

Connolly, Marie; Haeck, Catherine; Lapierre, David

Working Paper

Social Mobility Trends in Canada: Going up the Great Gatsby Curve

Research Group on Human Capital - Working Paper Series, No. 19-03

Provided in Cooperation with:

University of Quebec in Montreal, School of Management Sciences (ESG UQAM), Research Group on Human Capital (GRCH)

Suggested Citation: Connolly, Marie; Haeck, Catherine; Lapierre, David (2019) : Social Mobility Trends in Canada: Going up the Great Gatsby Curve, Research Group on Human Capital - Working Paper Series, No. 19-03, Université du Québec à Montréal, École des sciences de la gestion (ESG UQAM), Groupe de recherche sur le capital humain (GRCH), Montréal

This Version is available at:

<https://hdl.handle.net/10419/209570>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



Research Group on Human Capital Working Paper Series

Social Mobility Trends in Canada: Going up the Great Gatsby Curve

Working Paper No. 19-03

Marie Connolly, Catherine Haeck, and David Lapierre

May 2019 (revised version)



Groupe de recherche sur le
CAPITAL HUMAIN
ESG UQÀM

<https://grch.esg.uqam.ca/en/working-papers-series/>

Social Mobility Trends in Canada: Going up the Great Gatsby Curve

Marie Connolly*, Catherine Haeck and David Lapierre

Groupe de recherche sur le capital humain
University of Quebec in Montreal

This version: May 27, 2019

Abstract

While cross-sectional increases in inequality are a cause for concern, the study of the intergenerational transmission of socioeconomic status is perhaps more relevant. How is social status reproduced from one generation to the next? Recent work has highlighted the relationship, if not causal then correlational, between inequality and measures of social mobility in a cross-country setting. This relationship is dubbed the Great Gatsby Curve (Corak 2013): places with higher inequality during one's childhood are correlated with lower intergenerational income mobility between the child and his or her parents.

In this paper, newly developed administrative Canadian tax data are exploited to compute measures of intergenerational income mobility at the national and provincial levels. This work provides detailed descriptive evidence on the trends in social mobility. Results show that mobility has steadily declined over time, and that there has been an increase in the inequality of the parental income distribution, as measured by the Gini coefficient. Hence Canada, and all its provinces, have been "going up" the Great Gatsby Curve. The cross sectional, cross country relationship thus also holds within a same country over time, leading credence to the more causal than correlational nature of the relationship, though causality is not formally tested here. The decrease in mobility, particularly for children born in the bottom quintile of the income distribution, should be of concern to federal and provincial policymakers alike and highlights the need for additional research in order to provide equal opportunities to all children.

JEL: J62, D63

Key words: social mobility, intergenerational transmissions, income inequality, Great Gatsby curve, Canada

* Corresponding author, connolly.marie@uqam.ca

The authors would like to thank the Fonds de recherche du Québec - Société et culture for their funding (grant 2016-PU-195586) and the Social Analysis and Modelling Division at Statistics Canada, in particular Yuri Ostrovsky and Grant Schellenberg, for making this work possible. Cristian Stratica provided superb research assistance. The authors also thank participants at the CRDCN and SCSE conferences and at seminars at the Montreal Applied Micro Group, McGill University, Dalhousie University and the University of Ottawa for comments. All errors remain their own. The analysis presented in this paper was in part conducted at Statistics Canada's Federal Research Data Centre and at the Quebec Interuniversity Centre for Social Statistics, which is part of the Canadian Research Data Centre Network (CRDCN). The services and activities provided by the QICSS are made possible by the financial or in-kind support of the Social Sciences and Humanities Research Council (SSHRC), the Canadian Institutes of Health Research (CIHR), the Canada Foundation for Innovation (CFI), Statistics Canada, the Fonds de recherche du Québec - Société et culture (FRQSC), the Fonds de recherche du Québec - Santé (FRQS) and the Quebec universities. The views expressed in this paper are those of the authors, and not necessarily those of the CRDCN or its partners.

1. Introduction

In Canada as in most other parts of the world, income inequality is on the rise. While cross-sectional increases in inequality are a cause for concern, the study of the intergenerational transmission of socioeconomic status is perhaps more relevant. How is social status reproduced from one generation to the next? Recent work has highlighted the relationship, if not causal then correlational, between inequality and measures of social mobility such as the intergenerational elasticity of income in a cross-country setting. This relationship is dubbed the Great Gatsby Curve (Corak 2013): places with higher inequality during one's childhood are correlated with lower intergenerational income mobility between the child and his or her parents. This is particularly worrisome in the context of increasing inequality: are children from low-income backgrounds ever more likely to remain in a low-income situation as adults than ever before?

Research in the United States reaches divergent conclusions depending on the data source and methods: Chetty et al. (2014a) use tax data and find that the rank-rank relationship has not changed between the 1971 and 1982 birth cohorts, while Davis and Mazumder (2017) use the National Longitudinal Surveys and document declines in intergenerational mobility between cohorts born 1942-53 and 1957-64 in both the rank-rank relationship and the intergenerational elasticity of income. Up until recently, this type of analysis was impossible in Canada due to the lack of suitable data. This has changed with the recent addition of new birth cohorts to Statistics Canada's Intergenerational Income Database (IID). The earlier birth cohorts, born from 1963 to 1970, featured in Corak and Heisz (1999)'s groundbreaking work on intergenerational transmission of income. The later birth cohorts now stretch up to 1985.

In this paper, all available birth cohorts in the IID are exploited to compute measures of intergenerational income mobility and look at trends at the national and provincial levels. The sample is split into five successive birth cohorts, spanning from 1963 to 1985. While the focus is on rank mobility, shown to be more stable over the lifecycle than the intergenerational elasticity, and on quintile transitions matrices, intergenerational elasticities are also presented. Child income is measured over five years for three non-

overlapping age groups: when the child is 25 to 29, 30 to 34, and 35 to 39 years old. Late thirties have been found to be more representative of lifetime income, but the younger birth cohort, born from 1982 to 1985, has not reached those ages yet. Parental income is also measured over five years, when the child is aged 15 to 19 years old.

Findings show that mobility has steadily declined over time, nationally and provincially. Relative mobility, as measured by the rank-rank correlation, went from 0.189 for children born 1963-66 to 0.234 for those born 1982-85. Looking at transition matrices, the probability that a child from the bottom quintile of the parental income distribution stays in the bottom quintile of his or her income distribution went from 27.1% up to 32.6%, with a corresponding decline of the probability for those kids to reach middle class. The results are thus more in line with Davis and Mazumder's findings of declining mobility in the United States than with Chetty et al.'s findings of stable copula between parental and child income distributions.

Parallel to this decline in mobility, findings also document an increase in the inequality of the parental income distribution, as measured by the Gini coefficient. Hence Canada, and all its provinces, have been "going up" the Great Gatsby Curve. The cross sectional, cross country relationship thus also holds within a country over time, leading credence to the more causal than correlational nature of the relationship, though causality is not formally tested here. This study provides detailed descriptive evidence on the trends in social mobility in Canada, exploiting newly available administrative tax data. The decrease in mobility, particularly for children born in the bottom quintile of the income distribution, should be of concern to federal and provincial policymakers alike, and highlights the need for additional research on the mechanisms behind the decline in mobility in order to understand which policy or program would stand the best chance at improving equality of opportunities for all children.

The remainder of the paper is structured as follows. Sections 2 and 3 contain information on the methodology and the data. The findings are presented in Section 4. Section 5 offers a discussion and concludes.

2. Methodology

The goal is to measure the intergenerational transmission of income, or the degree to which an individual's income depends on that of his or her parents. The focus of the study is on income because the data contain detailed, reliable, and longitudinal information on income for successive cohorts of youth and their parents, which allows the computation of statistics both over time and across space. While other dimensions of social mobility may be important or interesting, such as occupation, education, or cultural capital, no administrative data source in Canada contains the necessary information to study those dimensions. The intergenerational elasticity (IGE) of income has been widely used in the literature as a measure of mobility (or lack thereof), including studies based on early IID cohorts in Canada such as Corak and Heisz (1999) and Chen et al. (2017). The IGE of income is typically computed by estimating a linear model where the natural logarithm of child income is explained by the natural logarithm of parental income. However, due to the presence of logs, as Dahl and DeLeire (2008), Chetty et al. (2014b) and Connolly, Corak and Haeck (2019) have noted, IGE estimates are sensitive to the treatment of very small values of income in a way that measures of rank mobility are not. Rank mobility is defined in much the same fashion as the IGE, except that child and parental income are measured as percentile ranks in their respective income distribution. Since rank mobility proves to be much more robust to the treatment of low incomes and across model specifications, this analysis of trends in social mobility is based on rank mobility, which is computed by estimating the following model:

$$R_{t,ip} = \alpha_p + \beta_p R_{t-1,ip} + \varepsilon_{ip}, \quad (1)$$

where $R_{t,ip}$ is the income rank of child i —the t generation—in province p , $R_{t-1,ip}$ is the income rank of his or her parent(s)—the $t-1$ generation—, and ε_{ip} is a random term. The slope from Equation (1), β_p , can be interpreted as a measure of intergenerational mobility: the higher the β_p , the more parental income rank explains child income rank, and the less mobility there is. Equation (1) is estimated both at the national and provincial level, where geographical location is fixed during teenage years. The ranks can be computed from the national distribution or the provincial distribution, and estimates using both types of ranks will be presented. More details on the data follow in Section 3.

Models based on Equation (2) below are also estimated:

$$\ln(Y_{t,ip}) = a_p + b_p \ln(Y_{t-1,ip}) + e_{ip}, \quad (2)$$

where $Y_{t,ip}$ is child i 's from province p total income, $Y_{t-1,ip}$ is his or her parents' income, and e_{ip} is a random term. The slope of this model, b , is the intergenerational elasticity of income.

Another type of mobility measure that can be computed is the transition matrix. Quintile transition matrices are used, where each column refers to a quintile of the parental income distribution, each row to a quintile of the child income distribution, and each cell is a conditional probability. Conditional probabilities are denoted $P_{o,d}$: the probability of moving from origin o (parental income quintile) to destination d (child income quintile), or $\Pr(\text{child income} \in \text{quintile } d \mid \text{parental income} \in \text{quintile } o)$. As in Corak (2017) and Connolly, Corak and Haeck (2019), the focus is on a few key points of the transition matrix: $P_{1,1}$, $P_{1,5}$, and $P_{1,2-4}$. The intergenerational cycle of poverty, $P_{1,1}$, captures the probability for a child raised in a bottom quintile of the family income distribution to remain in the bottom quintile him or herself as an adult. The rags-to-riches movement, $P_{1,5}$, is the probability to escape the bottom quintile and attain the top income quintile. Finally, $P_{1,2-4}$, measures the probability to leave the bottom income quintile and reach the middle three quintiles, which could be loosely defined as the middle class.

3. The Intergenerational Income Database

This study is based on all current cohorts of Statistics Canada's Intergenerational Income Database. This database, first developed in the mid 1990s (see Corak and Heisz, 1999), contains longitudinal administrative tax files of successive cohorts of children in Canada and their parents. The original IID cohorts, 1982, 1984 and 1986, covered children born between 1963 and 1970, inclusively. More recent cohorts are now available in the IID,¹ 1991, 1996 and 2001, covering most birth years between 1972 and 1985. In the IID, each cohort is identified using the first fiscal year in which the link between the parents and the child is

¹ The authors thank the Fonds de recherche du Québec - Société et culture for funding that allowed the new cohorts to be added to the IID (grant 2016-PU-195586).

attempted. For example, the 1982 cohort includes children born between 1963 and 1966, who were matched to their parents as of 1982, when they were 16 to 19 years old. If the match could not be established in 1982, the match was attempted again over the next three years. In the current study, to avoid overlapping birth years across different cohorts, the 1984 IID cohort is divided in two, pooling half with the 1982 IID cohort and the rest with the 1986 IID cohort, depending on birth year, and then removing duplicates. Table 1 gives the birth years and number of observations per cohort as defined for this paper. There are over one million children per birth cohort, for a total of close to six million child-parents pairs.

Table 1: The Intergenerational Income Database cohorts

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

Source: Authors' calculations based on the IID

In the IID, tax files are available annually starting in 1978 for the 1982, 1984 and 1986 IID cohorts and starting in 1981 for the more recent cohorts. The last available year of tax data for all cohorts is currently 2014. From those tax files, a variety of income measures are available for each individual of the family: both the mother and the father, the child, as well as the spouse of the child when reported on the child's tax return. The analysis is based on total income from all sources, as defined by the Canada Revenue Agency. This includes earnings, interest and investment income, self-employment net income, taxable capital gains/losses and dividends, and benefits. In the main analysis pre-tax total income is used; after-tax income is also considered in one part of the analysis.

Parental income is defined as the average annual parental income when the child is aged 15 to 19 years old, including both mother and father if present. Taking a five-year average reduces biases resulting from transitory shocks to income. A five-year window during the late teenage years is used to reflect resources available to the child during those crucial years of human capital accumulation and transitions between secondary and postsecondary school or between schooling and the labor market. These ages are also targeted because they are

the closest to the year of the family link in the tax files, thus ensuring that the family circumstances that apply to the child's life are effectively captured. Because biological links are not identified in the IID and because only the adults identified as the child's parents at the moment of the link can be tracked, the earlier the period considered in the child's life (e.g. early childhood), the lower the certainty that the actual family of the child at that moment of his or her life is captured accurately. Another reason to use parental income when the child is 15 to 19 years old is that since the tax files start in 1978, data on parental income during early childhood for the first birth cohorts are not available such that comparability across cohorts would be a challenge. Future studies could try to investigate the effect of parental age at childbirth on measures of total income rank.

