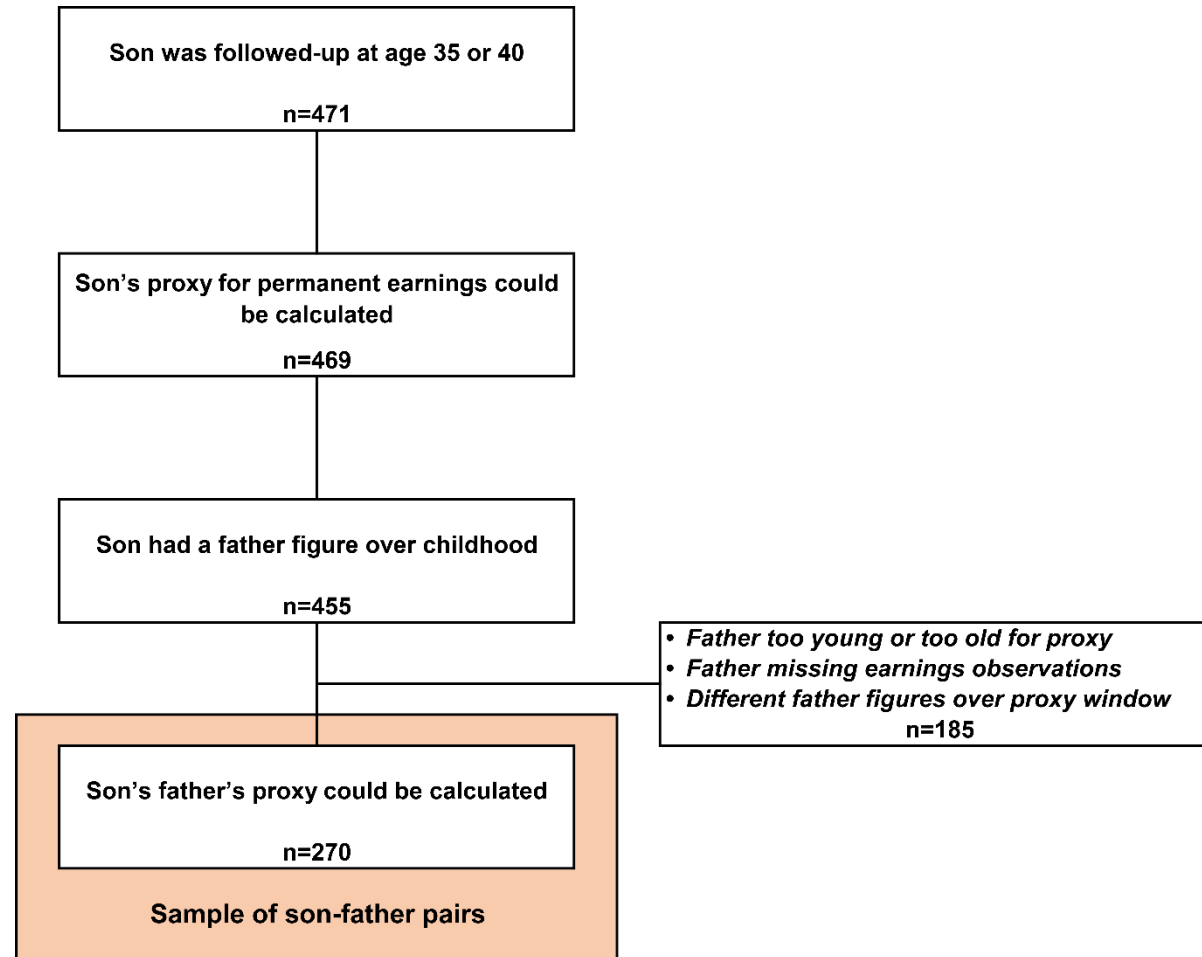
else

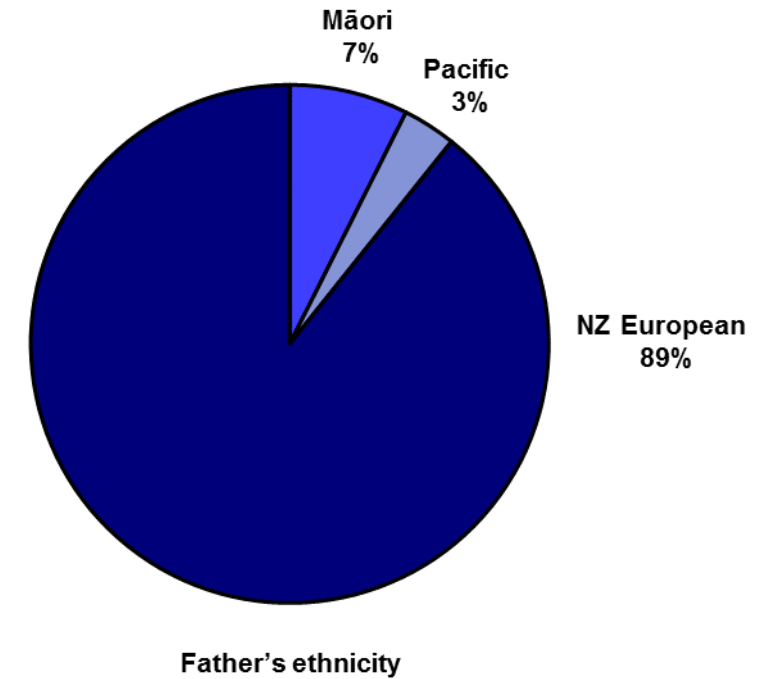**2 observations (30+40 years)**
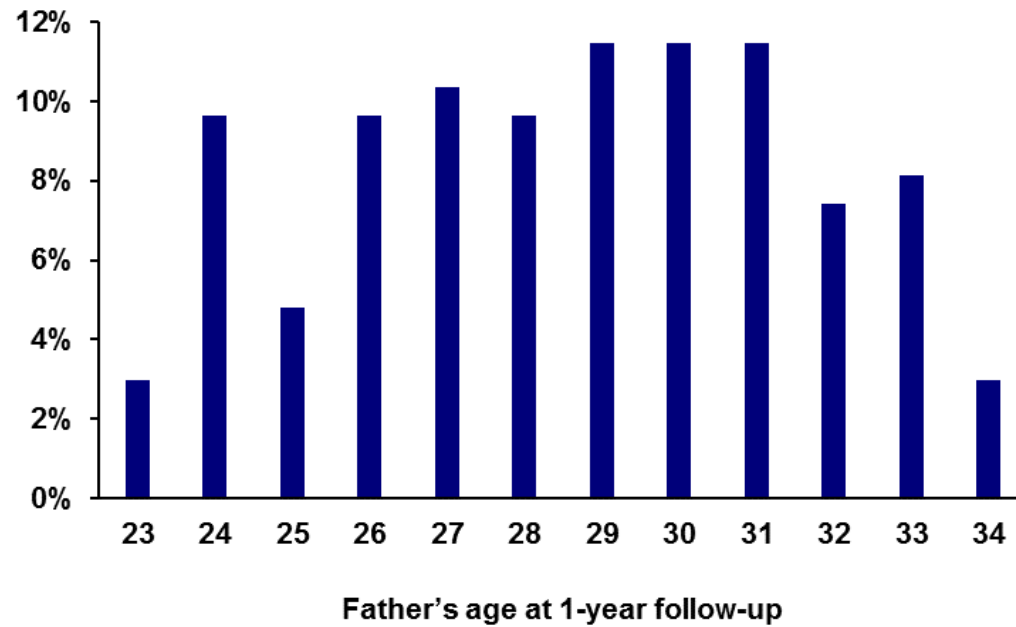
else

