Dynastic Human Capital, Inequality and Intergenerational mobility

Adrian Adermon [1 2] Mikael Lindahl [1 2] Mårten Palme [3]

[1]Uppsala University

[2]UCLS

[3]Stockholm University

Family and Education Workshop, Hawaii, January 2015

Introduction

Research agenda

- Persistence of inequality across generations

Research questions

- What does the extended family add to the intergenerational association in human capital?
- What are the relative contributions of different parts of the family?
- What is the degree of long-run social mobility in Sweden?

Motivation

- High persistence entails limited equality of opportunity
- Much research on parent-child correlation
- Not much known about impact of extended family
- If important, parent-child correlation underestimates true persistence

Motivation, cont.

Suppose that we estimate the model

$$y_j^c = \beta_0 + \beta_1 y_j^p + \epsilon \tag{1}$$

using a random sample of families (j), with data available on log lifetime earnings for both children (c) and parents (p).

If we we can measure lifetime earnings perfectly, the resulting estimate of β_1 will be an unbiased measure of the strength of the association between the lifetime earnings of parents and children.

Is this enough to characterize the transmission of inequality across generations?

What if there are multigenerational effects through

- Generation specific shocks
- Horizontal and vertical influence of ancestors

Contributions

Several contributions to literature on intergenerational persistence:

1. Estimate the degree of long-run social mobility in Sweden
2. Decompose intergenerational persistence into contributions from parents and extended family
3. Incorporating the effects of other proxies of human capital
4. The degree of intergenerational persistence within and between dynasties

Related literature

Theoretical background

- Literature on group effects (relates to sociological literature on class and racial stratification)
- Literature on social and ethnic capital (Coleman, 1988; Borjas, 1992)
- Literature on multigenerational effects, either direct or indirect influence (Becker and Tomes, 1979, 1986; Clark, 2014; Solon, 2014; Nybom and Stuhler, 2014, Stuhler, 2014)

Empirical findings

- Regression to the mean slower than predicted by parent-child (AR1) models (Lindahl et al, 2015; Clark, 2014)
- Non-negligible first and second cousin correlations (Hällsten, 2013)
- Some evidence of an independent effect of grandparents (Adermon, 2013; Zeng and Xie, 2014)

Data

High quality Swedish register data (utbildningsdatabasen)

- Multigeneration register covering full population links parents to children
- Observe child cohorts born 1932 or later
- Construct extensive family trees up to great grandparents, and hence second cousins
- 9th grade GPA observed for 1972–1994 cohorts — restrict children to these ages
- Registers containing information on education, income and occupation

Final estimation sample of +2 million children

Key variables

- For child generation: GPA: percentile rank by cohort, 0–100
- Years of schooling: 7–20 years: percentile rank by cohort and gender, 0–100
- Average income between ages 30-60, percentile rank by cohort and gender, 0–100
- Occupational/social stratification index: constructed 0-100

Summary statistics

	Years of schooling	Birth year	Obs./ind.	Non-miss. obs.
Child (GPA)	49.583 (28.585) [0–100]	1983.396 (6.719) [1972–1994]		2,182,402
Parents	11.773 (2.181) [7–20]	1954.075 (7.663) [1914–1980]	1.988 (0.109) [1–2]	2,182,402
Grandparents	8.982 (1.918) [7–20]	1926.425 (8.364) [1908–1962]	3.202 (1.088) [0–4]	2,182,402
Great grandparents	7.614 (1.188) [7–19]	1915.809 (3.535) [1905–1941]	0.596 (1.303) [0–8]	2,182,402
Aunts/uncles	11.626 (1.890) [7–20]	1954.254 (7.633) [1932–1980]	4.246 (2.451) [0–27]	2,143,630
Spouses of aunts/uncles	11.698 (1.903) [7–20]	1954.162 (8.931) [1911–1984]	3.638 (2.160) [0–24]	2,101,363
Parents' cousins	12.246 (1.276) [7–20]	1968.488 (4.490) [1948–1984]	9.743 (7.686) [0–83]	725,777
Parents' aunts/uncles	10.038 (1.951) [7–20]	1942.514 (4.638) [1932–1980]	4.961 (3.683) [1–40]	743,230