Comparability across cohorts becomes an important issue when deciding how to compute the child income measure. If five-year averages are used for child income, as is done for parents, then the latest that can be studied in the child's life for the last cohort, those born between 1982 and 1985, is from the ages of 25 to 29 years old. A child born in 1985 will turn 29 years old in 2014, the last year of data available at the time of writing. These ages, 25 to 29, are comparable to what Chetty et al. (2014b) use in their main analysis (ages 29 to 32) and in sensitivity checks (ages 26 to 29). To study trends over the longest period possible using the IID, five-year averages from age 25 to 29 are used in the main analysis. Child income averages are also computed for the ages of 30 to 34 and 35 to 39 years old. The first four of the five cohorts are used when child income is captured between the ages of 30 and 34 years old, and only the first three of the five cohorts are used if ages is constrained to 35 to 39 years old. Note that whenever a parent or a child is not found in the tax files for a given year, an income of \$0 is imputed for that year. The sample is then restricted to children that are observed at least once over the five-year period, and to parents and children that have an average income of at least \$500. This treatment is coherent with the sample selection done by Corak (2017).

All dollar figures are converted to 2016 Canadian dollars using the All-items Consumer Price Index (CANSIM Table 326-0021). Once the five-year averages are computed for both child and parental income, percentile ranks are computed using the national distribution for most of the analysis, and the provincial distribution for some complementary analysis. The

province of residence is fixed at the time of the link between the child and the parents, i.e. when the child is aged 16 to 19. This means that if a child moves out a province by the time his or her income is measured, that child is still assigned to the place where he or she grew up, as was done in Chetty et al. (2014b), Corak (2017) and Connolly, Corak and Haeck (2019). Studying the effect of geographical mobility on income mobility is left for further studies.

Table 2 presents some descriptive statistics for each birth cohort in the samples studied. The top panels shows statistics on the parents. Average parental income increased over time, as did its standard deviation as well the Gini coefficients computed using both before-tax and after-tax income, a reflection of increasing income inequality. The number of parents linked to a child depends on who filed a tax return on the year of the parent-child match (i.e. when the child is 16 to 19): if only one parent filed a tax return, then only that parent is observed in the IID. For the 1963 birth cohort, the fraction of children for whom only one parent filed taxes was 30.8%. This fraction does not really reflect the marital arrangement of the child's parents: single-earner households may be a married couple, but if only one spouse files a return, then they are reported here as a "one-parent tax filer," despite being married. This situation is more likely to happen for married couples in which one of the two parents does not work, typically the mother. The rise in women's labour force participation and the increase in dual-earner families (Statistics Canada, 2016) explains the substantial drop in one-parent tax filer fraction over time, to 21.8%, despite the increase in lone-parent families documented elsewhere (Statistics Canada, 2015). That said, the way the parental income variable is constructed in this analysis is not problematic: parental income simply represents household income around the time of the parent-child match, thus reflecting the resources available to the household that the child lived in. If a household has one parent earner and tax filer, then only that parent's income counts towards household income, whether it is because the parent is a lone parent, or a married parent in a single-earner household.

Table 2: Descriptive statistics

Variable	Birth cohort				
	1963	1967	1972	1977	1982
Average parental income (before tax)	\$78,800	\$77,700	\$82,100	\$81,200	\$89,200
	(84,300)	(82,800)	(91,800)	(104,200)	(167,300)

Gini coefficient, parental before-tax income		36.360	37.773	39.267	41.177	44.374
Gini coefficient, parental after-tax income		34.081	34.699	36.039	37.461	40.526
Fraction in one-parent tax filer household		0.308	0.296	0.248	0.231	0.218
Average child income	Ages 25-29	\$34,100 (23,100)	\$32,000 (24,200)	\$34,100 (27,800)	\$35,300 (27,000)	\$36,700 (30,100)
	Ages 30-34	\$42,100 (44,300)	\$43,600 (130,600)	\$46,100 (44,800)	\$47,700 (41,600)	—
	Ages 35-39	\$51,500 (73,400)	\$53,600 (77,600)	\$56,500 (63,500)	— (73,400)	—
Gini coefficient, child before-tax income	Ages 25-29	38.774	41.337	41.497	41.333	43.323
	Ages 30-34	45.150	46.844	46.085	45.723	—
	Ages 35-39	48.860	50.459	49.273	—	—
Gini coefficient, child after-tax income	Ages 25-29	31.179	32.733	33.113	33.503	35.244
	Ages 30-34	35.310	36.779	36.237	36.143	—
	Ages 35-39	38.886	39.796	38.686	—	—
Fraction female (ages 25-29)		0.490	0.487	0.489	0.489	0.491
Fraction single, children	Ages 25-29	0.511	0.491	0.525	0.558	0.579
	Ages 30-34	0.308	0.311	0.320	0.350	—
	Ages 35-39	0.246	0.252	0.264	—	—
N (excluding parents and children with income under \$500 and children missing all years)	Ages 25-29	1,469,010	1,437,190	1,357,900	1,442,150	1,501,800
	Ages 30-34	1,421,820	1,386,020	1,321,720	1,408,010	—
	Ages 35-39	1,393,430	1,364,920	1,301,780	—	—
Sample selection - parents						
Fraction missing at least once		0.075	0.081	0.109	0.093	0.110
Fraction with income under \$500		0.018	0.022	0.018	0.017	0.022
Sample selection - children						
Fraction missing all years	Ages 25-29	0.029	0.038	0.045	0.043	0.044
	Ages 30-34	0.050	0.064	0.069	0.065	—
	Ages 35-39	0.068	0.080	0.083	—	—
Fraction missing at least once	Ages 25-29	0.199	0.240	0.245	0.245	0.247
	Ages 30-34	0.225	0.248	0.249	0.241	—
	Ages 35-39	0.230	0.252	0.247	—	—
Fraction with income under \$500	Ages 25-29	0.015	0.018	0.019	0.017	0.018
	Ages 30-34	0.026	0.027	0.021	0.018	—
	Ages 35-39	0.027	0.025	0.021	—	—

Note: Standard deviations in parentheses. All figures are weighted using IID weights.

Source: Authors' calculations based on the IID

The second panel of Table 2 presents statistics that relate to the child. Similarly to the trends observed for the parents, income inequality is on the rise, as seen through the increase in the Gini coefficients. The bottom two panels investigate the sample selection. At most 2.2% of parents and 2.7% of children are excluded because their total income is under \$500. The

fraction of children that are completely missing from the tax data over the relevant five-year interval increases with the age of the child, going from 3-4% at ages 25 to 29, to 5-7% at ages 30 to 34, to 7-8.3% when 35 to 39 years old. The death rate is still very low at those ages, so the attrition most likely reflects outmigration. A nontrivial fraction of both parents and children have at least one year of tax files missing: up to 11% for the parents, and up to 25.2% for the children. In robustness analyses, the sample is further restricted to parents and children that are observed all years over the five-year window, and similar findings are obtained.

4. Findings

This section presents the findings from this study. For ease of presentation, birth cohorts are referred to by the first birth year of the cohort (e.g. 1963 birth cohort designates the 1963–1966 birth cohort). The first subsection presents the main findings regarding intergenerational mobility at the national level, including results on rank mobility, intergenerational elasticities, and differences by gender of the child. Nonlinearity in rank mobility is explored next. Then, rank mobility at the provincial level is investigated, followed by trends in the transition matrices. The next subsection presents a version of the Great Gatsby Curve, linking inequality (the Gini coefficient) to rank mobility. Robustness analyses are shown last.

4.1. Mobility at the national level

Mobility estimates at the national level are presented first. Table 3 shows the estimated slopes from the rank mobility Equation (1), by birth cohort and age at which child income is measured, for sons and daughters combined and separately, as well as the intergenerational elasticity estimates from Equation (2). A higher rank-rank slope or a higher IGE means that parental income has a higher explanatory power on child income, and thus mobility is lower.

Table 3: Mobility estimates

	Birth cohort				
	1963	1967	1972	1977	1982
Rank-rank					

All	ages 25-29	0.189	0.188	0.216	0.215	0.234
	ages 30-34	0.201	0.214	0.232	0.235	—
	ages 35-39	0.201	0.214	0.230	—	—
Sons	ages 25-29	0.188	0.187	0.214	0.219	0.233
	ages 30-34	0.227	0.237	0.252	0.253	—
	ages 35-39	0.238	0.247	0.257	—	—
Daughters	ages 25-29	0.204	0.200	0.228	0.216	0.238
	ages 30-34	0.193	0.205	0.223	0.224	—
	ages 35-39	0.182	0.194	0.214	—	—
Intergenerational elasticity (IGE)						
All	ages 25-29	0.153	0.154	0.199	0.210	0.224
	ages 30-34	0.171	0.184	0.223	0.239	—
	ages 35-39	0.180	0.192	0.232	—	—
Sons	ages 25-29	0.154	0.157	0.200	0.215	0.223
	ages 30-34	0.192	0.202	0.238	0.251	—
	ages 35-39	0.214	0.221	0.255	—	—
Daughters	ages 25-29	0.165	0.160	0.206	0.210	0.227
	ages 30-34	0.166	0.178	0.219	0.234	—
	ages 35-39	0.161	0.174	0.219	—	—

Note: Standard errors are all 0.001 or lower for the rank mobility estimates and for the IGE for sons and daughters combined. For the IGE for sons and daughters separately, standards errors are all below 0.002.

Source: Authors' calculations based on the IID

A clear pattern towards decreasing intergenerational mobility can be observed when moving from the earlier birth cohorts to the later birth cohorts: the rank-rank slope has been steadily going up, birth cohort after birth cohort. When measured at ages 25 to 29, the rank-rank slope went from 0.189 to 0.234 between the 1963 cohort and the 1982 cohort, a 24% increase. This trend is present for both sons (0.188 to 0.233) and daughters (0.204 to 0.238), albeit for a somewhat smaller extent for the latter. Intergenerational elasticities also exhibit an upward pattern across birth cohorts, hence towards lower mobility: the IGE went from 0.153 to 0.224 for sons and daughters combined, with similar trends when genders are taken separately and again lower mobility for sons relative to daughters. The same upward trend can be seen when child income is measured at older ages, even if the point estimates tend to be slightly larger the older the child is.

Although Canada is moving towards less equal opportunities, the rank-rank correlation of the 1982 birth cohort in Canada at 0.234 is still lower than the 0.344 estimate reported by

Chetty et al. (2014b) for the United States.

For ease of exposition, Figures 1 through 3 present the estimates from Table 3 in graphical form. Figure 1 presents the resulting estimates of the rank-rank slope, a measure of relative mobility, while Figure 2 shows the estimates of the IGE, and Figure 3 looks at sons and daughters, separately.

[Insert Figure 1 about here.]

[Insert Figure 2 about here.]

[Insert Figure 3 about here.]

4.2. Nonlinearity in rank mobility

Figure 4 presents five binned scatter plots of rank mobility: one for each birth cohort. The X-axis represents the percentile ranks of the parental income distribution and the Y-axis shows the mean child percentile rank using income measured when the child is aged 25 to 29 to allow for a comparison across all cohorts. Each point therefore captures the average rank of children for each of the parent's percentile rank. The equation shown at the bottom right of each subfigure shows the corresponding estimates of Equation (1). These binned scatter plots are a way to visualize the estimation of Equation (1). Note that the rank-rank relationship does not appear as linear as what Chetty et al. (2014b) had found for the United States, especially at the bottom of the parental income distribution (below the 20th percentiles for parents).

[Insert Figure 4 about here.]

To further investigate the nonlinearity, locally-weighted nonparametric smoothed scatter plots are presented in Figure 5, separately for each birth cohort. Darker lines are for the earlier birth cohorts and lighter ones for the more recent. The curves appear not to be linear: the slope is more pronounced at the bottom of the parental income distribution. Moreover, the curves for the various birth cohorts are roughly stacked according to birth years: the earlier birth cohorts have higher mean child ranks than the later ones for lower parental

ranks, and lower mean child rank for higher parental ranks. This is coherent with the declining rank mobility that was already noted using a linear model in the previous section, but indicates that the changes in mobility observed over time come from changes in the bottom and top quintile of the parental income distribution. An interesting result to look at it is where the curves meet each other as the parental income rank increases. The curve for the 1967 cohort meets the 1963 curve at parental income percentile rank of 16, whereas the 1982 curve only reaches the 1963 cohort at percentile 36, a full 20 ranks further up the income distribution. This means that the children from the bottom 36% of the 1982 parental income distribution have on average lower income ranks than similarly positioned children from the earliest birth cohort. In a sense, it has grown more difficult to reach the relative position of the children of the 1963 cohort for children from low-income backgrounds in later birth cohorts. The reverse is true at the top end of the parental income distribution.

[Insert Figure 5 about here.]