1 observation (35 years)

Son's age: | **30** | | **35** | | **40**

2007   2012   2017

Sample selection

Sample descriptives - fathers

Father's age at 1-year follow-up

Father's ethnicity

Sample descriptives - fathers

Adoptive father
4%

Birth father
96%
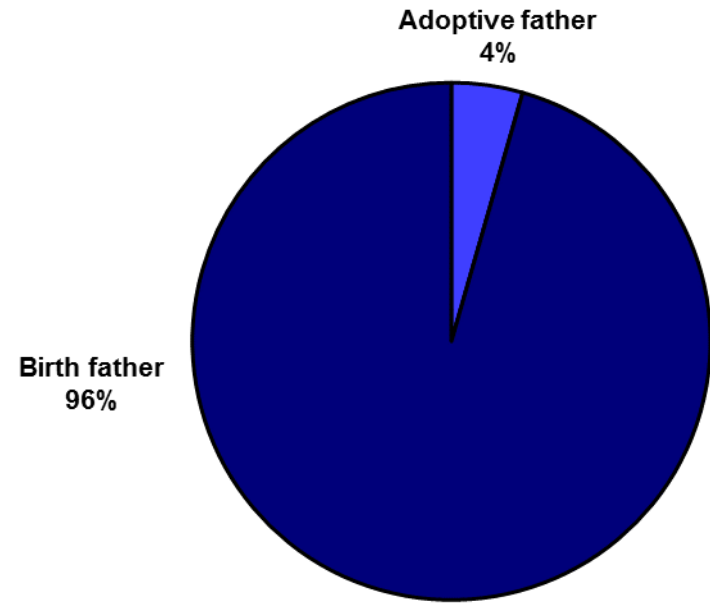
Father's relationship to son at 1-year follow-up

Tertiary qualification
22%

No formal qualification
38%

Secondary school qualification
40%
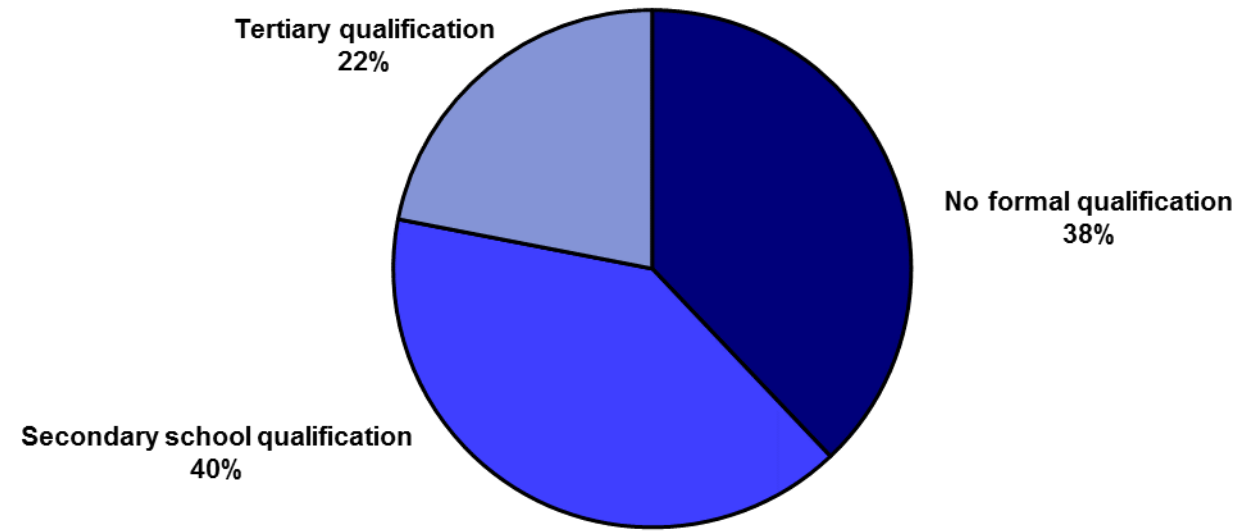
Father's highest qualification at 1-year follow-up

