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Title: Education and the Intergenerational Transmission of Income in Canada

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Abstract
This project will contribute directly to this aim by providing descriptive evidence on the evolution of the transmission of income between parents and children by parental education by geography across Canada, using newly created linked education-income longitudinal administrative data. We will also analyze the causal relationship between parental education and income mobility. To identify the role of parental education on children's mobility in Canada, we will exploit changes in school-entry age and school leaving-age laws.

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Please note: this project is starting and it is still work in progress. We will be working on this project over the summer.

1. OBJECTIVES Over the last century, the education system in Canada has seen many changes. From the expansion of minimum school-entry age and school-leaving age, to the deployment of post-graduate education across the country, Canada's education landscape has changed dramatically. Today, more than ever before, higher education plays a strategic role in providing access to employment with decent wages. With the rise in wage inequality and the decrease in social mobility, it is important to understand the role of education in the promotion of social mobility. Connolly, Corak and Haeck (2019) show that there are important differences across Canada in terms of social mobility. Our recent work also show that mobility has been decreasing over time in Canada. Understanding and ensuring equality of opportunity must be a priority for public policy decision makers and citizens alike. An important part of Canada's future success lies in the level of economic opportunities available for children from different socioeconomic backgrounds. Identifying the factors promoting access to economic opportunities irrespective of backgrounds is essential. Compared to other countries, and especially to the United States, Canada appears to be a place of relatively equal opportunities. Children growing up in poor households in Canada are more likely to move up the socioeconomic ladder as adults than their American counterparts (Connolly, Corak and Haeck 2019; Corak 2006). However, is this also true for children whose parents are not highly educated? Chetty et al. (2017) show that, in the United States, children of high-income families are more likely to attend elite colleges by a factor of 77, but that conditional on college attendance, youth from bottom-quintile families perform equally well on the labour market. This suggests that when given access, youths from poorer backgrounds also have high returns from postsecondary education on the labour market. Finally, they find that rates of upward mobility (moving up the income ladder compared to one's parents) are highest at certain public universities. This suggests that universities may have the potential to contribute positively to mobility and that studying the role of post-secondary institutions is an important next step in the research agenda.

This project will contribute directly to this aim by **providing descriptive evidence on the evolution of the transmission of income between parents and children by parental education by geography across Canada,** using newly created linked education-income longitudinal administrative data. We will also analyze **the causal relationship between parental education and income mobility.** To identify the role of parental education on children's mobility in Canada, we will exploit changes in school-entry age and school leaving-age laws. Oreopoulos (2006) shows that compulsory instruction laws have had a positive impact on educational attainment of the parent generation in Canada. In the US, Oreopoulos and Page (2006) show that compulsory schooling for parents also benefited children.

The existing Canadian research on income mobility and education in Canada has thus far been limited by data constraints. This project aims to address the limits of current knowledge. The existing national-level statistics are valuable, but limit our capacity to understand the geographic dispersion of mobility among parents and children of different education levels and act where needed. The data constraints have limited our ability not only to study the geographic patterns and place-based policies, but also to directly compare the intergenerational transmission of income of lower-educated parents to those with higher education diplomas, as well as finer questions such as the contribution of the geographic and temporal dispersion of higher education. **Newly linked administrative microdata** sources allow us to revisit the social mobility of children of parents with different levels of education in Canada, with the intent to **generate knowledge on this individual and social issue, and to inform public policy, in particular education policy**.