Looking at Figures 4 and 5, it seems reasonable that a model allowing two slopes, one below and one above the 20th percentile of the parental income distribution, would provide a good fit for the data. Consequently, a version of Equation (1), the rank mobility equation, is estimated using a spline model allowing for two slopes. The resulting slope estimates are plotted in Figure 6, where the panel on the left is for the slope for parental ranks 1 to 20, and the one on the right is for ranks from 21 to 100. Note here that the scales of the Y-axes are not the same for the two panels. Looking at either of the two slopes, a similar pattern can be seen, with estimated slopes showing an increasing trend from the 1963 cohort to the 1982 cohort (right panel), albeit with a slightly different intermediate trajectory for the slopes for lower parental ranks (left panel). The panel on the left of Figure 6 shows that the slope for the bottom quintile of parents peaked for the 1972 birth cohort at over 0.7 before going back down to reach close to 0.55 for the 1982 cohort. Across all years, the slopes are much higher, so mobility much lower, for the bottom quintile of the parental income distribution than they are for the top four quintiles, and the rate of increase has been stronger for that bottom quintile, too. In contrast, for the rest of the parental income distribution, mobility, though decreasing, is relatively high. Although the slopes in the bottom quintile are higher in 1963 and 1972 compared to 1977 and 1982, the average rank of a child given his or her parents'

rank is almost always lower in 1977 and 1982 than that of the earlier cohort (see Figure 5). As time passes, it is getting much harder for a child from the bottom income quintile to reach higher income ranks. What matters for mobility may not simply be the slope of the rank-rank relationship, but also its average level, or in the present case where the curves meet.

[Insert Figure 6 about here.]

4.3. Rank mobility at the provincial and territorial level

Up to now, the analysis focused on the national level. This section now turns to rank mobility at the provincial level. Three sets of results are presented from models estimated separately for each province or territory: one where parental and child ranks are computed at the national level; one where ranks are computed within each province or territory; and finally one where ranks are computed nationally but the income measured used is net of taxes. Using local ranks is one way to take into account the different realities of the different provinces and territories, and in a sense to control for cost of living differences. If a salary of \$60,000 does not mean the same thing in Alberta and in Nova Scotia, then using within-province ranks should help compare the relative positions of each. The next three figures present the resulting slope estimates, using national ranks (Figure 7) then provincial or territorial ranks (Figure 8), and after-tax income (Figure 9). Starting with Figure 7, one can see that the trend of decreasing mobility observed at the national level is also present in all provinces, albeit to different degrees. Only the Yukon shows an overall decrease in the rank-rank slope, but it should be noted that the population size for the Yukon is quite small compared to the other regions. There are substantial differences across provinces, with some provinces showing low slopes/high mobility, such as Prince Edward Island or Newfoundland and Labrador, with slopes around 0.15-0.23, and other provinces with high slopes/low mobility, like Saskatchewan and Manitoba, both with slopes above 0.3 for the latest birth cohort. Saskatchewan is also the province that saw the greatest increase in the slope coefficient, going from 0.17 for the 1963 birth cohort to almost double that for the 1982 birth cohort. By and large, using ranks computed at the provincial or territorial does not change the conclusions drawn from looking at Figure 6; the estimated slopes are practically identical. The same can be said about using after-tax income rather than gross income to compute

income ranks: Figure 9 displays patterns that are very similar to those of Figures 7 and 8.

[Insert Figure 7 about here.]

[Insert Figure 8 about here.]

[Insert Figure 9 about here.]

4.5. Trends in transition matrices

In this subsection, points from 5 x 5 transition matrices are presented, showing conditional probabilities for the various income quintiles. Again, findings are presented graphically for ease of exposition. Figure 10 shows, conditional on parental income quintile, the probability that a child has an income in the bottom quintile of his or her income distribution. For most parental income quintiles, this probability is relatively stable across the five birth cohorts, and perhaps slightly decreasing for the very top income quintile. The largest movement is seen for children who grew up in families at the bottom of the income distribution. $P_{1,1}$, the probability to remain in the bottom quintile, has grown from 0.27 to 0.33, a 22% increase between the oldest cohort and the youngest one. It has thus become more difficult for a child from a disadvantageous background to get out of a low income situation.

[Insert Figure 10 about here.]

Figure 11 is constructed the same way as Figure 10, but this time showing the probability for a child to have an income in the top income quintile of his or her distribution. Figure 11 shows that all the probabilities remain constant across the five birth cohorts. The flipside of the increase in $P_{1,1}$ observed in Figure 10 is thus not that children from low-income families have a lower probability to reach to top income quintile, but rather that they have a lower probability to be in one of the three middle income quintiles (quintiles 2, 3 or 4). This can be seen in Figure 12, which presents the probability for a child to be in those middle three quintiles, conditional on parental income quintile. The drop in these transitions to middle class, so to speak, can clearly be seen for children who grew up in bottom-quintile families. For those children, the probability to reach one of the three middle quintiles went from 0.60 for the 1963 birth cohort to 0.56 for the 1982 cohort, a nearly 8% decrease.

[Insert Figure 11 about here.]

[Insert Figure 12 about here.]

4.6. The Canadian Great Gatsby Curve

Now that measures of rank mobility for five successive birth cohorts of Canadians have been computed, they can be put in relation with a measure of income inequality for the parental income distribution, to trace out a within-country version of the Great Gatsby Curve. Figure 13 does just this for the slope coefficient, a measure of relative mobility, at the national level. Each dot represents a birth cohort, and it is clear that Canada has been “going up” the curve, by moving towards the top right. In doing so, the successive cohorts are tracing out the upward sloping curve, too, showing that the classic inequality-mobility relationship described in the literature across countries for a given time period (Corak 2013) also holds within a country across birth cohorts. Figure 14 is similar to Figure 13, this time using after-tax income. The Gini coefficients for the parental income distribution are lower when using after-tax income, a result of the income redistribution through the tax system, but the slope coefficients remain very similar. The resulting Great Gatsby curve is thus simply shifted to the left.

[Insert Figure 13 about here.]

[Insert Figure 14 about here.]

Another way to visualize the relationship between inequality and mobility is to look within Canada by plotting a provincial version of Figure 13, that is one where each point corresponds to a province and birth cohort. Again, the inequality-mobility relationship holds within a given country for a given point in time (looking at a given birth cohort across provinces), and within a given country when all cohorts are pooled together (see the best linear fit line on Figure 15). Figure 16 presents the same points, connected by province this time. Given that every province has seen an increase in inequality over the period studied, so increasing Gini coefficients, each provincial series is labeled by adding the province abbreviation to the right of the series, i.e. next to the point corresponding to the 1982 birth cohort. The movement of “going up” the Great Gatsby Curve is not just true for Canada overall

(as seen in Figure 13); it is true for every single province of Canada. Some provinces have a relatively steep mobility-inequality profile, meaning that their decrease in mobility is relatively more important than their increase in inequality (for example Saskatchewan), while others have a flatter profile, with relatively large increases in inequality but not necessarily large increases in the rank-rank slope coefficient (for example Ontario).

[Insert Figure 15 about here.]

[Insert Figure 16 about here.]

4.7. Robustness analyses

In this section robustness analyses are presented. One possible source of bias could come from the fact that some individuals cannot be found in the tax files in some years. Table 2 showed that when looking at ages 25 to 29, 3 to 4% of children cannot be linked to any tax file. Those percentages are 5 to 7% when considering ages 30 to 34 and 7 to 9% for ages 35 to 39. Moreover, some children can only be found in some years. The question of what to do when children are missing from the tax files could be important. In the main analysis, the sample excludes parents and children with average income under \$500 and children that cannot be found in any tax file. In a robustness analysis, the sample is further restricted to include only parents and children that are observed for the full 5-year window during which income is measured. The resulting slope estimates from Equation (1) are in Table 4.

Table 4: Mobility estimates from alternative specifications

		Birth cohort				
		1963	1967	1972	1977	1982
Rank-rank all quintiles of the parental income distribution						
All	ages 25-29	0.189	0.188	0.216	0.215	0.234
	ages 30-34	0.201	0.214	0.232	0.235	—
	ages 35-39	0.201	0.214	0.230	—	—
Restricted set	ages 25-29	0.186	0.182	0.209	0.206	0.226
	ages 30-34	0.201	0.214	0.231	0.233	—
	ages 35-39	0.202	0.215	0.229	—	—
Rank-rank bottom quintile of the parental income distribution						
All	ages 25-29	0.483	0.616	0.722	0.460	0.544
	ages 30-34	0.432	0.585	0.657	0.392	—
	ages 35-39	0.439	0.563	0.635	—	—
Restricted set	ages 25-29	0.513	0.655	0.810	0.566	0.700
	ages 30-34	0.460	0.624	0.758	0.540	—
	ages 35-39	0.465	0.594	0.735	—	—
Rank-rank top four quintiles of the parental income distribution						
All	ages 25-29	0.172	0.160	0.181	0.178	0.193
	ages 30-34	0.197	0.203	0.214	0.217	—
	ages 35-39	0.201	0.208	0.218	—	—
Restricted set	ages 25-29	0.166	0.155	0.171	0.166	0.181
	ages 30-34	0.192	0.200	0.209	0.210	—
	ages 35-39	0.197	0.206	0.214	—	—

Note: Standard errors are all 0.001 for the rank mobility estimates for all quintiles and for the top four quintiles. For bottom quintile, standards errors are all around 0.01.

Source: Authors' calculations based on the IID

Tables 4 presents the rank-rank slope estimates for the whole distribution (top panel) as well as separately for the bottom quintile of the parental income distribution (middle panel) and for the other four quintiles of the parental income distribution (bottom panel). Although there are some differences when comparing the results from the main sample to those of the restricted set, the patterns mostly hold. For example, the top panel shows that the estimated slope went from 0.189 to 0.234 across the birth cohorts in the main analysis, and from 0.186 to 0.226 in the restricted set. Looking at the bottom quintile of the parental income distribution in the middle panel, the increase in the slope coefficient for the later birth cohorts is somewhat larger in the restricted set than it is in the main sample: 0.566 and 0.700 for the 1977 and 1982 birth cohorts, respectively, for the restricted set, compared to 0.460

and 0.544 for the analysis sample. Overall, the potential bias coming from the unavailability of tax files for some individuals does not appear to be much of a concern.

5. Discussion and conclusion

In this study, decreases in social mobility across five consecutive birth cohorts in Canada are documented using a previously unavailable very large set of administrative tax files. The focus is on rank mobility, and findings show that the slope between a child's income rank, as an adult, and his or her parents' income rank has been on an increasing trend, going from 0.189 to 0.234 between the 1963-66 birth cohort and the 1982-85 cohort. There also appears to be substantial nonlinearity in the rank mobility equation, motivating a split of the rank-rank slope in two segments: one for parental income rank up to the 20th percentile, the other for ranks 21 to 100. The bottom segment has much higher slopes, thus lower mobility, than the top segment. Moreover, the average child ranks for the more recent cohorts are lower than those of the first cohort for a substantial part of the bottom of the parental income distribution: even children whose parents are at the 30th to 35th percentiles have lower average ranks for the 1982-85 cohort than for the 1963-66 cohort. Rank mobility is also described at the provincial and territorial levels. While there has been a deterioration of mobility in every single province, there are still large variations in rank-rank slopes across regions in most recent cohort, and the within-province variations over time have had different magnitudes. Some places, notably the Maritimes, have among the lowest rank-rank slopes, meaning the most equal opportunities for children, along with the smallest increases in slopes. On the other hand, Manitoba generally displays the least intergenerational mobility amongst the 10 provinces, and it is in Saskatchewan that the deterioration of equality of opportunities has been the worst. A look at quintile transition matrices reveals much the same story of declining mobility: children born in the bottom 20% of families in terms of income have become less likely to exit the bottom quintile themselves, and less likely to transition into the middle class.

These results can seem to contradict Ostrovsky's (2017) finding of stable rates of intergenerational income mobility between 1970 and 1984, using the same data source.

Ostrovsky's measure however was quite different: he used as an absolute mobility measure the fraction of children earning more than their parents at age 30. This choice was motivated by the desire to compare the Canadian case with Chetty et al.'s (2017) similar estimates for the United States. The restriction to use income measured at age 30 for both parents and children constrained the cohorts that could be used from the IID. Due to data constraints, Ostrovsky's analysis starts with birth year 1970, but the present analysis documents decreases in rank mobility starting with the 1963 birth cohort. It is thus possible that by having to start with the 1970 birth cohort, a substantial part of the decline observed herein was missed. Moreover, the absolute mobility measure used in Ostrovsky states which fraction of children tips past a certain income threshold and in so doing does not describe the rank-rank relationship in the same level of details as done here.

Together with the increases in income inequality observed over the same time period, the increasingly strong association uncovered between parental income rank and child income rank means that Canada, and every single one of its provinces, have been "going up" the Great Gatsby Curve. More inequality has gone hand in hand with lower mobility. This association is purely correlational at this stage, and the current descriptive analysis makes no attempt to uncover causal relationships. But the fact that the relationship holds across countries for a given time period, as well as for a given country over time, and within a given country (across its regions) both at a given point in time and across time, points to something more than simply a spurious correlation. When the rungs of the socioeconomic ladder are further apart, it becomes more difficult to climb it. Theoretical models explaining this relationship would be an important step forward in our understanding of social mobility.

Armed with a battery of descriptive statistics, a much clearer portrait of the situation of social mobility in Canada and its recent trends emerges. A lot of questions remain. What makes a region more mobile than another, and why do some experience much stronger declines? The literature suggests some factors that correlate with more or less intergenerational income transmission (see Chetty et al., 2014b, or Connolly, Corak and Haeck, 2019). But more research is needed to uncover causal mechanisms and identify public policies that may play in favour of more equal opportunities for Canadian children.