Sample descriptives - sons
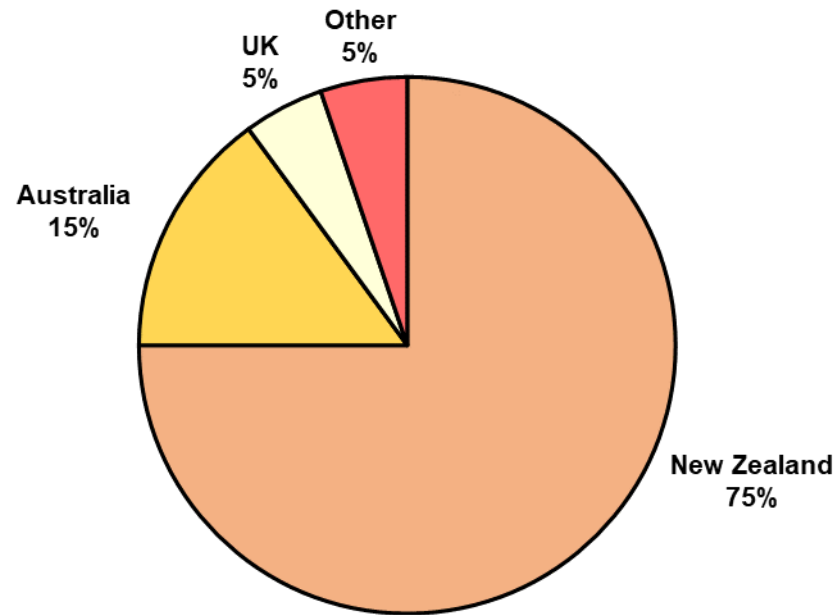

Son's country of residence at 35-year follow-up

- Other 5%
- UK 5%
- Australia 15%
- New Zealand 75%
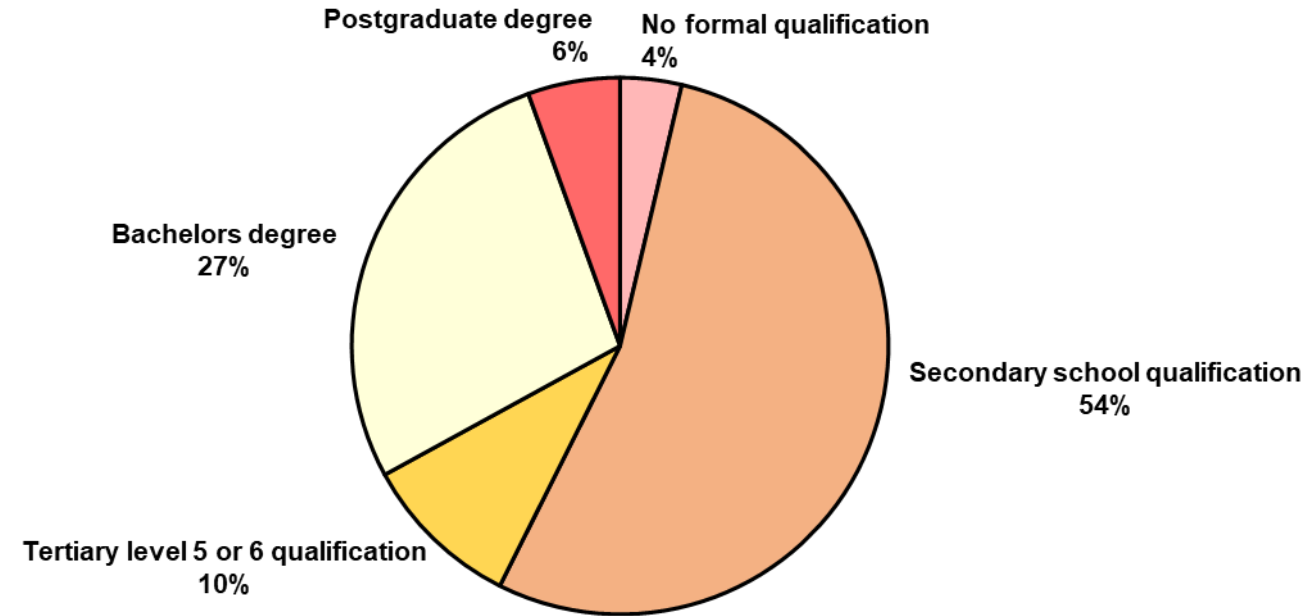
Son's highest qualification by 35-year follow-up

- Postgraduate degree 6%
- No formal qualification 4%
- Bachelors degree 27%
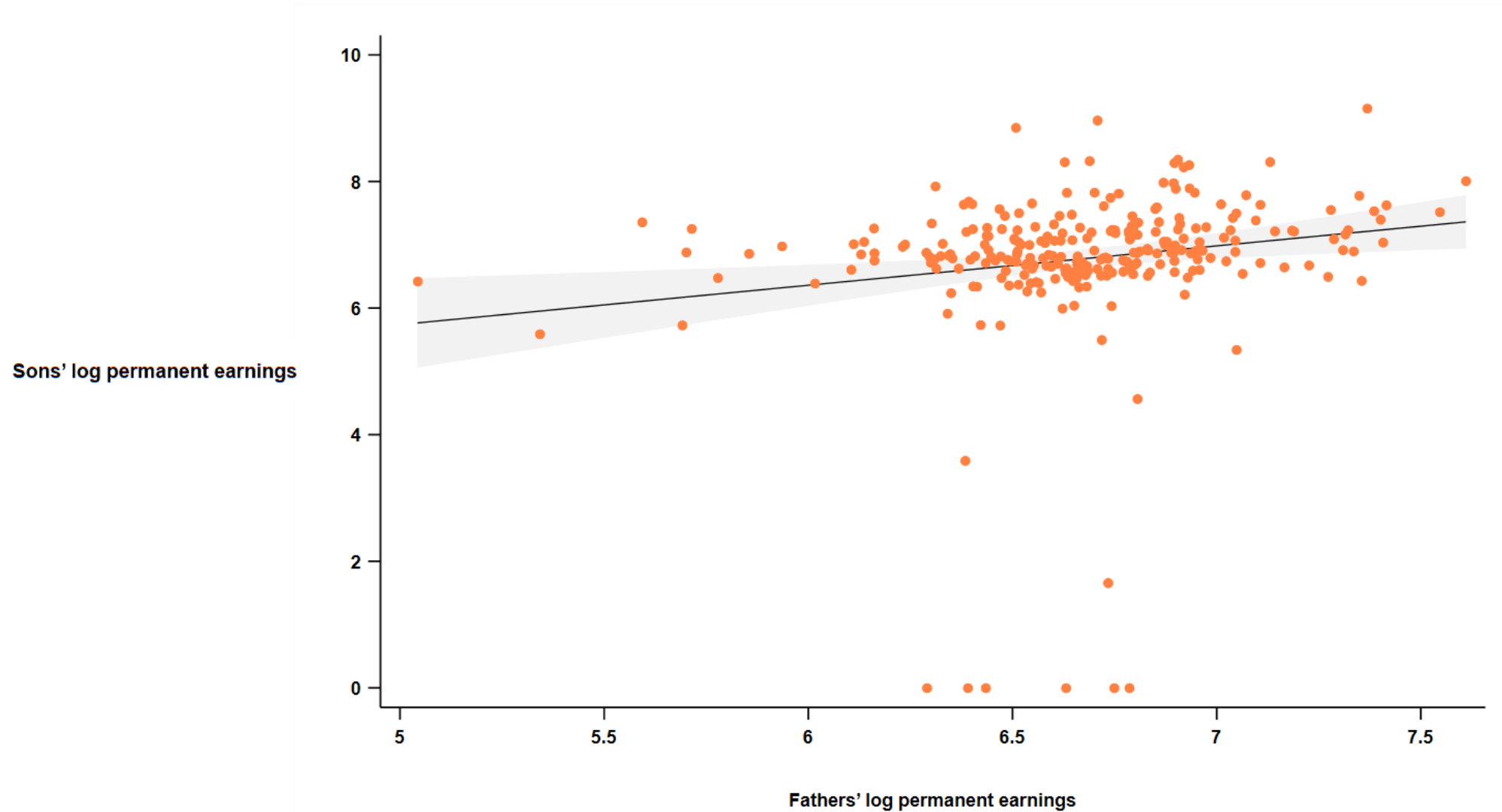- Secondary school qualification 54%
- Tertiary level 5 or 6 qualification 10%