2. CONTEXT **Originality** A non-trivial challenge that researchers face when measuring mobility is the need to have data on two successive generations with measures of socioeconomic status and, ideally in the case of income, for a large number of years to get closer to the true permanent income and away

from possible transitory shocks (Grawe 2006; Mazumder 2016; Chen et al. 2017). Until recently, mobility estimates for the U.S. were based mostly on survey data of limited sample sizes, such as the Panel Study of Income Dynamics (Solon 1992; Corak 2004). Recent work by Chetty et al. (2014a,b) uses administrative federal tax data in the U.S. to provide mobility estimates at a subnational level, the commuting zone, that would have previously been impossible with survey data. Most of the estimates on Canada are based on administrative tax files from Statistics Canada's Intergenerational Income Database (IID) (Corak and Heisz 1999; Chen et al. 2017). The original version of the IID provides tax data on cohorts of children born between 1963 and 1970 and their parents. Through funding received by Connolly and Haeck from the Fonds de recherche du Québec – Société et Culture (FRQSC), more recent cohorts of children were added to the IID. This allowed Connolly, Corak and Haeck (2019) to directly compare Canadians with Chetty et al.'s (2014a) American children born between 1980 and 1982. We find that intergenerational mobility is greater overall in Canada than it is in the United States. Although Canada is more mobile overall, the dispersion of mobility within the country is large, with some areas offering little opportunities for children to move up the economic ladder, while in others movement along the income distribution is high. In summary, over the past decades, the literature has focused on building and exploiting new data sets that link parents and children's income. This was already a major achievement.

In this project, we go one step farther and build upon the great work of our predecessors. We **exploit new longitudinal administrative data files containing both education and income data for parent-children pairs**. We describe below the data construction and terms of use. This new data set allows us to study mobility for young adults of parents with different educational backgrounds at a fine geographic level, providing us with the **first-ever detailed picture of mobility across Canada by parental education level**. This will help to better understand the role of education in the promotion of social mobility. We also want to look at the **role of accessibility to higher education and general education on the intergenerational transmission of income**.

Framework As in Connolly, Corak and Haeck (2019), we frame our study of intergenerational transmissions using a simplified version of the model in Solon (2004), itself an adaptation of the workhorse model of Becker and Tomes (1979, 1986) and Loury (1981). In this model, the current generation (t) is related to the previous one ($t-1$) according to the following equations:

$$y_t = \rho h_t \quad (1) \qquad h_t = \theta y_{t-1} + e_t \quad (2) \qquad e_t = \lambda e_{t-1} + \epsilon_t \quad (3)$$

where y is the natural logarithm of permanent income, h is human capital, which determines income through its return ρ, and in turn may be determined by parental income (y_{t-1}) if there are credit constraints in human capital investment (captured by θ), but otherwise determined by endowment e. This unobserved endowment e is not influenced by family investment decisions and is mechanically transmitted across generations by a first-order auto-regression governed by parameter λ, the "inheritability of endowments," with ϵ being a random variable representing "luck." This framework does have limitations, as described in Solon (1999): it does not take into account the intergenerational transfer of assets other than human capital, and it ignores the role of assortative mating, of division of family resources among multiple children and the effects of interactions among siblings. Yet, while very simplified, it allows us to conceptualize what we are measuring and capturing in our empirical specifications, and to identify the broad transmission channels that come into play when studying the intergenerational transmission of income, as also laid out in Corak (2013). We focus here on **income transmission**, as the literature in economics often does, given the richness of the income variables in our data. The process of education transmission is the subject of a rich literature, especially in sociology (e.g. Lawrence and Breen 2016; Song and Mare 2017 for recent work).

3. METHODOLOGY Relying on the framework described above, in a first step, we will estimate the intergenerational transmission of income for children with parents of different educational backgrounds. Different measures of mobility will be estimated based on the linear model shown above (also see Connolly, Corak and Haeck, 2019) for children with parents of different education levels. The new data detailed in this proposal and developed by Statistics Canadawill allow us to measure mobility at a very fine geographic level for children of different socioeconomic backgrounds. This will provide valuable information to policy makers across Canada. In a second step, we want to push the boundaries of research by investigating the role of education in the transmission of income by exploiting temporal and geographic differences in compulsory education laws. More specifically, we want to exploit variations in school-entry age and school-leaving age for the parent generation to identify the role of general instruction in the promotion of social mobility. Education is endogenous. To identify the causal impact of education, this endogeneity will be addressed by exploiting variations in school-entry age and school-leaving age. The first step is a difference-in-differences specification but with more than one intervention and more than one "treatment group". We estimate the following equation:

$$S_{pcy} = \delta CL_{pc} + \gamma X_{pc} + e_p + e_c + e_y + e_{pcy},$$

where S_{pcy} measures schooling attainment for parents in province p, in birth cohort c and in census year y. CL_{pc} captures the compulsory laws on entry age and leaving age; X_{pc} is a vector of controls; e_p, e_c and e_y are provincial, cohort and year fixed-effects; and e_{pcy} is the error term. The predicted educational attainment obtained in the first step is then used in a second step to estimate the role of parental education on mobility:

$$M_{pcy} = \beta \overline{EDUC}_{pcy} + \gamma X_{pc} + u_p + u_c + u_y + u_{pcy},$$

where M_{pcy} is a mobility measure; and $\overline{EDUC}_{pcy}$ is the predicted level of parental education.

4. The Intergenerational Income Database (IID) and new data linkages The original IID was developed in the mid 1990s by Miles Corak, then at Statistics Canada, with the aim of using administrative tax data to study the transmission of income across generations of Canadians. This important data contribution spawned many valuable papers on the topic (Corak and Heisz 1999; Corak 2001; Oreopoulos 2003; Grawe 2004, 2006; Oreopoulos et al. 2008; Chen et al. 2017, among others), and became the main source of intergenerational mobility estimates in Canada. The IID is a set of administrative tax files that contain tax records from 1978 to 2014 for successive cohorts of Canadian children and their parents. The original IID covered cohorts of children born between 1963 and 1970. Through Connolly and Haeck's FRQSC funding, the IID was supplemented by adding younger cohorts. Table 1 below presents the number of observations by birth year, where cohorts are labelled using the year of the match between children and their parents in the tax data.

Table 1: Cohorts in the Intergenerational Income Database

Cohort	Birth years	IID count	IID weighted	Census count	Ratio
1982	1963 to 1966	1,183,614	1,517,127	1,723,720	0.88
1984	1965 to 1968	1,124,849	1,517,126	1,563,105	0.971
1986	1967 to 1970	1,155,248	1,517,127	1,520,745	0.998
1991	1972 to 1975	1,102,855	1,484,566	1,495,750	0.993
1996	1977 to 1980	1,166,879	1,558,393	1,570,605	0.992
2001	1982 to 1985	1,350,222	1,634,646	1,642,535	0.995

The IID is based on Statistics Canada's T1 Family File, and as such, contains detailed tax data on millions of individuals filing their tax returns in Canada and their parents, thus allowing analysis at a finely disaggregated geographic level. Yet, for its millions of observations, the IID is limited by the relative paucity of variables pertaining to something other than income, and crucially to the lack of

information on education. A new data development will bring unprecedented opportunities to researchers interested in intergenerational transmissions. Statistics Canada has, over recent years, been promoting a new approach to the generation of data, based on existing administrative data files that can be coupled with one another (and with other survey data) using keys that are generated from record IDs and stored in a key registry. This process, known as the Social Data Linkage Environment, opens up new possibilities, in this case by **supplementing the IID with data from the Census**, which contains educational attainment, as well as the geographic location of the last diploma obtained for both parents and children. The Census contains information on the place of birth for the respondent and his or her parents, education, and occupation, among others. One in five Canadians is asked to complete the so-called long-form Census, so the merge with the IID will not cover all individuals in the data. However, the link with the Census will be attempted for multiple waves: the 1991, 1996, 2001 and 2006 Census, as well as the 2011 National Household Survey, each time trying to find a match with either the children or the parents of the IID. A combined coverage rate of 20% would mean that more than one million parent-child pairs from the IID would be linked. **This new data set is now available only to our team in Montreal under a pilot project directed by Statistics Canada.**

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