References

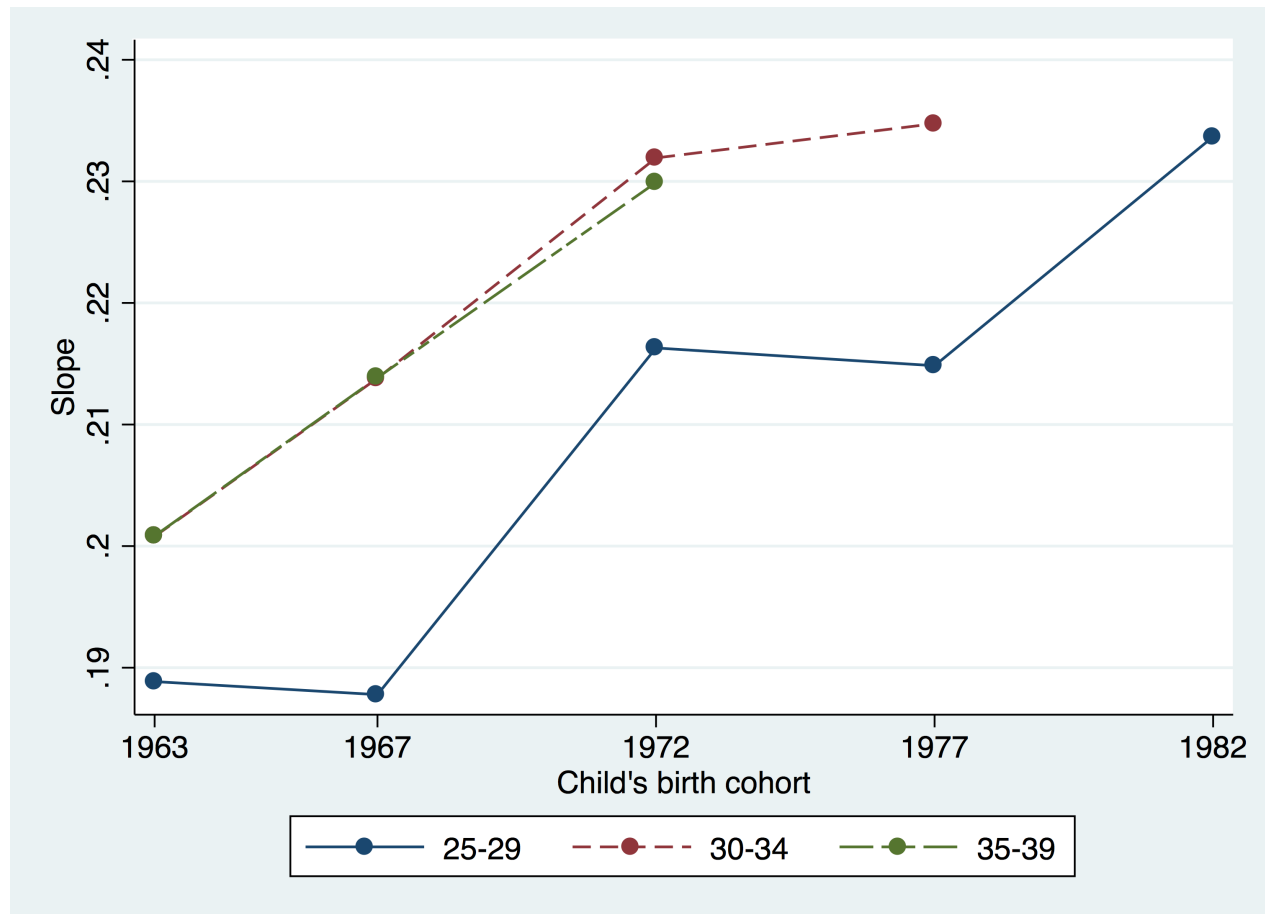
- Becker, G. S., & Tomes, N. (1979). An Equilibrium Theory of the Distribution of Income and Intergenerational Mobility. *Journal of Political Economy*, 87(6), 1153-1189.
- Becker, G. S., & Tomes, N. (1986). Human Capital and the Rise and Fall of Families. *Journal of Labor Economics*, 4(3, Part 2), S1-S39.
- Black, S. E., & Devereux, P. J. (2011). Recent Developments in Intergenerational Mobility. In O. C. Ashenfelter, & D. E. Card (Eds.), *Handbook of Labor Economics*, 4B(16), (p. 1487-1541). Amsterdam: North-Holland.
- Chen, W. H., Ostrovsky, Y., & Piraino, P. (2017). Lifecycle Variation, Errors-in-Variables Bias and Nonlinearities in Intergenerational Income Transmission: New Evidence from Canada. *Labour Economics*, 44(January), 1-12.
- Chetty, R., Hendren, N., Kline, P., Saez, E., & Turner, N. (2014a). Is the United States Still a Land of Opportunity? Recent Trends in Intergenerational Mobility. *The American Economic Review*, 104(5), 141-147.
- Chetty, R., Hendren, N., Kline, P., & Saez, E. (2014b). Where is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States. *The Quarterly Journal of Economics*, 129(4), 1553-1623.
- Chetty, R., Grusky, D., Hell, M., Hendren, N., Manduca, R., & Narang, J. (2017). The Fading American Dream: Trends in Absolute Income Mobility Since 1940. *Science*, 356(6336), 398-406.
- Connolly, M., Corak, M., & Haeck, C. (2019). Intergenerational Mobility within and between Canada and the United States. Forthcoming, *Journal of Labor Economics*.
- Corak, M. (2013). Income Inequality, Equality of Opportunity, and Intergenerational Mobility. *The Journal of Economic Perspectives*, 27(3), 79-102.
- Corak, M. (2017). Divided Landscapes of Economic Opportunity: The Canadian Geography of Intergenerational Income Mobility. University of Chicago, Human Capital and Economic Opportunity Working Paper Number 2017-043.
- Corak, M., & Heisz, A. (1999). The Intergenerational Earnings and Income Mobility of Canadian Men: Evidence from Longitudinal Income Tax Data. *Journal of Human Resources*, 34(3), 504-533.
- Dahl, M. W., & DeLeire, T. (2008). The Association between Children's Earnings and Fathers' Lifetime Earnings: Estimates Using Administrative Data. Discussion Paper No. 1342-08, University of Wisconsin-Madison, Institute for Research on Poverty.
- Davis, J., & Mazumder, B. (2017). The Decline in Intergenerational Mobility After 1980. Federal Reserve Bank of Chicago, WP 2017-05, March 2017.
- Ostrovsky, Y. (2017). Doing as Well as One's Parents?: Tracking Recent Changes in Absolute Income Mobility in Canada. Economic Insights, Catalogue no. 11-626-X — No. 073, Statistics Canada.

Statistics Canada (2015). Lone-parent families: The new face of an old phenomenon. Canadian Megatrends, Catalogue no. 11-630-X, 2015002, ISBN 978-0-660-25887-4.

Statistics Canada (2016). The rise of the dual-earner family with children. Canadian Megatrends, Catalogue no. 11-630-X, 2016005, ISBN 978-0-660-25887-4.

Figures

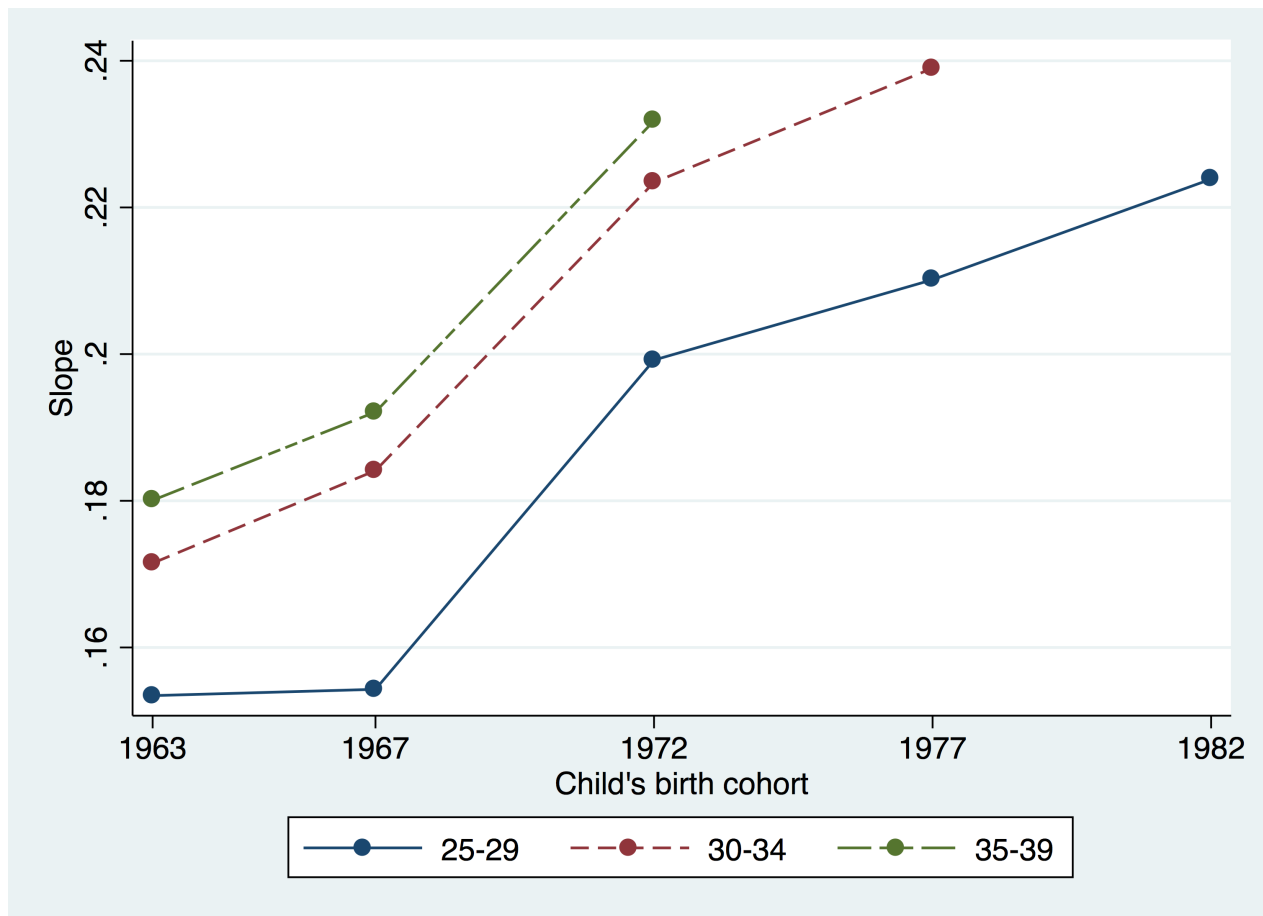
Figure 1: Rank mobility by age group and birth cohort



Note: This figure shows the estimated slope coefficient of Equation (1), by age group and birth cohort.

Source: Authors' calculations based on the IID

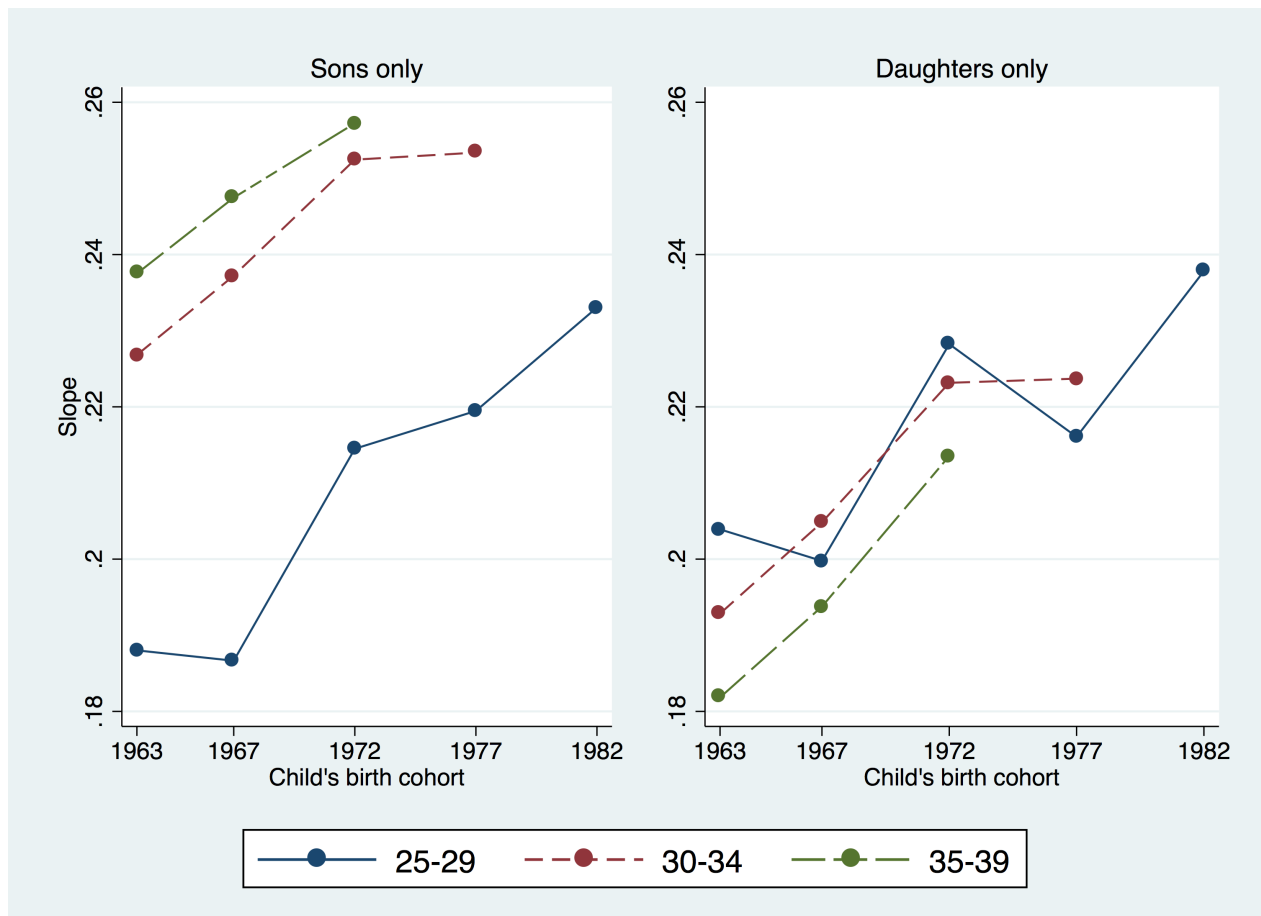
Figure 2: Intergenerational elasticity, by age group and birth cohort



Note: This figure shows the estimated slope coefficient of Equation (2), by age group and birth cohort.

