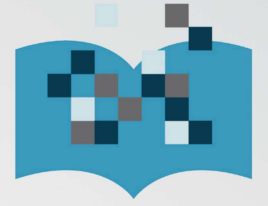


# The Relative Role of Parental Income and Parental Education in Child Educational Achievement and Socioeconomic Status Attainment: A Decomposition Approach

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**Education  
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RESEARCH INITIATIVE



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# Abstract

In this paper, we provide evidence on the relative importance of two family background variables for the educational attainment and income level achieved by Canadians: parental education and parental income. We find that parental education is more strongly related to a child's educational attainment than parental income, although parental income also plays a significant role both statistically and substantively. These findings call into question less nuanced interpretations of some existing studies, which often appear to discount the role of parental income and financial obstacles to postsecondary education participation. At the same time, this study is consistent with existing evidence of the independent role of parental education in child educational attainment, hinting at important non-financial obstacles to educational attainment. Our insights are based on observational data and provide relevant insights for further causal research as well as discussions of new policy interventions.



# Executive Summary

- In this paper, we provide evidence on the relative importance of two family background variables for the educational attainment and income level achieved by Canadians: parental education and parental income.
- Previous analyses by Canadian researchers use approaches that do not allow to accurately quantify the relative role of each type of parental background characteristics. Leveraging a new data source, the Longitudinal and International Study of Adults (LISA), we propose a method that addresses the limitations of previous studies in this area.
- We find that parental education is more strongly related to a child's educational attainment than parental income, although parental income also plays a significant role both statistically and substantively.
- Our results focusing on child income in adulthood show that parental income is more strongly related to the child's adult earnings than parental education. However, most of the relationship between parental education and child income operates indirectly through the educational attainment of children, while the opposite is true for parental income. In other words, earnings disparities observed between children of more or less highly educated parents can be accounted to a large extent by differences in the educational attainment of these children. Conversely, earnings disparities observed between children of lower- and higher-income parents remain substantial even when comparing children with the same level of educational attainment.
- Our results have several important implications:
  - First, the large and significant gaps in educational attainment that we observe between children of more or less highly educated parents can be interpreted as evidence of the importance of non-financial obstacles to postsecondary education (PSE) access and completion. This mirrors findings from experimental studies of the effects of informational interventions among high school students.
  - Second however, our findings of the significant and non-negligible role of parental income for child educational attainment can be interpreted as evidence that financial obstacles to PSE access and participation should not be discounted when designing policy interventions.

- More specifically, our findings of a large earnings gap between children of lower- and higher-income parents with the same level of educational attainment suggest that the educational pathways of students with different parental income levels may differ substantially even among those who complete the same credential. For example, differences related in institutions, fields of study, time to completion, and school-to-work transitions may play a role, and future work should explore further the role of those factors.
- In terms of limitations, our findings are based on observational data and do not directly measure the financial and non-financial obstacles encountered by students, nor their causal effects on education and earnings. They nevertheless provide insights for policy discussions and the design of programs and interventions aimed at addressing inequalities emerging in the education system between students of more or less privileged backgrounds.

# 1. Introduction

## 1.1. Context

Canadian studies asking what are the obstacles to postsecondary education (PSE) participation and success often aim to provide evidence of the relative role of financial and non-financial factors. To do so, researchers have been able to leverage data from longitudinal data sources such as the Youth in Transitions Survey (YITS), providing rich information on the family background of young Canadians prior to high school completion as well as information on their educational achievement. The basic setup of most of these studies is a multivariate regression of child educational access or attainment on family background variables, including a parental income variable as a measure of financial resources, and a measure of parental education as a measure of social or cultural capital, or of information about the PSE system (Drolet 2005; Finnie, Mueller, and Wismer 2015; Kamanzi and Doray 2015; Moulin and Gingras 2019).

These studies have contributed to show a strong relationship between educational achievement and parental education, highlighting the importance of non-financial factors as possible barriers to PSE access and as an area of interest for policy interventions. However, many of these studies also formulate strong claims about the primacy of cultural capital and the marginal role of financial resources in PSE participation, sometimes contending that the role of parental income in child educational attainment is negligible relative to parental education.

## 1.2. Motivations and objectives

In this paper, we aim to revisit these findings for two reasons. First, we aim to address methodological shortcomings of many existing studies that stem from limitations of previously available datasets (especially possible measurement error in parental income variables) and from interpretation issues (the choice of statistics used to evaluate the relative importance of parental income and parental education as correlates for educational attainment).