Sons' and fathers' proxies for permanent earnings
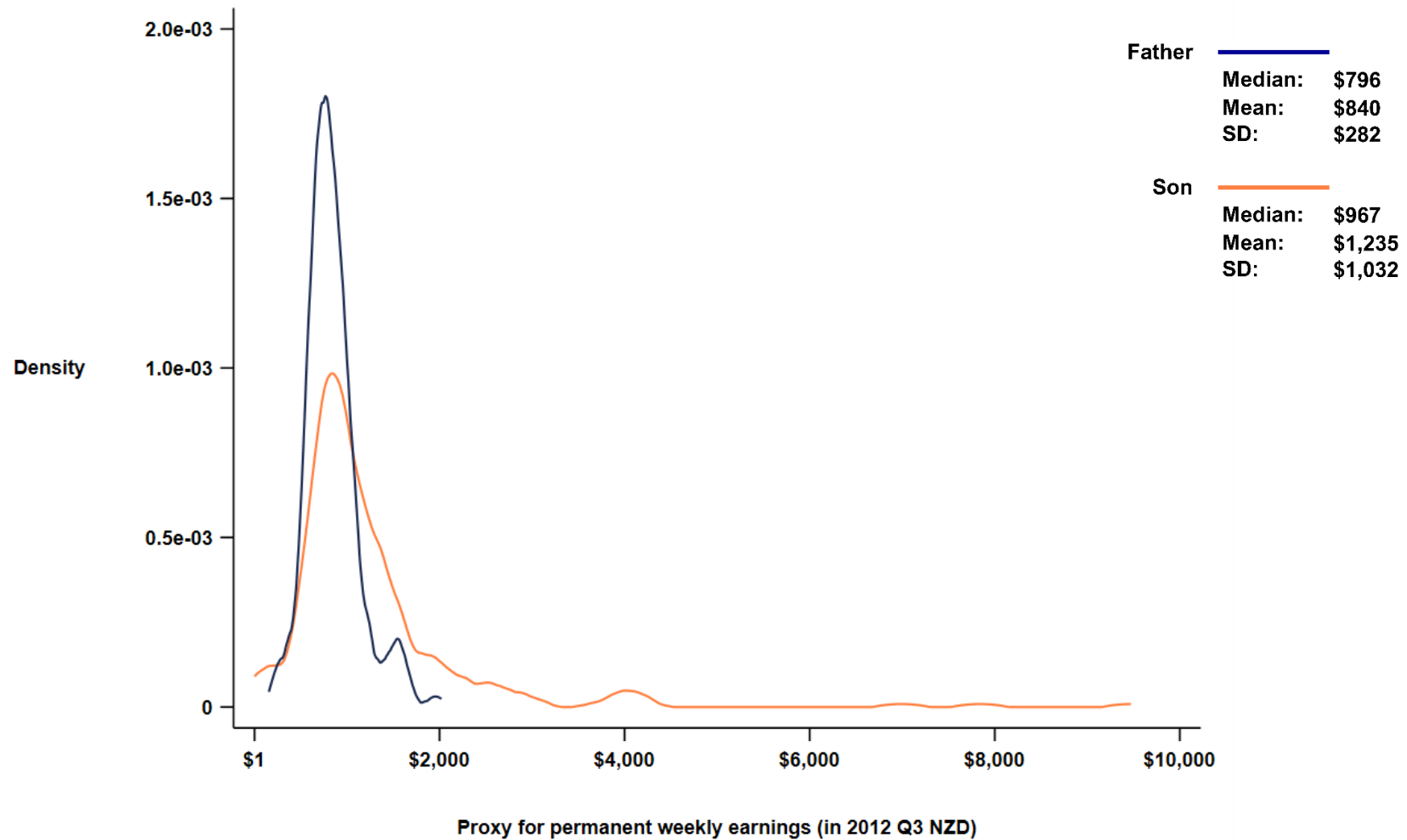
Sons' and fathers' log permanent earnings