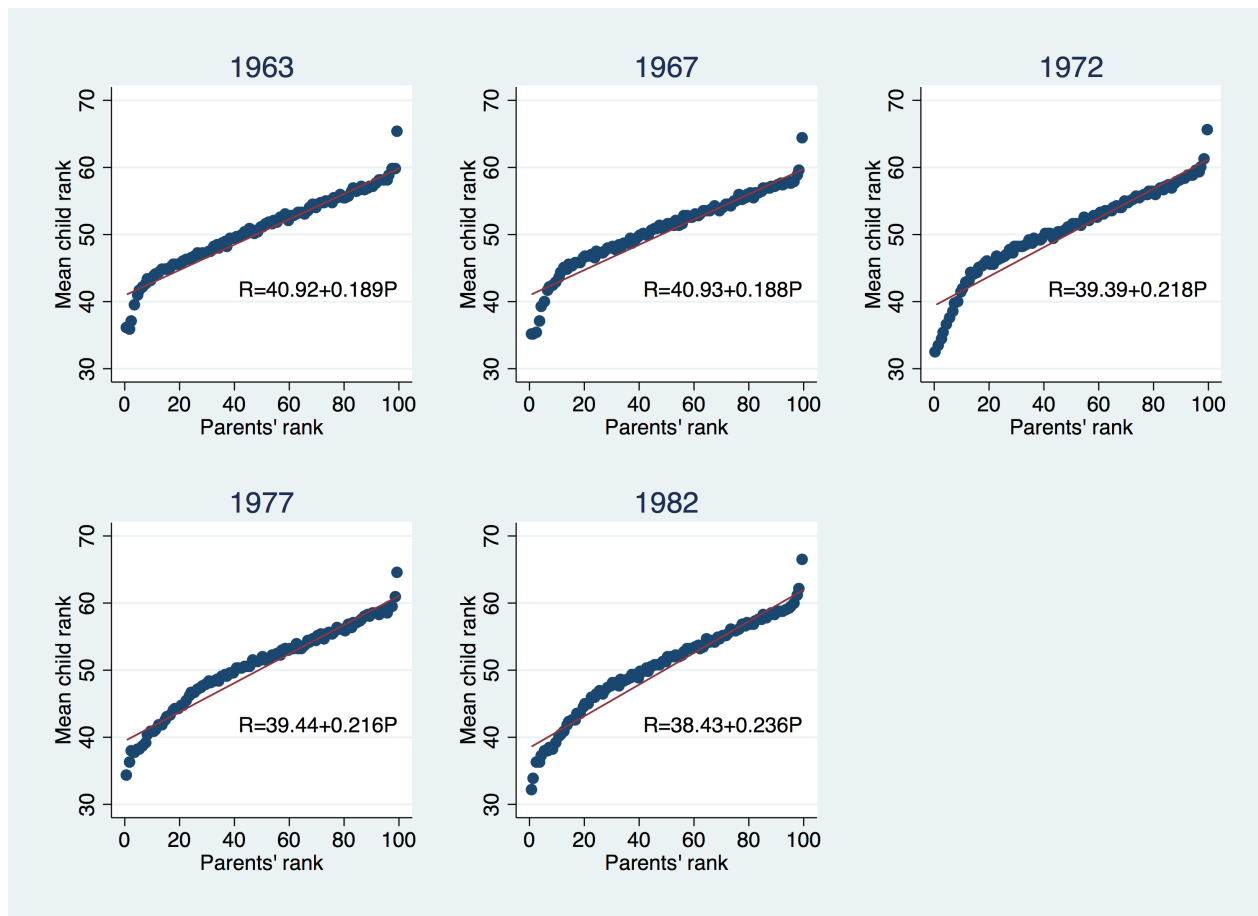
Source: Authors' calculations based on the IID

Figure 3: Rank mobility by age group and birth cohort, sons and daughters separately



Note: This figure shows the estimated slope coefficient of Equation (1), by age group and birth cohort, for sons and daughters separately.
Source: Authors' calculations based on the IID

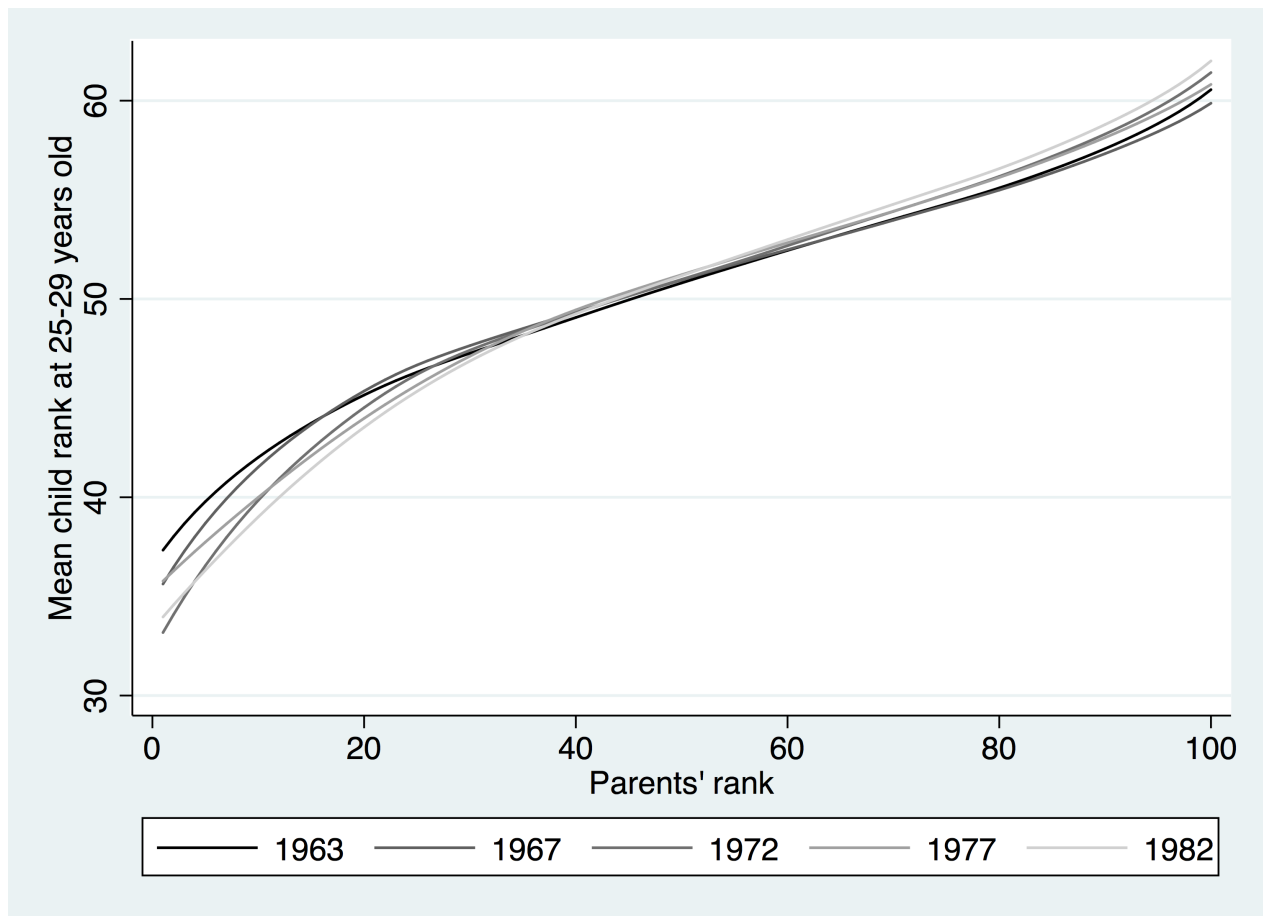
Figure 4: Rank mobility by birth cohort



Note: This figure shows binned scatter plots of rank mobility by birth cohort. Each dot corresponds to one percentile rank of the parental income distribution. The Y-axis gives the mean value of child rank by parental income rank. Child individual income is measured at ages 25 to 29. The estimate of Equation (1) is shown at the bottom right of each subfigure.

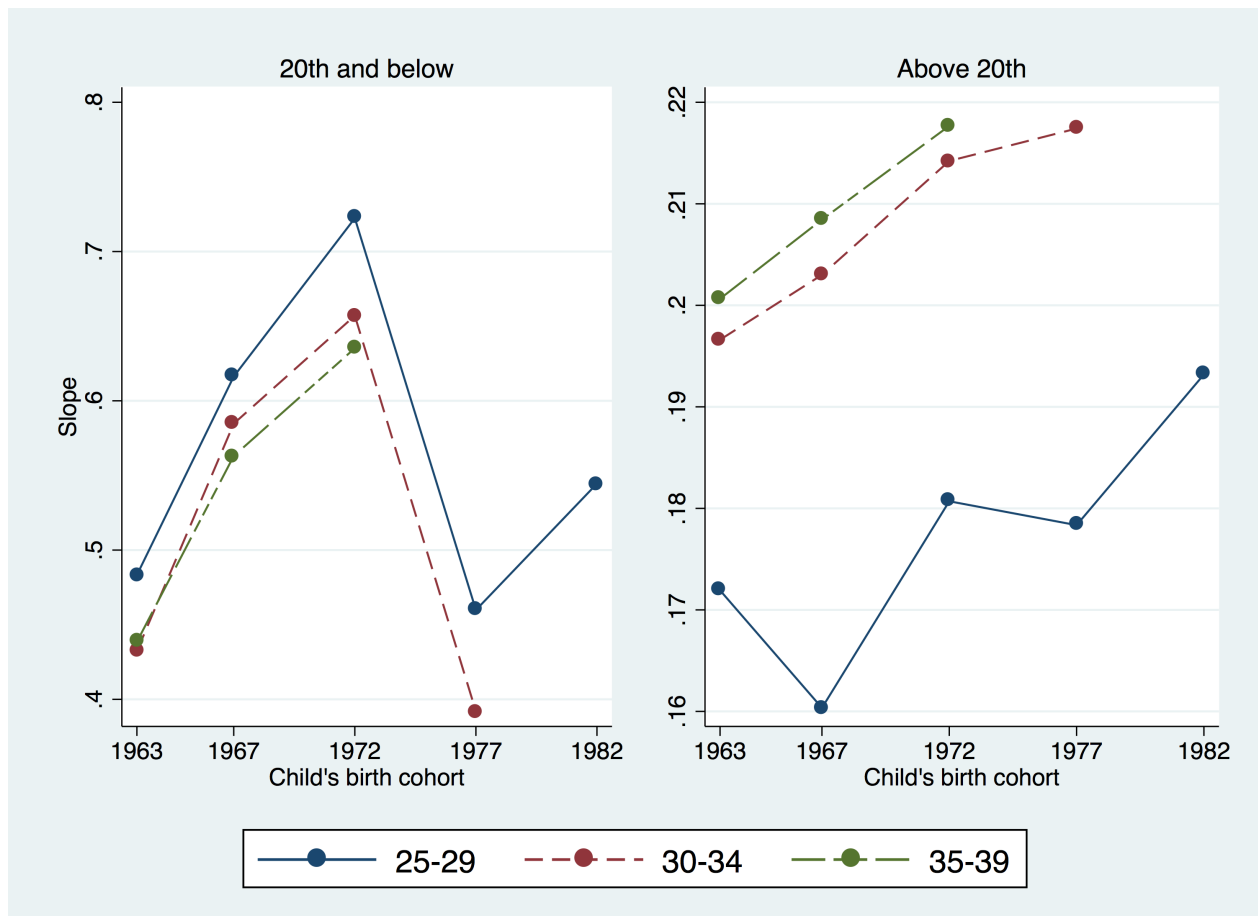
Source: Authors' calculations based on the IID

Figure 5: Nonlinearity in rank mobility by birth cohort



Note: This figure shows the lowess estimations of Equation (1), by birth cohort.
Source: Authors' calculations based on the IID