Providing updated and improved evidence on this topic is important given that in Canada and elsewhere, financial barriers to PSE access receive a lot of attention in academic, policy, and public debates, such as those on the cost of tuition and student loan debt. In fact, several recent studies in Canada and the US find strong relationships between parental income and child education or academic achievement in models that do not include a parental education variable (Bailey and Dynarski 2011; Reardon 2011; Simard-Duplain and St-Denis 2020c; Finnie and Pavlic 2013; Frenette 2021). Therefore, there are good reasons to investigate to what extent this relationship is spurious, and whether it is attenuated when taking into account the role of parental education in multivariate models.



Second, few Canadian studies have investigated the relative role of parental income and parental education together on outcomes other than educational attainment, and especially a child's income in adulthood. Recent evidence shows an increase in the association between parental and child income (Connolly, Haeck, and Lapierre 2021), which stands as evidence of a decrease in social mobility over the few last decades. These findings indicate that a child's income in adulthood is increasingly dependent on the income level of their parents in childhood.

Importantly, education accounts for 30% to 50% of the association between parental and child income in Canada (Simard-Duplain and St-Denis 2020c), much like the UK (Blanden, Gregg, and Macmillan 2007) and the US (Bowles and Gintis 2002), making it an important mediator of intergenerational income transmission. That is, the relationship between parental and child income operates in part indirectly, through a greater likelihood of postsecondary education completion among children from higher-income families. The remaining 50 to 70% of the intergenerational income transmission estimates, or the direct association, can be viewed as an estimate of the reproduction of inequalities based on parental income among individuals with the same level of education. We interpret it as evidence of disparities emerging throughout and after educational trajectories between children of lower and higher-income families, such as those that would emerge in PSE pathways in terms of time to completion, choice of field of study and institution, and school-to-work transitions.

In other words, while the existing literature highlights that parental education may be an important factor for educational attainment, parental income may drive inequalities emerging during PSE which, importantly, translate into economic inequalities among graduates with similar educational attainment levels but different parental income levels. That being said, little to no Canadian research has estimated mediation models with datasets including both parental income and parental education as predictors of child income in adulthood. In this paper, we aim to address this knowledge gap by extending our analyses beyond child education, to child income in adulthood.

### 1.3. Research questions

In this paper, we use observational data from the Longitudinal and International Study of Adults (LISA) linked with detailed parental and child income data from tax records to address this puzzle in the literature. The LISA includes detailed measures of parental education and child educational attainment. More importantly, its linkage with administrative data allows us to derive fairly reliable measures of income for the parents of a large subsample of respondents. This feature of the data allows us to address the data quality concerns posed by the use of surveys such as the YITS, that include measures of parental income with a potential measurement error.

With this data, we are able to ask the following questions:

1. What is the relative importance of parental education and parental income for child educational attainment and income level in adulthood?
2. Is child educational attainment an important mediator of the relationship between parental background and child income?
3. Is child educational attainment a more important mediator for one of the two parental background variables? And conversely, is one of the parental background variables more strongly related to child income net of child educational attainment?

Following evidence of important gender differences in social mobility levels in Canada (Simard-Duplain and St-Denis 2020c), as well as of the importance of mother-daughter dynamics in the status attainment process (Beller 2009; Stevens 1986), we also conduct analyses separately by gender, including measures of both maternal and paternal educational attainment in various models.

Although our results of this project are descriptive rather than causal, they are likely to provide insights guiding policy intervention. They represent important complementary evidence relative to previous studies that have received a large amount of attention from academics and have informed policy discussions.

## 2. Review of the Literature

Several studies of educational attainment and of status attainment and social mobility focus on parental education or parental income. Early contributions to the social mobility literature in economics have focused on imperfect access to financial capital and limitations in the ability to contract debt to fund human capital investments as a driver of intergenerational income transmission (Becker and Tomes 1986). Subsequent US research identified financial constraints to parental investment in a child's education as an important factor driving disparities in educational attainment (Kornrich and Furstenberg 2013; Schneider, Hastings, and LaBriola 2018). For obvious reasons, parental income is often used as a variable capturing financial constraints. In Canada, research finds substantial gaps in RESP contributions by parental income (Milligan 2004; Frenette 2022), a possible channel for differences in financial resources available to lower- and higher-income children to fund their postsecondary education.