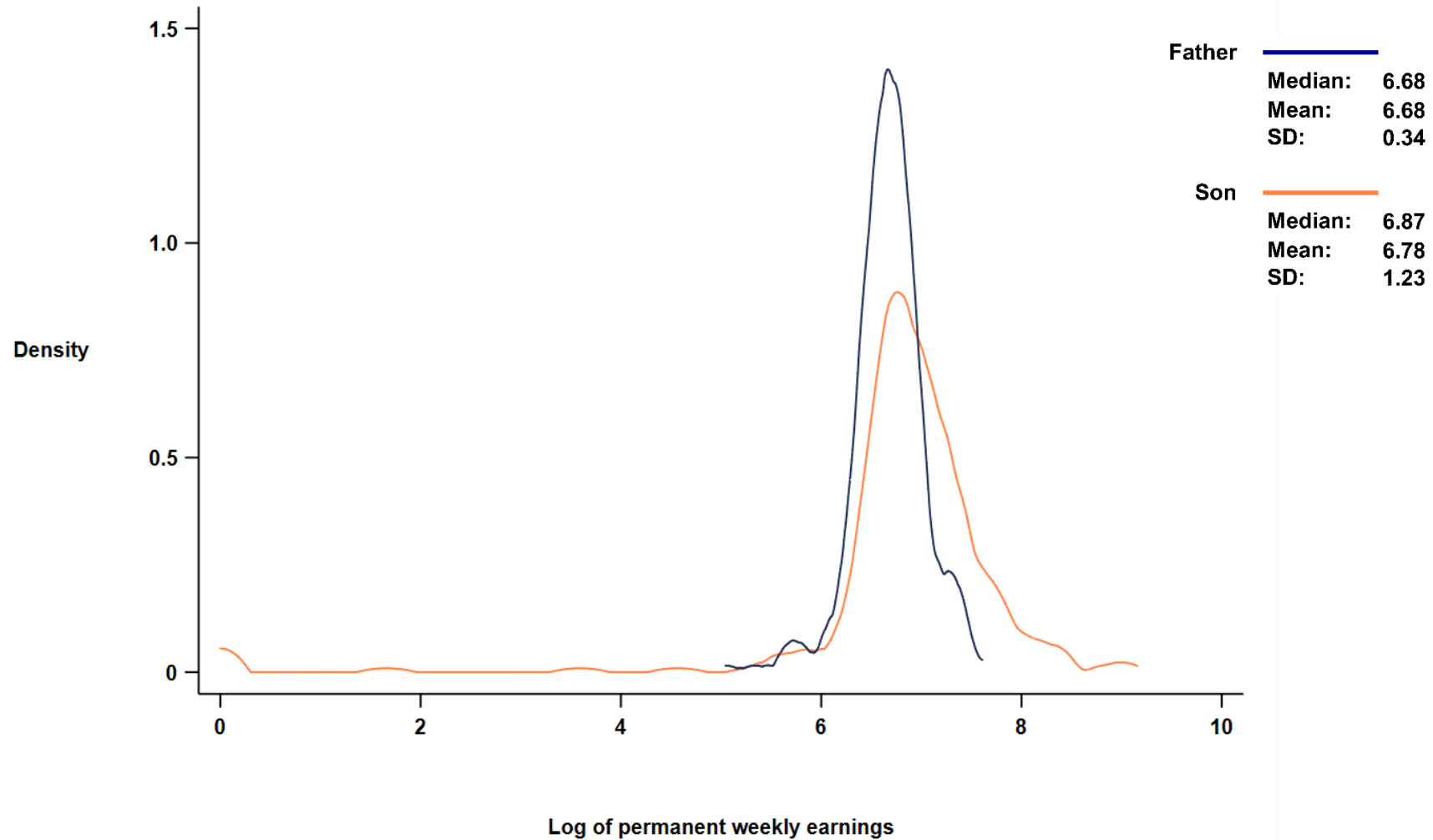
Sons' versus fathers' log permanent earnings
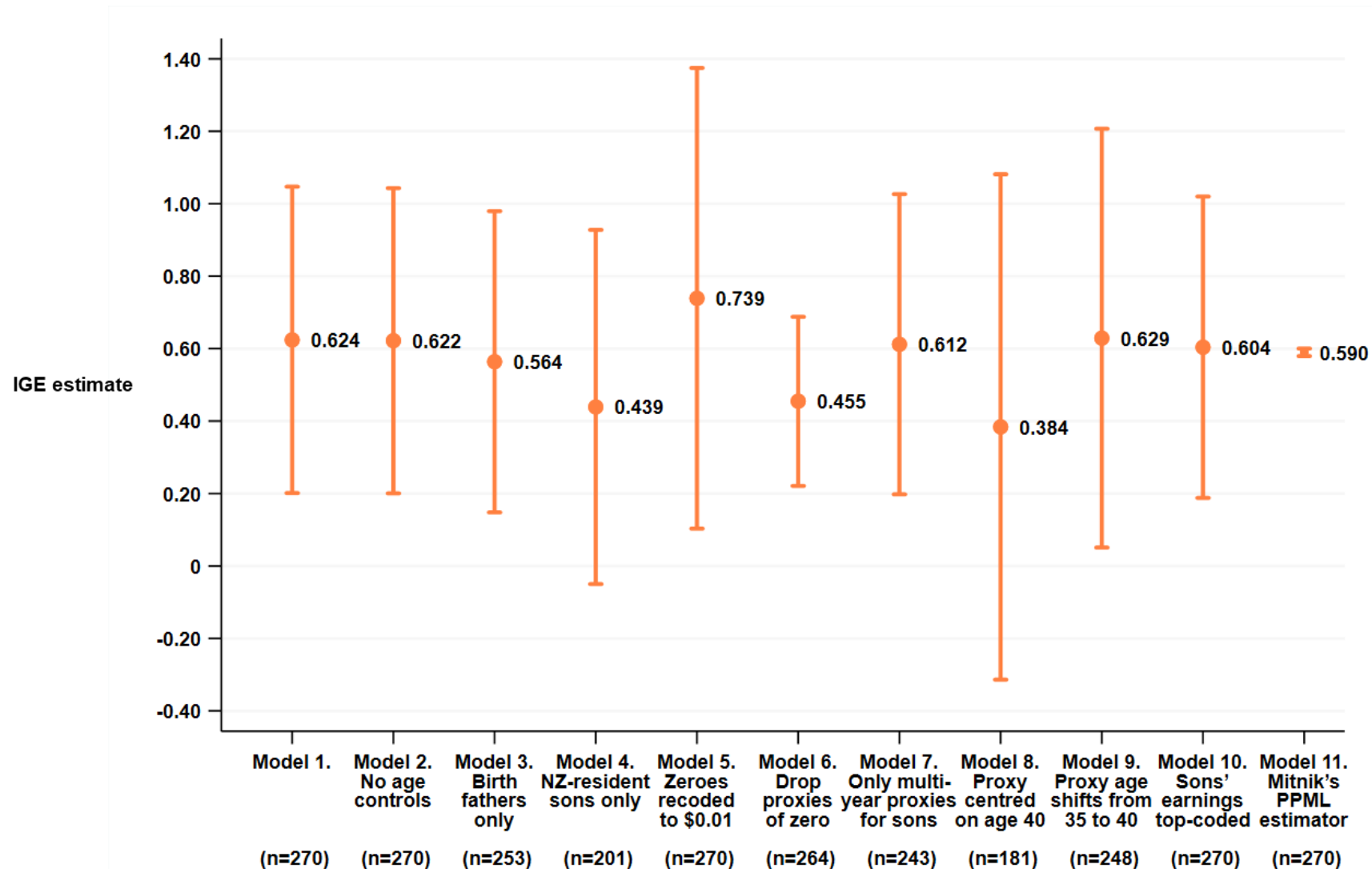
Estimating the IGE