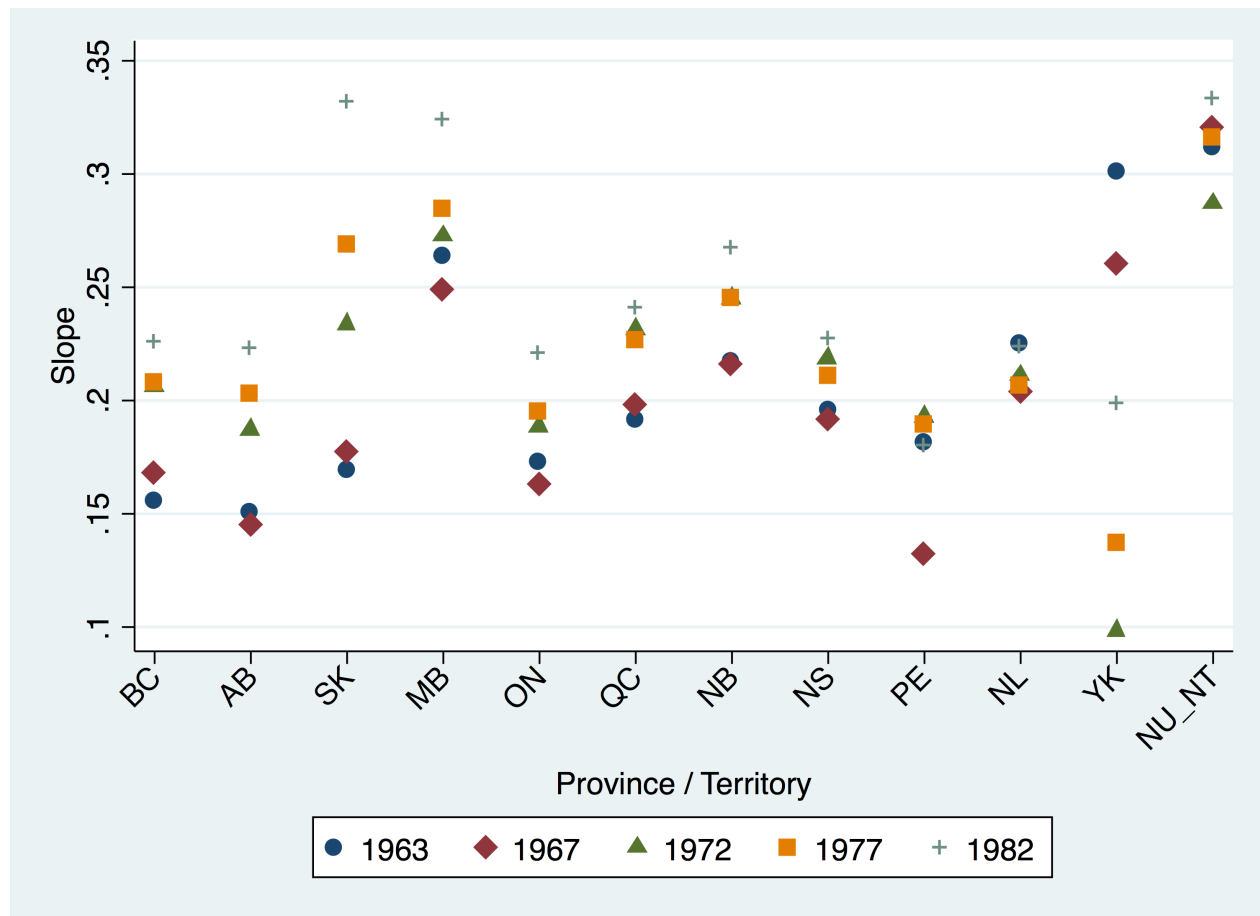
Figure 6: Rank mobility below and above the 20th percentile of parental income



Note: This figure shows the estimated slope coefficient of rank mobility, by age group and birth cohort, where Equation (1) is modified to allow two slopes: one for parental ranks 1 to 20, and the other for parental ranks 21 to 100.

Source: Authors' calculations based on the IID

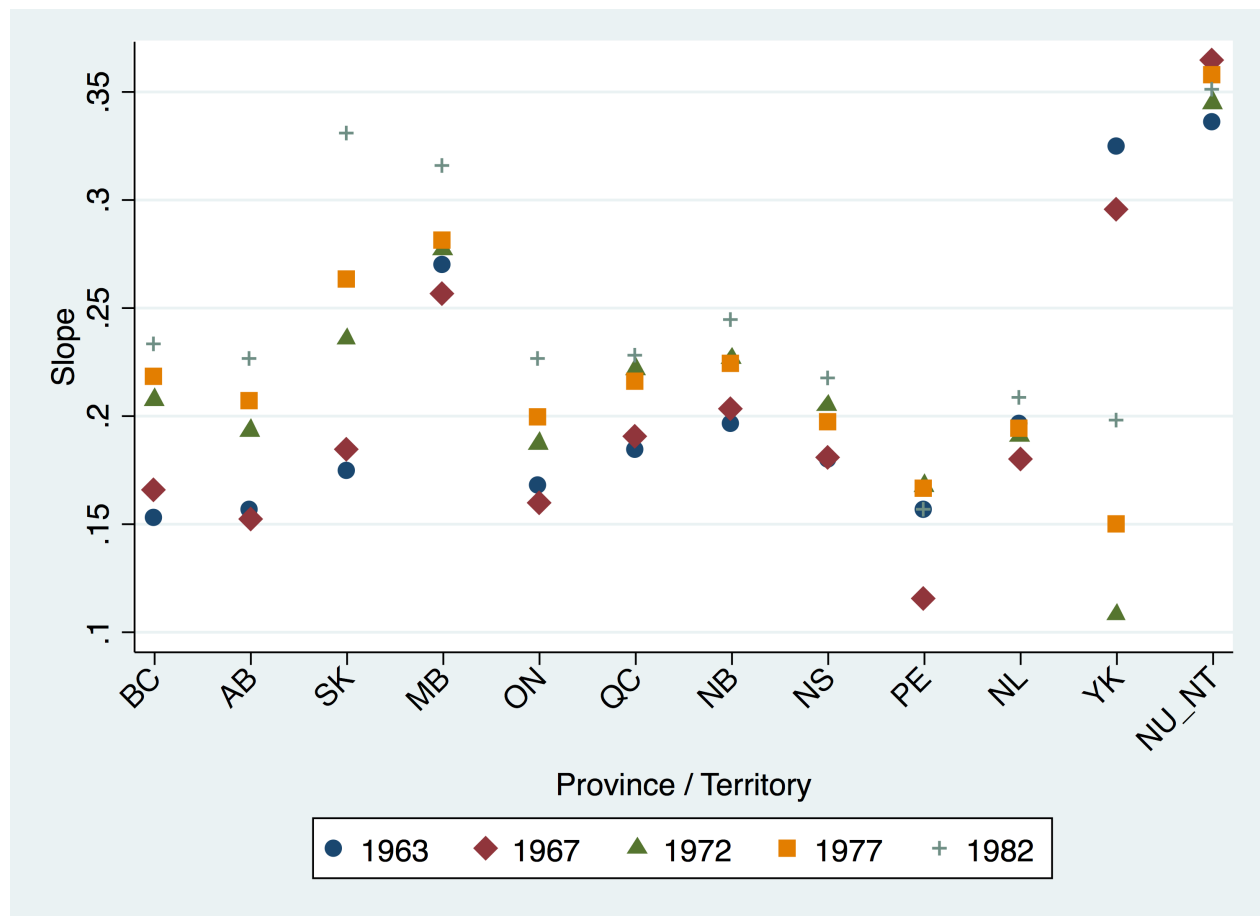
Figure 7: Rank mobility by province or territory and birth cohort using national ranks



Note: This figure shows the estimated slope coefficient of Equation (1), by province or territory and birth cohort, with ranks computed at the national level.

Source: Authors' calculations based on the IID

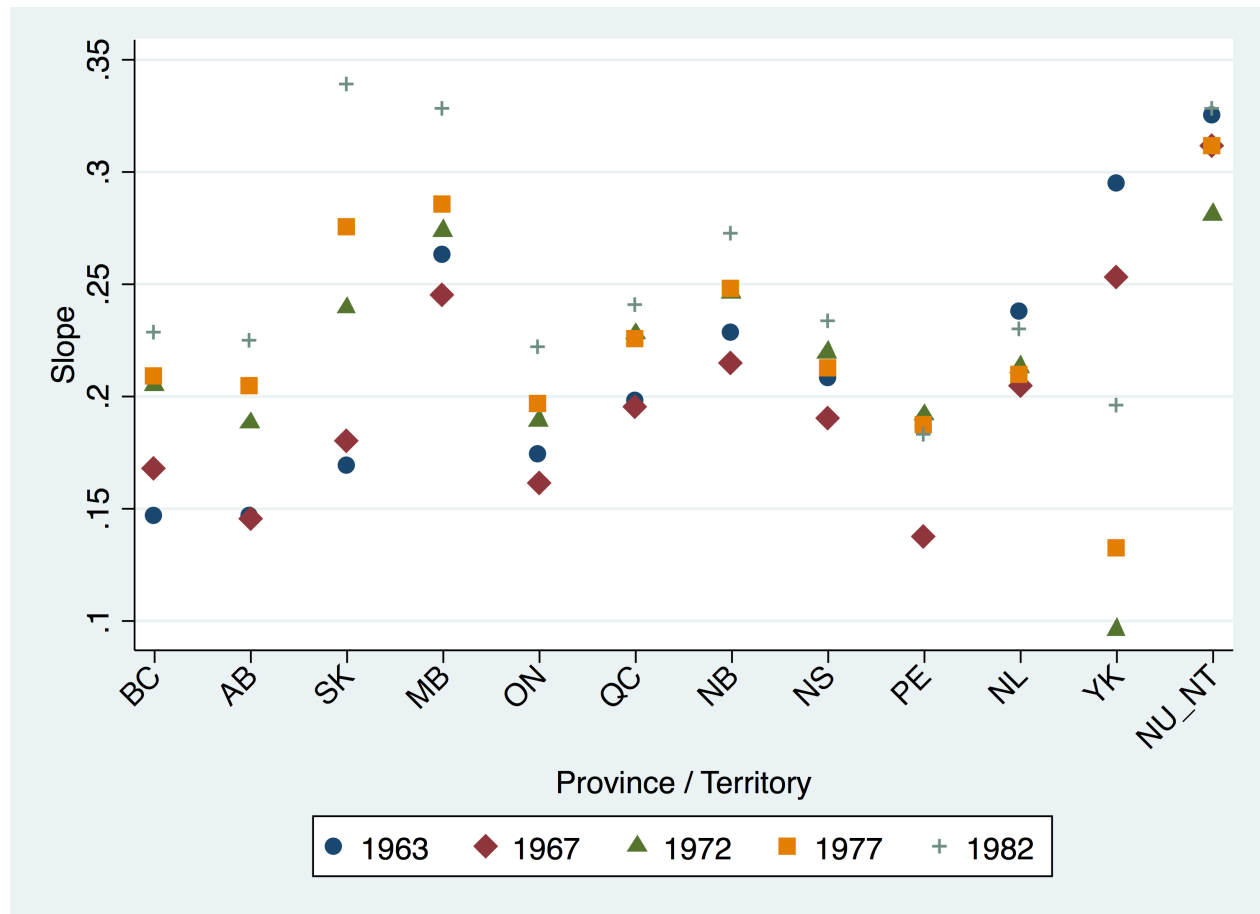
Figure 8: Rank mobility by province or territory and birth cohort using provincial or territorial ranks



Note: This figure shows the estimated slope coefficient of Equation (1), by province or territory and birth cohort, with ranks computed at the provincial or territorial level.