At the same time, parental education is viewed as a resource or factor that may operate independently from parental income and from financial obstacles to educational attainment. For sociologists, parental education is a measure of cultural capital, or the source of transmission of aspirations and of cultural codes and attitudes (the habitus concept) valued in the education system, that contribute to success as well as to a sense of belonging (Bourdieu and Passeron 1964). The role of parental education is also informational: first-generation students may not be familiar with what the education system has to offer, how to navigate it, what are the real costs associated with participation, and the earnings returns associated with a college or university degree (Finnie, Mueller, and Wismer 2015; Dynarski et al. 2022). Note that children of parents with experience in the postsecondary education system may also be more aware of programs providing financial assistance, meaning that parental education should not be viewed as a factor only related to non-financial obstacles to PSE access and completion. For all these reasons, we can expect gaps in educational attainment between children of more or less educated parents. In fact, Chow & Guppy (2021) show that parental education has a significant and persistent influence on the probability of different educational transitions among cohorts of Canadians born between 1911 and 1985.



## 2.1. Empirical studies on the relative role of parental income and parental education in Canada

Because the mechanisms discussed above have relatively different implications, several researchers have attempted to isolate the role of parental education and parental income in multivariate regression models using child educational attainment or PSE participation as a dependent variable. Here, we review the existing Canadian literature and highlight a few important methodological limitations in recent research.

Finnie et al. (2015) use the YITS to estimate the probability of PSE participation. The key dependent variables are parental education (eight categories) and parental income (five categories starting with below \$5,000 and then with cutoffs at \$25,000, \$50,000, \$75,000, and \$100,000). They find larger coefficients on the parental education variables, on the basis of which they conclude that parental education strongly matters and financial constraints constitute a more marginal factor. Moulin and Gingras (2019) also adopt the same approach and reach similar conclusions with YITS data restricted to Quebec. Finally, Drolet (2005) uses the SLID, which allows her to calculate a measure of parental income averaged over three years. She regresses college and university participation dummies on measures of parental education (three categories) and parental income (five categories in \$25,000 intervals). She also finds larger coefficients on parental education than parental income and concludes that parental education is a more important predictor than parental income for PSE participation.

Meanwhile, Kamanzi and Doray (2015) use the YITS to estimate a multinomial model regressing child educational attainment (university, college, and high school) on education (three categories) and a continuous measure of the log of parental income. Finding a smaller coefficient on the parental income variable than on the dummy for parental university education, they conclude that parental education plays a larger role than parental income. Again, this interpretation relies on comparing the coefficient of a continuous predictor with that of a dummy variable, which is problematic to the extent that the two variables are scaled differently.

We find three shortcomings common to these three studies:

1. First, the output produced in these studies does not allow to test and validate their hypotheses about the relative role of parental education and income. They compare coefficients for two variables which are scaled differently. This comparison says little about the relative role of each factor. More appropriate methods should rely on a standardization of the variables (which is hard to achieve given that parental income is a continuous variable and parental education is a categorical variable), or more plausibly, on measures of model fit such as the R-squared or the likelihood-based fit statistics of logistic regression models.

2. Second, three of the four studies artificially attenuate the variation in parental income across children by collapsing a continuous parental income variable into a small number of categories (especially given that the selected cut-offs for their categories do not correspond to meaningful points of the parental distribution, such as quintiles). This is likely to downwardly bias estimates of the association between parental and child education.
3. Third, data from the YITS used in Finnie et al. (2015), Kamanzi and Doray (2015), and in Moulin and Gingras (2019) include a measure of parental income with a potentially high level of measurement error: the measure is self-reported and captures a single year of income (therefore vulnerable to bias introduced by transitory volatility) rather than a more reliable measure of permanent income that has become standard in the social mobility literature (Chen, Ostrovsky, and Piraino 2017; Haider and Solon 2006; Mazumder 2005).

These shortcomings cast doubts on the reliability of the results from studies finding only a limited role for parental income. However, no recent study has addressed these concerns in Canada. Therefore, we hypothesize that the role of parental income may have been underestimated in existing studies because of these limitations. Our intuition is supported by research on intergenerational income transmission in Canada, which shows that the relationship between parental and child income net of parental education is large and statistically significant, and that the coefficient for parental income does not drop substantially when controlling for parental education (Connolly, Haeck, and Laliberté 2020). Note that in this study, parental education is the mother's educational attainment from the Census, and it does not take into account the educational attainment of respondents.

## 2.2. Summary

In sum, the existing Canadian research using the YITS or other similar datasets such as the SLID are undermined by major issues in the interpretation of regression coefficients. Different tools are necessary to test their hypotheses. To address the first limitation, we report various fit statistics that allow us to formally quantify the contribution of parental income and parental education as correlates of a child's educational attainment. To address measurement error stemming from limitations 2 and 3 above, we use a measure of parental income calculated from the average of parental total family income when the child is 15 to 19 years old, and the income variable is drawn from tax data. We also extend our analyses to child income and take into account the mediating role of child educational attainment.