Dependent variable: Son's log permanent earnings

Father's log permanent earnings	**0.624 ****
	(0.215)
Father's age at son's birth	**0.120**
	(0.477)
Father's age squared	**-0.002**
	(0.008)
Constant	**1.178**
	(6.837)
R-squared	**0.0326**
Number of observations	**270**

Robust standard errors in parentheses
****p*** <0.001   *******p*** <0.01   ******p*** <0.05**
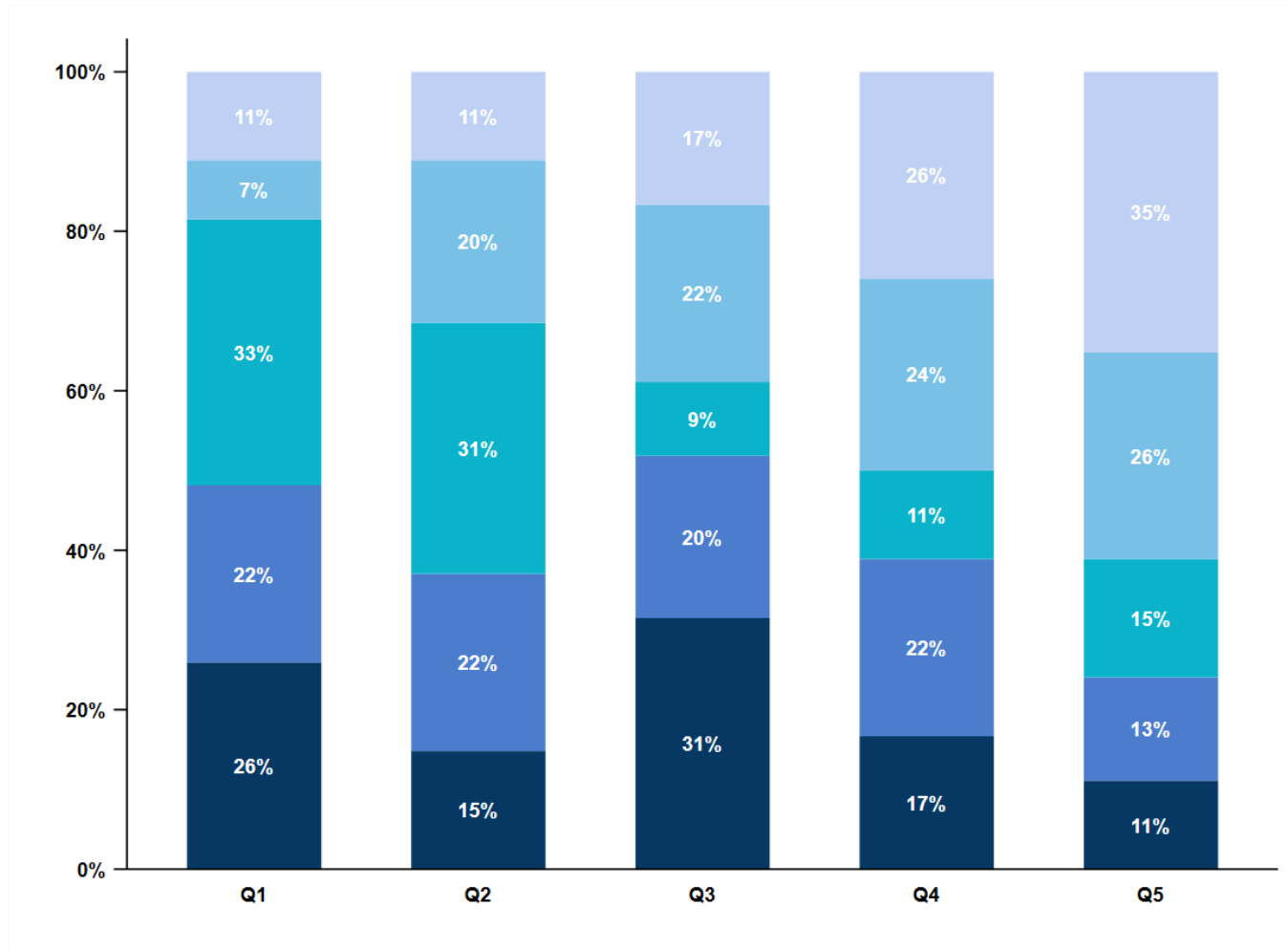
IGE robustness checks