Source: Authors' calculations based on the IID

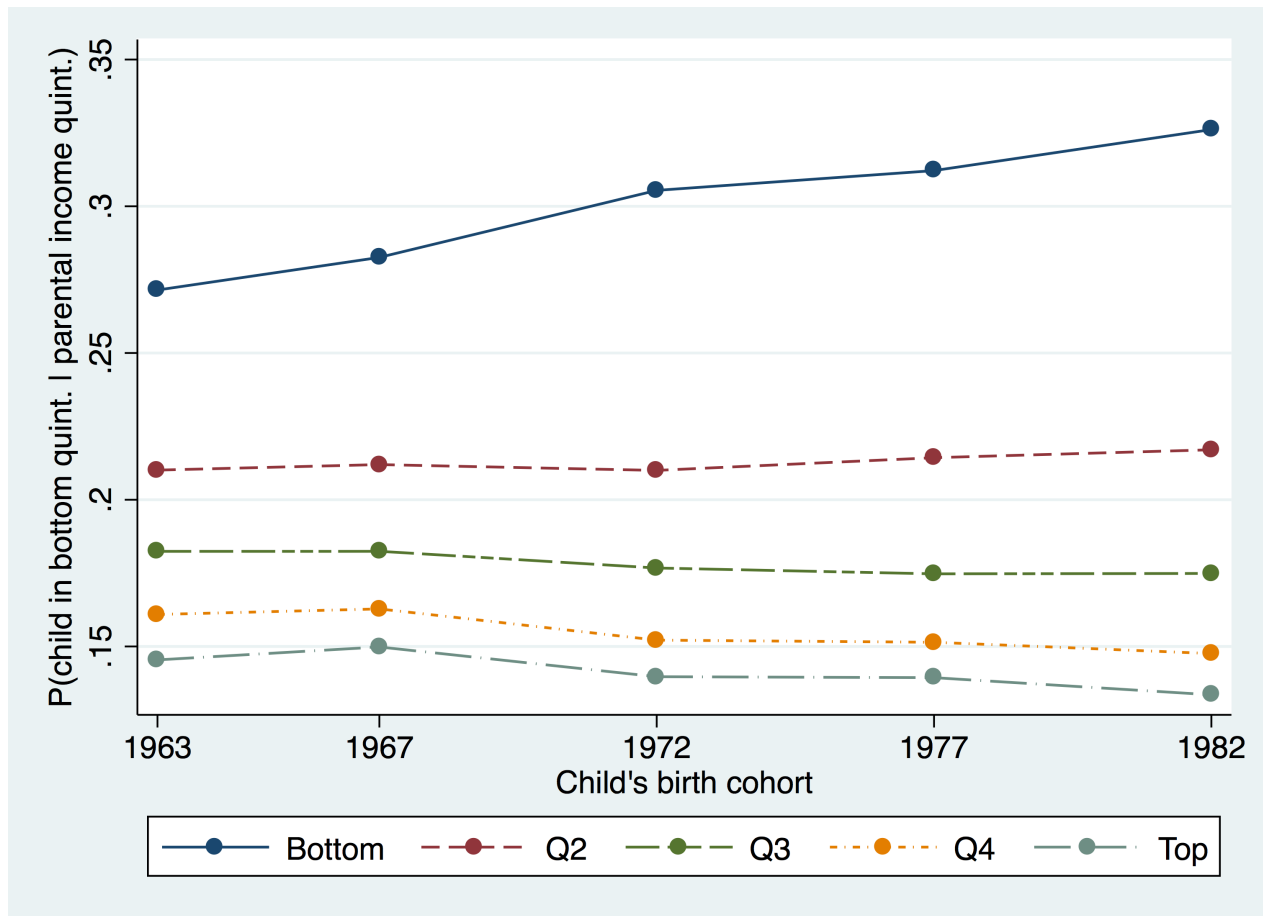
Figure 9: Relative rank mobility by province or territory and birth cohort using after-tax income and ranks at the national level



Note: This figure shows the estimated intercept coefficient of Equation (1), by province or territory and birth cohort, with ranks computed at the national level.

Source: Authors' calculations based on the IID

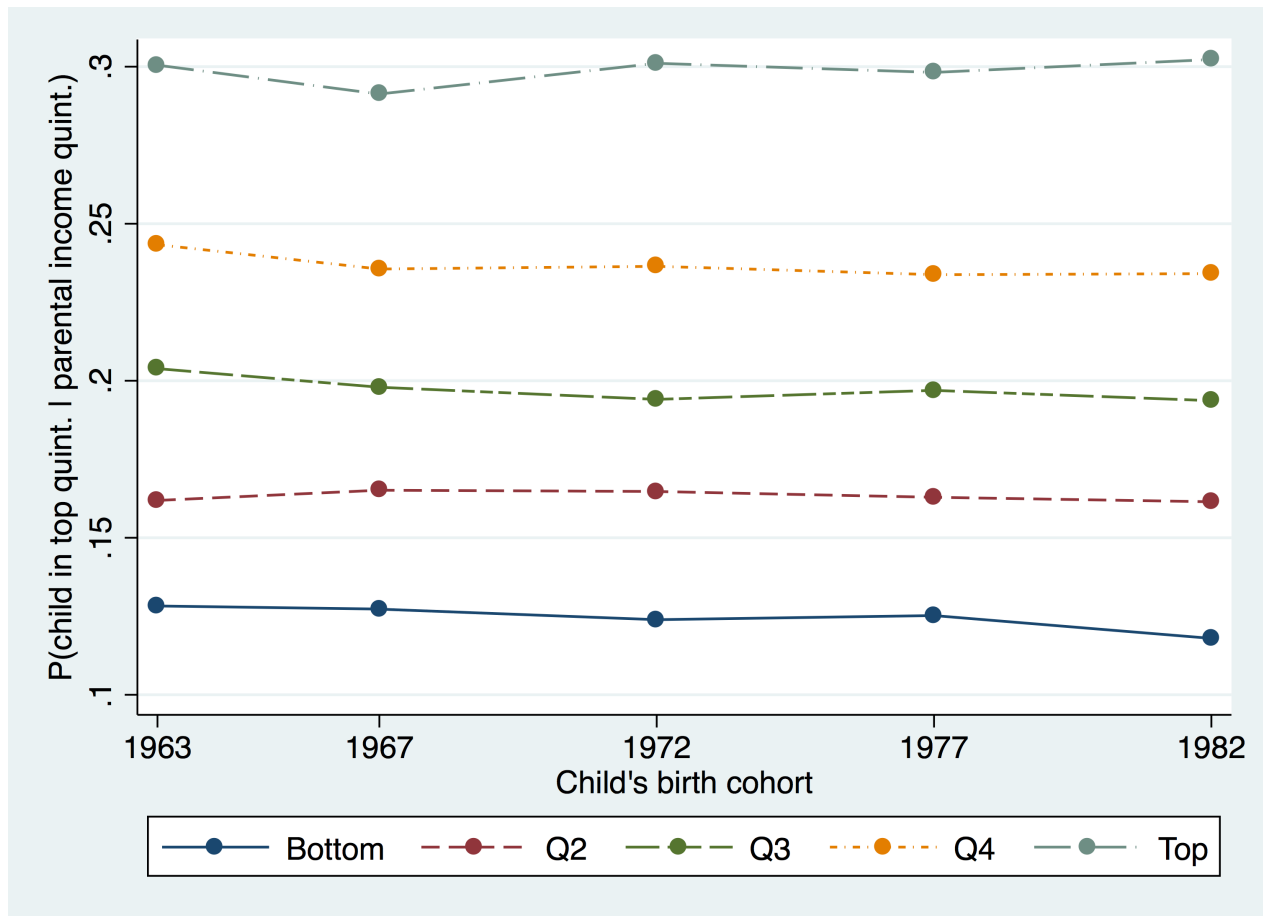
Figure 10: Probability for a child to be in bottom income quintile by parental income quintile and birth cohort



Note: This figure shows the probability for a child to be in the bottom income quintile of his or her income distribution, by parental income quintile and birth cohort.

Source: Authors' calculations based on the IID

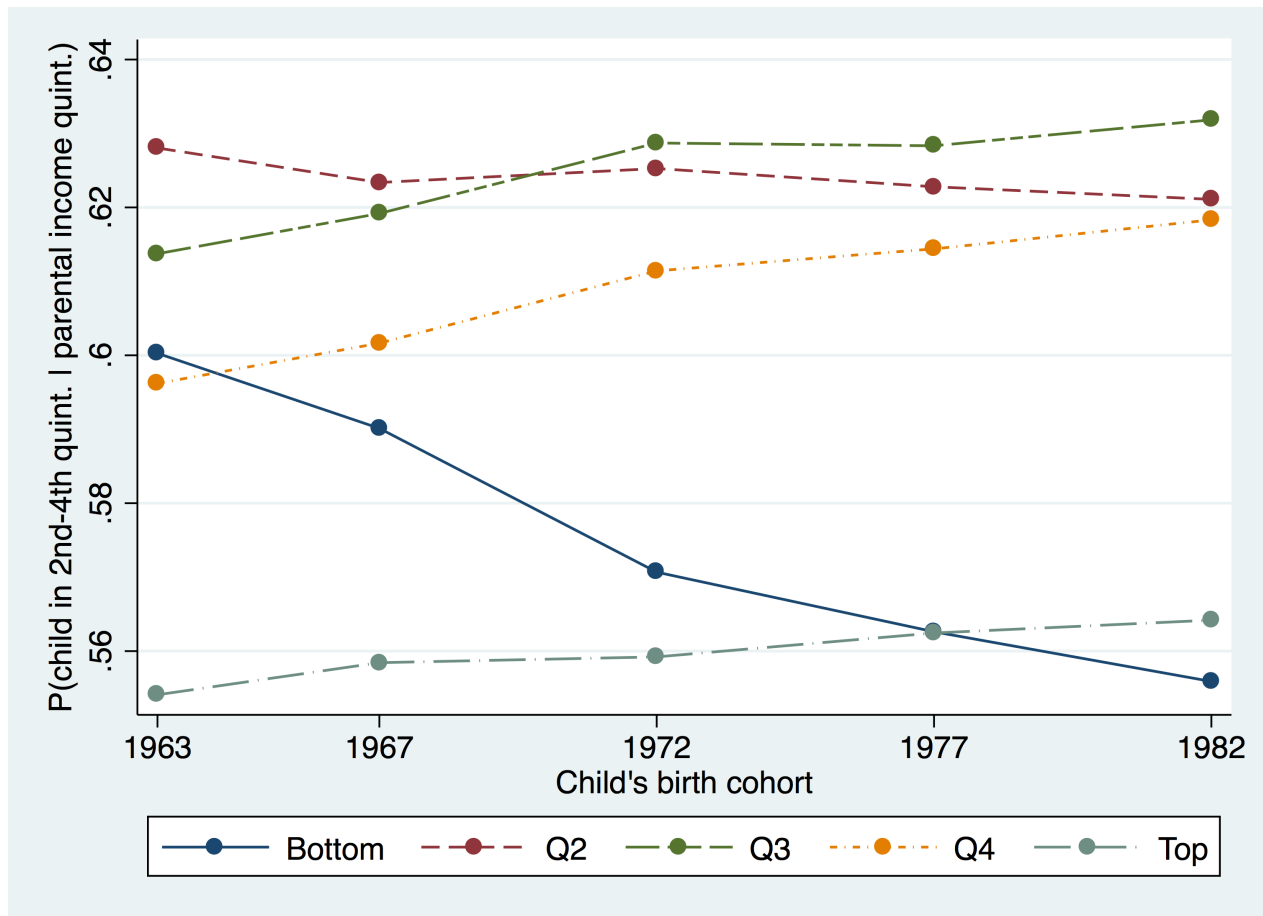
Figure 11: Probability for a child to be in top income quintile by parental income quintile and birth cohort



Note: This figure shows the probability for a child to be in the top income quintile of his or her income distribution, by parental income quintile and birth cohort.

Source: Authors' calculations based on the IID

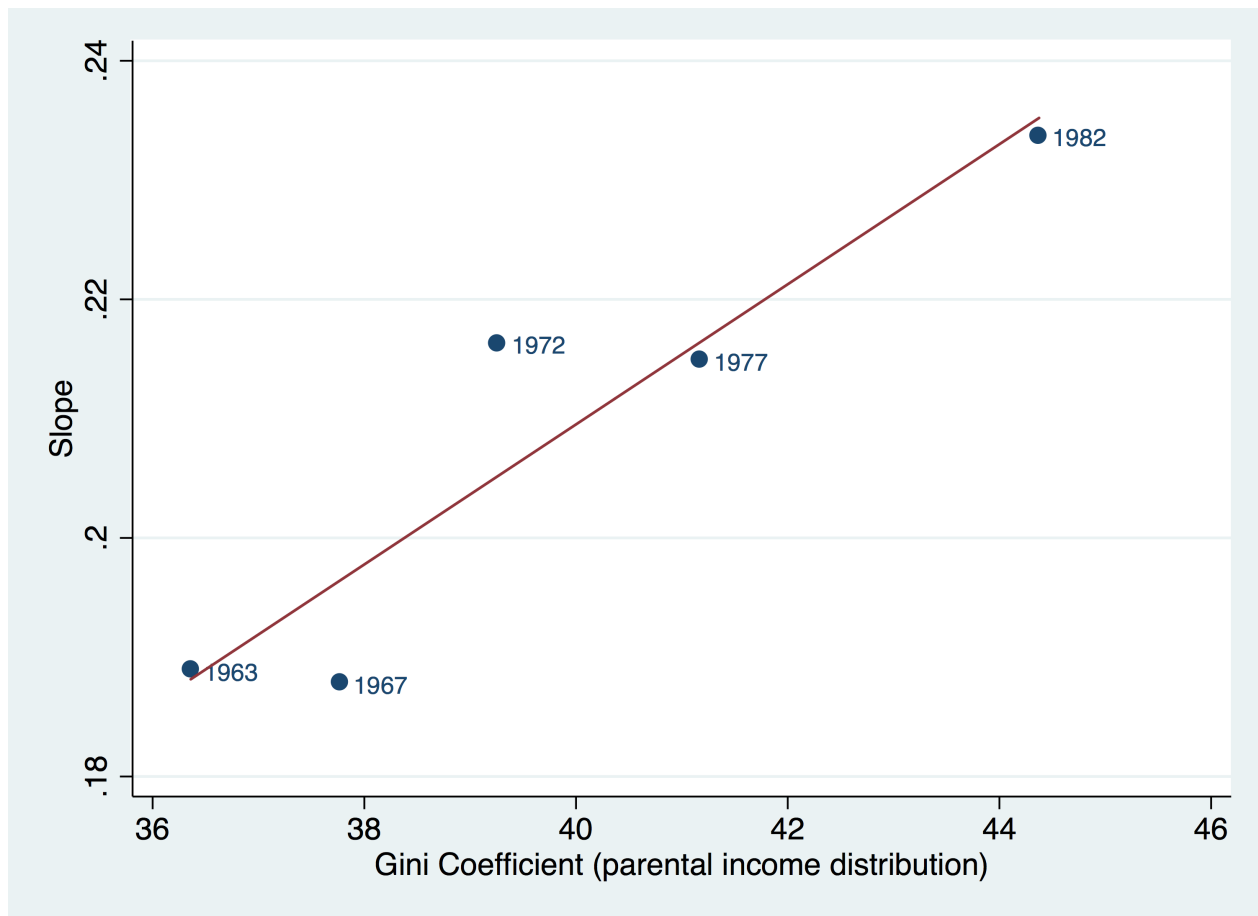
Figure 12: Probability for a child to be in middle three income quintiles by parental income quintile and birth cohort



Note: This figure shows the probability for a child to be in the middle three income quintiles of his or her income distribution, by parental income quintile and birth cohort.