Intergenerational regressions I: persistence between dynasties

$$y_{jd}^{c} = \beta_0 + \beta_1 y_{jd}^{p} + e_{jd} \tag{2}$$

$$y_{jd}^{c} = \beta_0 + \beta_2 y_{d} + e_{jd} \tag{3}$$

y_{jd}^{c} is child's outcome (ninth grade GDP)

y_{jd}^{p} is a measure of parent's outcome

y_d is an average of y for the dynasty in the parent's generation (parents, siblings of parents, cousins of parents)

The second equation is equivalent to regressing the first equation using a full set of dynasty fixed effects as instruments

Dynastic regressions

	Schooling		Schooling and income		Schooling, income and social stratification	
	(1)	(2)	(3)	(4)	(5)	(6)
Parents	0.458		0.574		0.594	
	(0.001)		(0.001)		(0.001)	
Dynasty		0.568		0.698		0.716
		(0.001)		(0.001)		(0.001)
R^2	0.158	0.156	0.175	0.166	0.173	0.164
Obs.	2,273,658	2,274,889	2,273,658	2,274,889	2,273,658	2,274,889

Intergenerational regressions II: decomposing the influence of the extended family and of multiple proxies

multigenerational effects (vertical influence)+horizontal influence

$$y_{jd}^{c} = \beta_0 + \beta_1 y_{jd}^{p} + \beta_2 y_{jd}^{gp} + \beta_3 y_{jd}^{uncle} + ... + e_{jd} \qquad (4)$$

Also add multiple proxies for human capital for all ancestors

We do all this in a framework proposed by Lubotsky Wittenberg (2006)

Multiple proxies

We can view the three outcome measures for the different parts of the family as a set of proxy variables for a single latent variable that is transmitted across generations. If the true model we want to estimate is $y = \beta x^* + \varepsilon$, but we only observe a set of J proxies $x_j = \rho_j x^* + u_j$, Lubotsky and Wittenberg (2006) show that the most efficient way to use the information in the proxies is to estimate the regression

$$y = \sum_{j=1}^{J} b_j x_j + \nu, \tag{5}$$

and then take the weighted average

$$b^P = \sum_{j=1}^{J} \frac{\text{Cov}(y, x_j)}{\text{Cov}(y, x_1)} b_j. \tag{6}$$

In principle, x_1 can be any of the proxies. Throughout we use parents' schooling as x_1, so that all weighted average coefficients can be interpreted relative to the coefficient on parents' schooling.

Extended family regressions: schooling

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Parents	0.449	0.415	0.415	0.367	0.363	0.362	0.361
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Grandparents		0.087	0.084	0.032	0.027	0.023	0.021
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Great grandparents			0.028	0.027	0.026	0.015	0.011
			(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Aunts and uncles				0.168	0.146	0.144	0.143
				(0.001)	(0.001)	(0.001)	(0.001)
Spouses of aunts and uncles					0.049	0.049	0.048
					(0.001)	(0.001)	(0.001)
Parents' cousins						0.104	0.086
						(0.002)	(0.002)
Parents' aunts and uncles							0.027
							(0.002)
Total effect	0.449	0.455	0.456	0.492	0.496	0.517	0.519
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Only parents	0.449	0.415	0.415	0.367	0.363	0.362	0.361
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Excluding parents		0.039	0.041	0.125	0.132	0.156	0.157
		(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
R^2	0.160	0.165	0.166	0.175	0.176	0.177	0.177
Observations	2,426,468	2,426,468	2,426,468	2,426,468	2,426,468	2,426,468	2,426,468

Extended family regressions: schooling and income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total effect	0.500	0.510	0.513	0.543	0.546	0.567	0.568
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Only parents	0.500	0.466	0.466	0.421	0.418	0.417	0.416
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Excluding parents		0.044	0.047	0.122	0.128	0.150	0.152
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Schooling	0.378	0.375	0.375	0.403	0.409	0.426	0.426
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Income	0.122	0.136	0.138	0.140	0.137	0.141	0.142
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
R^2	0.180	0.185	0.185	0.193	0.193	0.194	0.194
Observations	2,426,468	2,426,468	2,426,468	2,426,468	2,426,468	2,426,468	2,426,468

Extended family regressions: schooling, income, and social stratification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total effect	0.518	0.523	0.526	0.553	0.555	0.576	0.578
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Only parents	0.518	0.485	0.485	0.441	0.439	0.437	0.437
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Excluding parents		0.038	0.041	0.112	0.117	0.139	0.141
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Schooling	0.325	0.321	0.321	0.351	0.356	0.373	0.373
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Income	0.103	0.115	0.117	0.122	0.119	0.122	0.123
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Social stratification	0.090	0.087	0.088	0.079	0.080	0.081	0.082
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
R^2	0.185	0.190	0.191	0.197	0.197	0.198	0.198
Observations	2,426,468	2,426,468	2,426,468	2,426,468	2,426,468	2,426,468	2,426,468