# 3. Data

This paper relies on data from the Longitudinal and International Study of Adults (LISA), Wave 3 (2016), restricted to LISA respondents in the 1964 to 1980 birth cohorts. Each LISA respondent is linked with their administrative data from the T1 Family Files (T1FF). Using this feature of the dataset, we can measure the income of LISA respondents as reported in their tax records between 1982 and 2015 (for details on this linkage, see Hemeon 2016). The T1FF data also includes a roster of family members for each year when the respondent reported living at the same address as another family member in a year when they both filed (spouses and parents). The T1FF data of these individuals is also included in our list of variables from 1982 to 2015, allowing us to build an intergenerational dataset linking LISA respondents to their parents (Simard-Duplain and St-Denis 2020a; 2020b; 2020c).

We measure parental income as the sum of the annual total income of both parents (when present). More specifically, we average parental income when the child was 15 to 19, in line with the existing Canadian literature, which allows us to address measurement error and approximate permanent income (Chen, Ostrovsky, and Piraino 2017; Corak and Heisz 1999). We drop parents whose individual permanent income was below \$500. Child income is measured with individual employment income<sup>1</sup> (earnings reported in T4 slips and self-employment), averaged when the child was 30 to 34 years old, again dropping individuals with less than \$500 of average income. Both of these income variables are inflation-adjusted (all-item CPI) and scaled in percentile ranks. With these sample restrictions in place, we obtain a sample of approximately 2200 observations.

Next, the LISA provides a measure of maternal and paternal education, self-reported by the respondent in the survey component (less than high school; high school certificate; some postsecondary; university credential). We also use the LISA survey data to measure the educational attainment of respondents by allocating them into one of five categories based on their highest certificate, diploma, or degree: (1) high school certificate or equivalent, or less; (2) trade, vocational, or apprenticeship certificate or diploma; (3) college, cégep, and other non-university and university certificates and diploma below the bachelor's degree; (4) bachelor's degree; or (5) Graduate or first professional degree.

We report descriptive statistics for our sample in Table 1 (based on weighted frequency counts). Our sample is composed of 47% women. Around 40% of our sample has a Bachelor's degree (24%) or more (17%). Another 40% have some PSE, either at the college/cégep or other university credentials below Bachelor level (30%) or at the trades, vocational or apprenticeship certificate or diploma level (11%). Finally, 18% have a high school certificate (or equivalent) or less. In comparison, parents have lower levels of education, especially mothers, who are less likely than men to have completed a university credential (16% for mothers versus 25% for fathers).

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<sup>1</sup> In alternate models, we also use child total family income (the sum of a child's income and the income of their spouse, when present) as our dependent variable, with the same exclusions and transformations as with total family income. Results are similar to those for individual earnings and are not reported.



Table 1.

**Sample description**

	<b>Percentage</b>
Women	46.9
<b>Child education</b>	
HS certificate or less	18.0
Trade/Voc/Apprent	11.2
College/cegep/Uni below Bachelor	30.2
Bachelor	23.8
Graduate/Professional	16.8
<b>Paternal education</b>	
Less than HS	29.9
HS certificate or eq.	20.3
PSE credential below university	25.0
University credential	24.9
<b>Maternal education</b>	
Less than HS	25.3
HS certificate or eq.	32.4
PSE credential below university	26.5
University credential	15.9
Number of observations	2200

Source: LISA Wave 3 (2016)

# 4. Methods

## 4.1. Assessing model fit in regressions of child educational attainment on parental background variables

In the first set of models, we estimate two sets of models with child educational attainment as a dependent variable. The first model is a logistic regression of child's bachelor's degree completion on parental education and parental income, separately and then together in a multivariate model. The second model is an Ordinary Least Squared (OLS) regression model with a child's number of years of education as a dependent variable. This variable is derived from the categorical variable on highest educational credential obtained.

Because parental education and parental income are scaled differently, we base our analysis on a comparison of overall measures of fit rather than on a comparison of the model coefficients. More specifically, we focus on the unique contribution of the parental education and parental income variables to the overall model fit to quantify their relative role. This is accomplished by calculating the difference in fit statistics (R-squared, BIC, etc.) between a fully specified model and a model without parental education or parental income. A larger difference in the value of the fit statistics indicates a more substantial unique contribution of the variable to the model, that is an explanatory power net of the other model covariates.

For the logistic regression model, our selected statistics of model fit are the following:

1. Deviance
2. Likelihood-ratio
3. McFadden's pseudo R-squared
4. Aiken Information Criterion (AIC)
5. Bayesian Information Criterion (BIC).