Source: Authors' calculations based on the IID

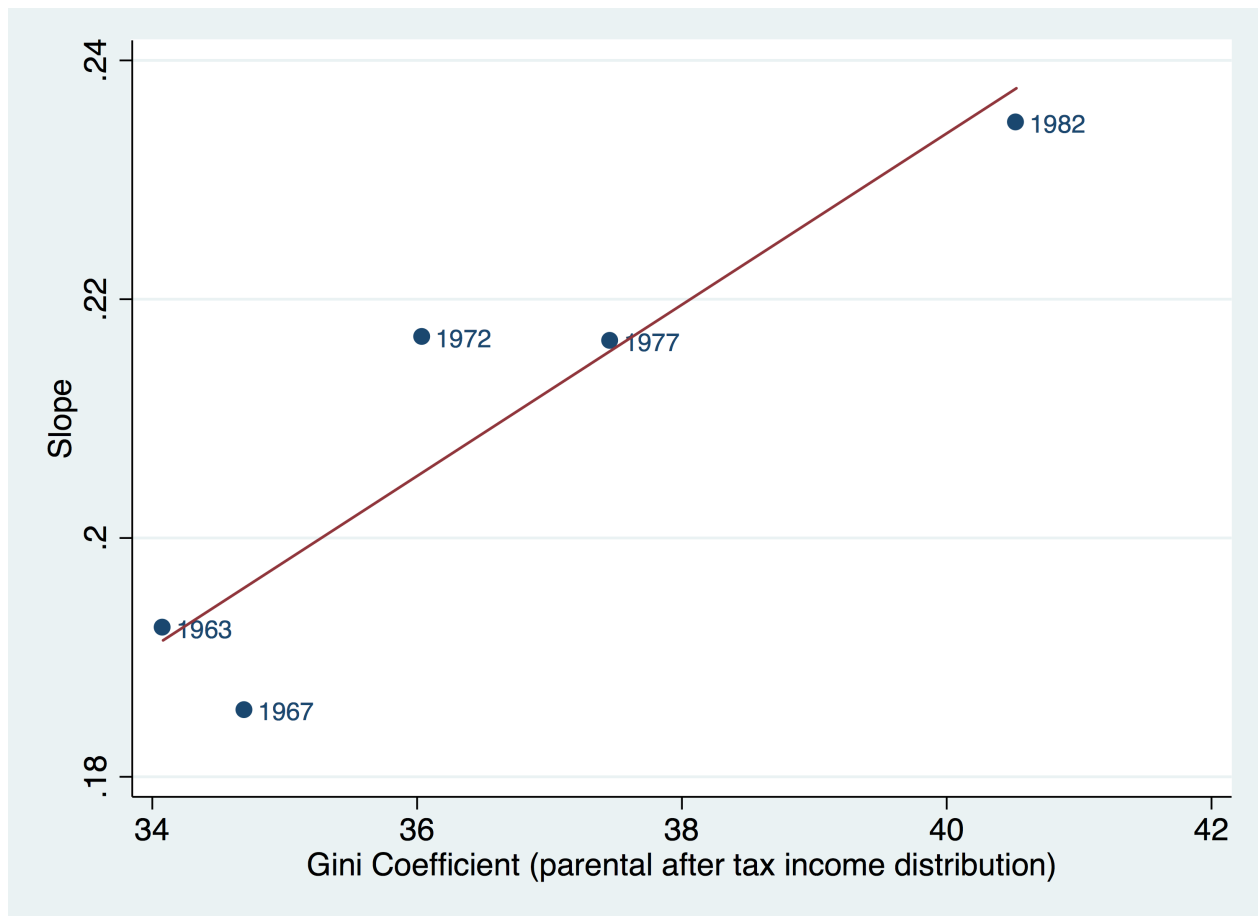
Figure 13: Great Gatsby Curve for relative rank mobility



Note: This figure shows the relationship between the Gini coefficient of the parental income distribution (on the X-axis) and the estimated slope of Equation (1) (on the Y-axis). The line is the best linear fit. Each point corresponds to a birth cohort.

Source: Authors' calculations based on the IID

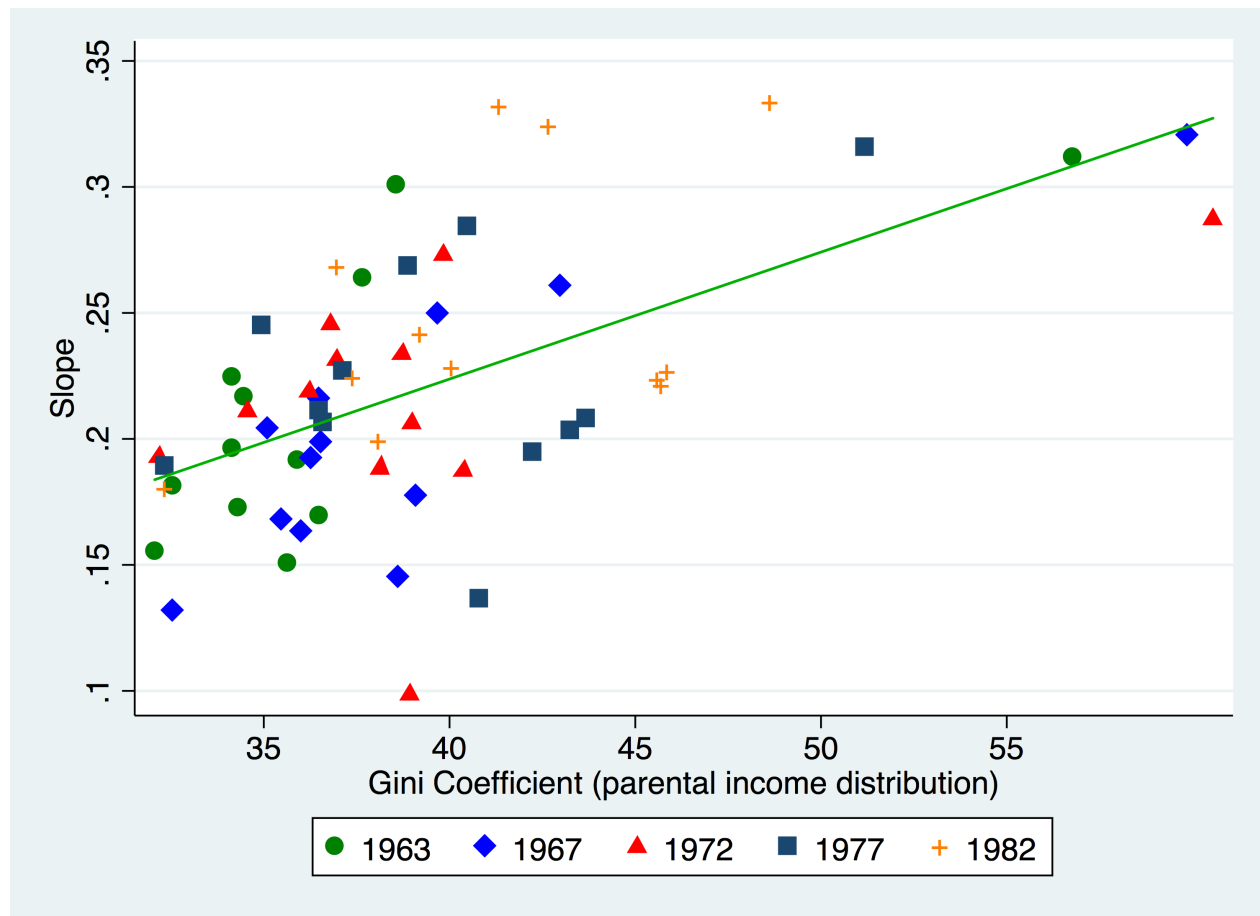
Figure 14: Great Gatsby Curve for relative rank mobility, using after-tax income



Note: This figure shows the relationship between the Gini coefficient of the parental after-tax income distribution (on the X-axis) and the estimated slope of Equation (1) (on the Y-axis). The line is the best linear fit. Each point corresponds to a birth cohort.

Source: Authors' calculations based on the IID

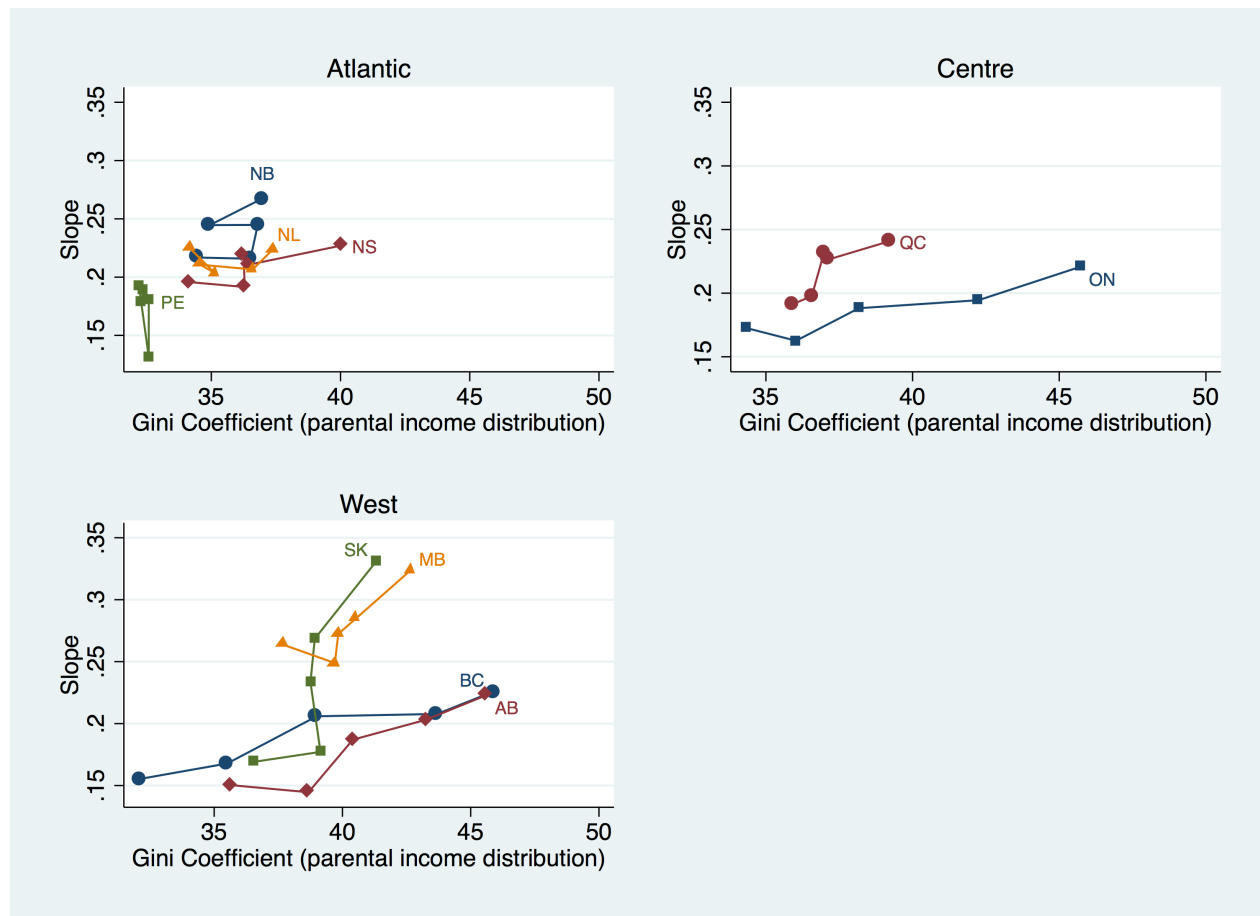
Figure 15: Great Gatsby Curve for relative rank mobility at the provincial level



Note: This figure shows the relationship between the Gini coefficient of the parental income distribution (on the X-axis) and the estimated slope of Equation (1) (on the Y-axis, where the ranks are computed at the national level). The line is the best linear fit. Each point corresponds to a province or territory and birth cohort.

Source: Authors' calculations based on the IID

Figure 16: Great Gatsby Curve for relative rank mobility by province



Note: This figure shows the relationship between the Gini coefficient of the parental income distribution (on the X-axis) and the estimated slope of Equation (1) (on the Y-axis, where the ranks are computed at the national level). Each point corresponds to a province and birth cohort. The points for a given province are connected from the oldest birth cohort to the more recent, with the province abbreviation next to the point for the more recent birth cohort.

Source: Authors' calculations based on the IID