IGE cross-national comparison
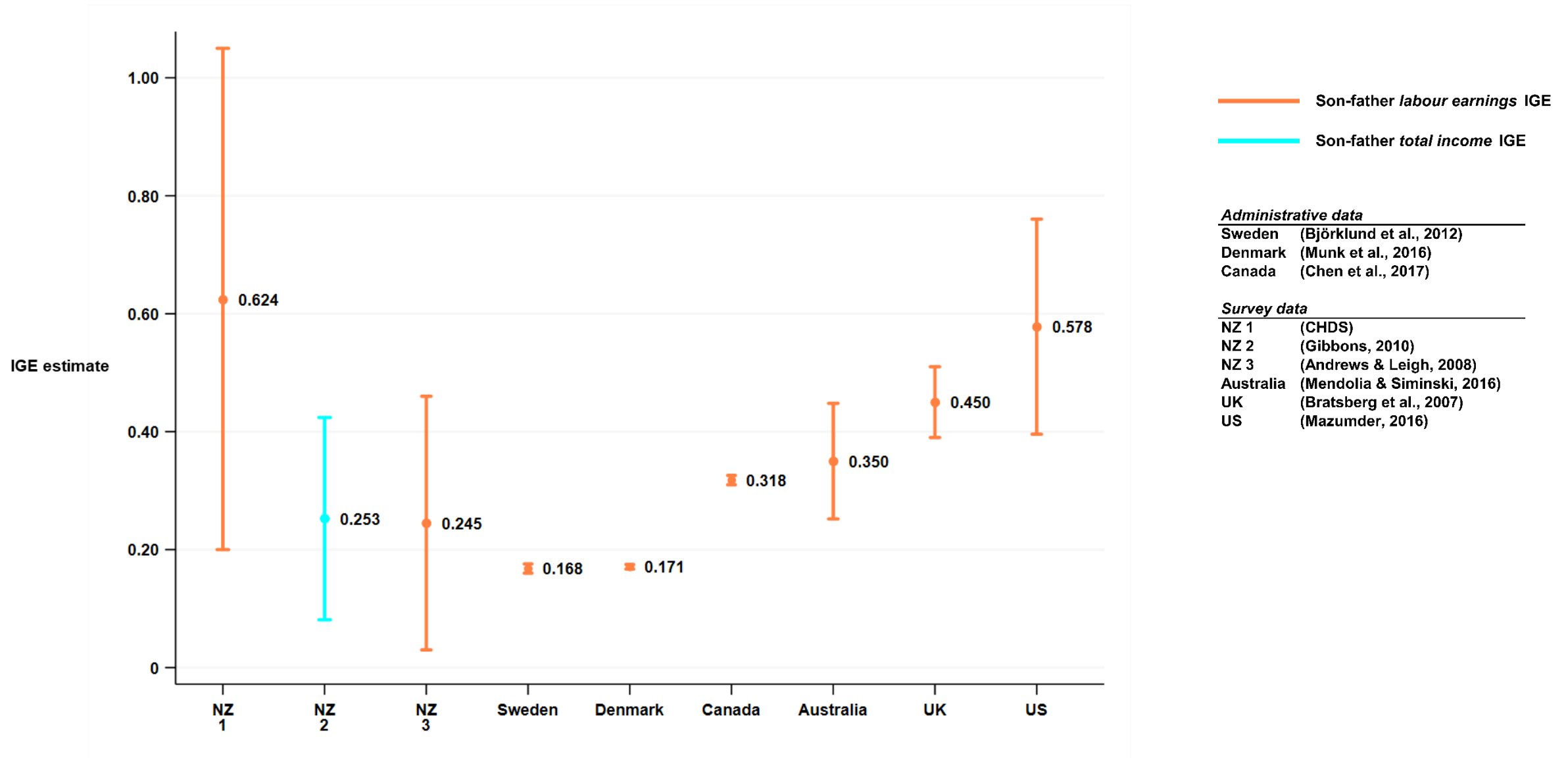
Graphed transition matrix of rank mobility

Estimating the rank correlation (with quintiles)

Dependent variable: Son's quintile of permanent earnings

Father's quintile of permanent earnings	0.241 ***
	(0.059)
Constant	2.278 ***
	(0.197)
R-squared	0.0580
Number of observations	270

Robust standard errors in parentheses

***$p < 0.001$ **$p < 0.01$ *$p < 0.05$
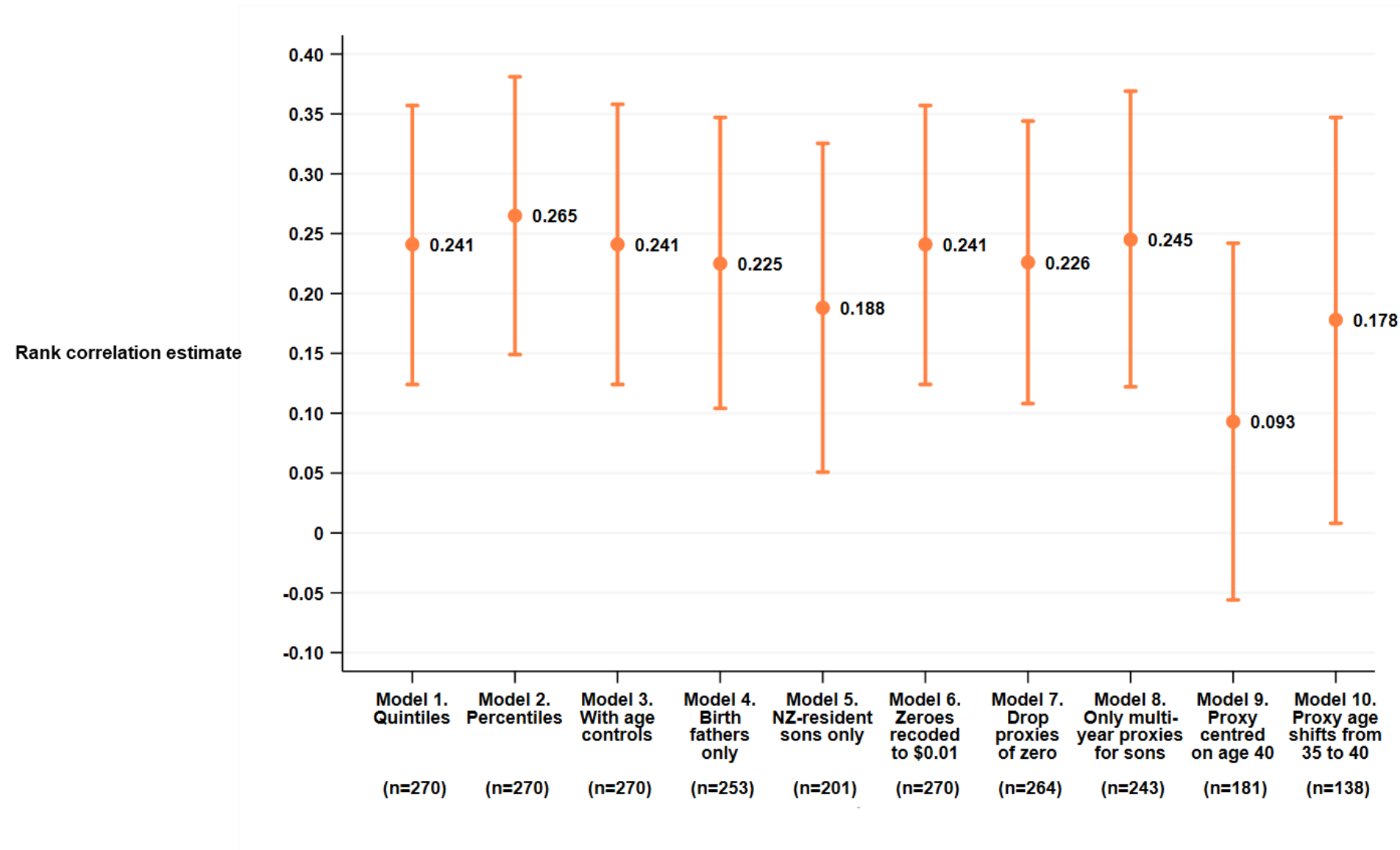
Estimating the rank correlation (with percentiles)