Small sample regressions: schooling

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Parents	0.477	0.431	0.427	0.382	0.376	0.369	0.367
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Grandparents		0.140	0.131	0.078	0.071	0.059	0.052
		(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Great grandparents			0.012	0.009	0.008	0.001	−0.005
			(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Aunts and uncles				0.193	0.165	0.154	0.152
				(0.005)	(0.005)	(0.005)	(0.005)
Spouses of aunts/uncles					0.071	0.067	0.067
					(0.004)	(0.004)	(0.004)
Parents' cousins						0.117	0.097
						(0.006)	(0.006)
Parents' aunts/uncles							0.034
							(0.005)
Total effect	0.477	0.497	0.489	0.534	0.541	0.553	0.551
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Only parents	0.477	0.431	0.427	0.382	0.376	0.369	0.367
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Excluding parents		0.066	0.063	0.153	0.165	0.184	0.184
		(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
R^2	0.138	0.147	0.149	0.159	0.160	0.163	0.163
Observations	156,910	156,910	156,910	156,910	156,910	156,910	156,910

Small sample regressions: schooling and income

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total effect	0.566	0.590	0.582	0.624	0.628	0.639	0.638
	(0.00351)	(0.00360)	(0.00364)	(0.00373)	(0.00375)	(0.00378)	(0.00381)
Only parents	0.566	0.508	0.503	0.455	0.451	0.444	0.442
	(0.00351)	(0.00385)	(0.00386)	(0.00404)	(0.00406)	(0.00407)	(0.00408)
Excluding parents		0.0817	0.0790	0.169	0.177	0.195	0.195
		(0.00242)	(0.00244)	(0.00325)	(0.00332)	(0.00344)	(0.00347)
Schooling	0.417	0.420	0.414	0.445	0.450	0.459	0.456
	(0.00344)	(0.00368)	(0.00372)	(0.00396)	(0.00404)	(0.00414)	(0.00422)
Income	0.149	0.170	0.168	0.180	0.179	0.180	0.181
	(0.00236)	(0.00275)	(0.00279)	(0.00304)	(0.00312)	(0.00321)	(0.00330)
R^2	0.160	0.169	0.171	0.180	0.181	0.183	0.183
Observations	156,910	156,910	156,910	156,910	156,910	156,910	156,910

Small sample regressions: schooling, income, and social stratification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total effect	0.601	0.617	0.609	0.648	0.651	0.661	0.660
	(0.00361)	(0.00367)	(0.00371)	(0.00379)	(0.00381)	(0.00385)	(0.00387)
Only parents	0.601	0.542	0.537	0.490	0.485	0.479	0.477
	(0.00361)	(0.00403)	(0.00404)	(0.00423)	(0.00426)	(0.00427)	(0.00427)
Excluding parents		0.0750	0.0720	0.158	0.166	0.182	0.183
		(0.00251)	(0.00252)	(0.00332)	(0.00340)	(0.00351)	(0.00354)
Schooling	0.367	0.362	0.358	0.391	0.395	0.406	0.404
	(0.00369)	(0.00417)	(0.00421)	(0.00454)	(0.00468)	(0.00480)	(0.00498)
Income	0.135	0.153	0.151	0.164	0.162	0.164	0.165
	(0.00238)	(0.00280)	(0.00284)	(0.00310)	(0.00318)	(0.00328)	(0.00337)
Social stratification	0.0990	0.102	0.100	0.0928	0.0939	0.0909	0.0901
	(0.00262)	(0.00318)	(0.00320)	(0.00340)	(0.00359)	(0.00363)	(0.00386)
R^2	0.167	0.175	0.177	0.185	0.186	0.187	0.188
Observations	156,910	156,910	156,910	156,910	156,910	156,910	156,910

Conclusions

Parent-child correlation significantly underestimates long-run persistence

Between dynasty intergenerational persistence very high

However, as pointed out by Chetty et al (2014), a parameter estimated from group regressions is different from the typical intergenerational mobility parameter

But even an intergenerational regression at the family level generates sizable parameter estimates if we incorporate a) vertical and horizontal effects of ancestors and b) other proxies of human capital