Dependent variable: Son's percentile of permanent earnings

Father's percentile of permanent earnings	0.265 ***
	(0.059)
Constant	36.969 ***
	(3.421)
R-squared	0.0701
Number of observations	270

Robust standard errors in parentheses
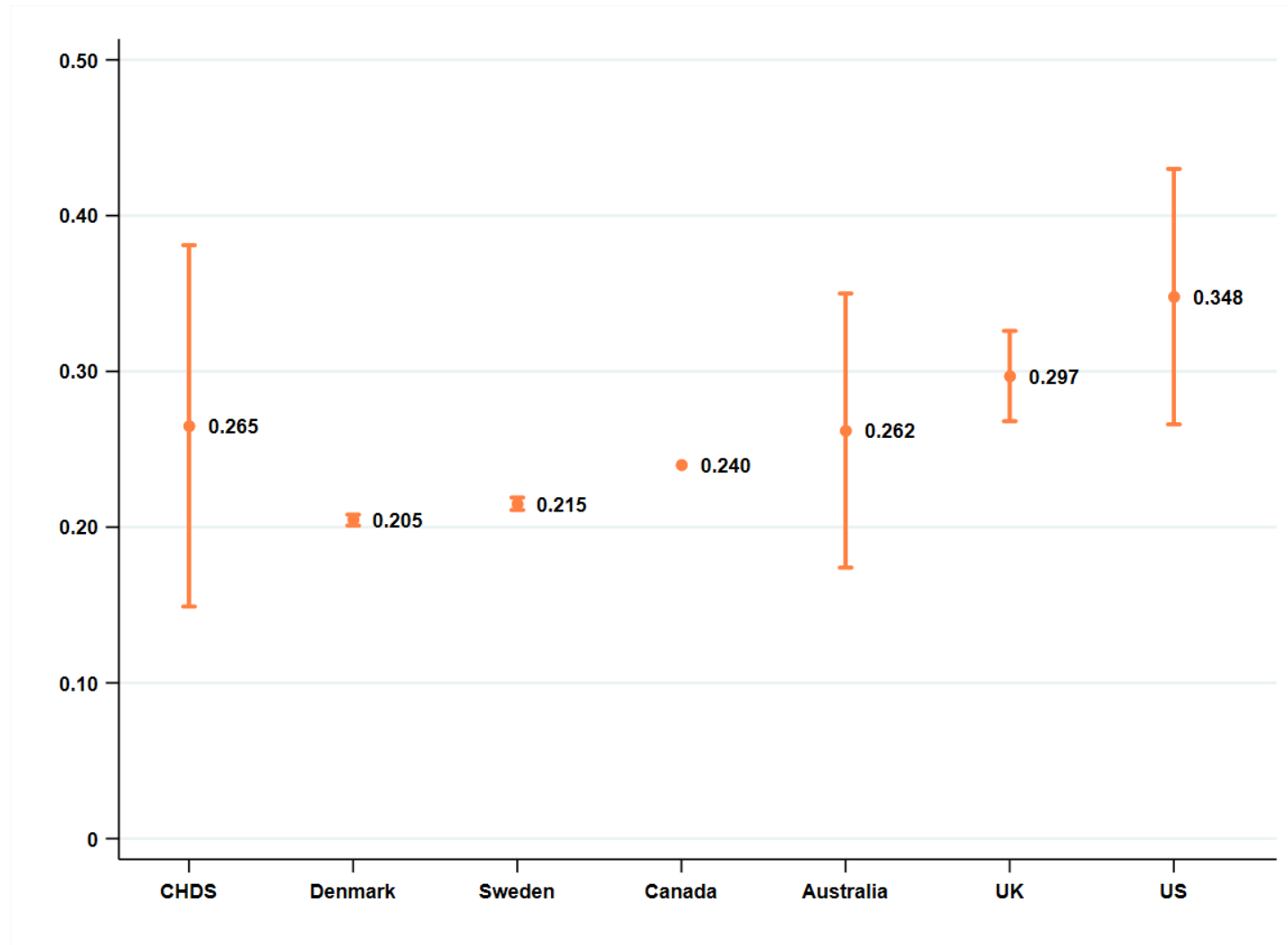
***$p<0.001$ **$p<0.01$ *$p<0.05$

Rank correlation robustness checks

Rank correlation cross-national comparison

Administrative data
Denmark   (Landersø & Heckman, 2017)
Sweden   (Bratberg et al., 2017)
Canada   (Corak et al., 2014)

Survey data
CHDS
Australia   (Murray et al., 2018)
UK   (Gregg et al., 2017)
US   (Mazumder, 2016)

Conclusions

- Intergenerational earnings persistence between fathers and sons in the CHDS sample is high when measured by the IGE, but low when measured by the rank correlation

- Implies considerable re-ranking (high relative mobility) but more muted income growth (low absolute mobility)?

- Estimates may not be generalisable as sample is unrepresentative of population

- Cross-country comparisons are inconclusive

- CHDS dataset may be more useful in understanding mechanisms

- Next step: decompose IGE into pathways through which parental income is 'transmitted' to offspring