A greater value for the first three fit statistics indicates better model fit, while a smaller value for AIC and BIC indicates better model fit. Further details on these standard fit-statistics can be found in Long and Freese (2006). For the OLS regression model, we follow standard practice and use the R-squared.

## 4.2. Decomposition of the association between parental background variables and child income

Next, we conduct a decomposition analysis focusing on the mediating role of child educational attainment in the relationship between parental background characteristics and child income. The objective of this decomposition is to determine what share of the association between parental background variables and child income in adulthood can be attributed to differences in child educational attainment. To do so, we follow an approach similar to the one implemented in Simard-Duplain and St-Denis (2020c). We summarize the three steps of this method in the Appendix.

# 5. Results

## 5.1. Child educational achievement and parental background characteristics

As a first step in our analysis, we provide estimates of the relationship between parental background variables (parental income and parental education) and child educational achievement. We use two alternative measures of child educational achievement: a binary variable for Bachelor’s degree graduation, and a continuous variable for years of education.<sup>2</sup>

In **Table 2**, we show that parents with higher educational attainment have higher family income as well, with the gradient being similar based on father’s and mother’s education. In other words, both background variables are related, and multivariate regression is an appropriate tool to disentangle the relative role of each variable for child educational attainment (as well as income level, in later analyses).

Table 2.

### Mean parental income percentile by parental education level

<b>Educational level</b>	<b>Mother</b>	<b>Father</b>
Less than HS	37.7	37.6
HS certificate or eq.	49.4	48.1
PSE credential below university	55.1	52.2
University credential	65.4	66.2

Note that across models in this part of the results section, we report estimates for mother’s and father’s education separately, and then together in the same model. This is motivated by the fact that although in many families, fathers and mothers have similar educational attainment levels, the correspondence is not perfect, and each variable is not a complete proxy for the other (see **Table A1**).

Readers should also note that the estimates presented here are not causal. Rather, they should be interpreted as statistical associations between parental background variables and child outcomes. These associations will not be causal if unobserved characteristics associated with both of the background and outcome variables. In addition, dynamics related to selection into postsecondary education prevent us from interpreting the association between child education and child income as causal.

<sup>2</sup> Both of these variables are derived from the LISA variable on the highest completed credential.



### 5.1.1. Baseline results

The objective of this part of the analysis is to provide relevant estimates of the relative role of parental education and parental income on child's educational achievement. In the existing literature, most studies narrow in on the coefficients from their models. As explained above, model coefficients are insufficient information in order to identify the relative importance of each variable in a regression model, especially logistic regression. For that reason, we instead focus on measures of fit associated with our models.

**Table 3a** shows the results of a logistic regression model on child's bachelor's degree completion on parental income and the educational attainment of the father and mother of the respondent. We report various relevant measures of fit:<sup>3</sup> the D statistics (or deviance), the Likelihood-ratio statistic, McFadden's R-squared, the Aiken Information Criterion (AIC), and the Bayesian Information Criterion (BIC).

Overall, the fit statistics show that the parental income model (model 1) has a similar fit to the father's and mother's educational attainment models (models 2 and 3 respectively). Model 2 (father's education) has a slightly better fit than model 1 (parental income), but model 3 (mother's education) has a slightly worse fit. However, when we take into account the educational attainment of both parents (Model 4), the fit is improved substantially especially relative to model 1. For example, the estimate for McFadden's R-squared is 0.092 in model 4, in comparison to 0.066 in model 1, indicating a greater explanatory power of parental education than parental income by a small margin.

### 5.1.2. Multivariate results

We conclude our analysis with a model including both of these parental background characteristics, in models 5 to 7. This is an important step given that families with higher parental education also have higher parental income (**Table 2**).

When comparing Model 1 to Model 7, we find that adding parental education to a model already including parental income substantially improves the fit. In other words, it accounts for a greater share of the variance in the outcome variable. For example, McFadden's R-squared almost doubles. Meanwhile, when comparing Model 4 to Model 7, we find some improvement in fit, but that improvement is much smaller than when comparing Model 1 to 7 (a 27% increase in the McFadden R-squared). We interpret this as evidence that the unique contribution of parental income as an explanatory variable in our model is more modest than the unique contribution of parental education (only when both the mother's and father's educational attainment are included together in the model).

Next, we turn to **Table 3b**, which reports results from an OLS regression of child years of education completed on the same parental background variables. The advantage of an OLS model is that the fit statistics and model coefficients are easier to compare, even if years of education is a

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<sup>3</sup> These fit statistics are obtained with the `-fitstat-` command in Stata.

coarser measure of educational achievement. Overall, the results lead to a similar interpretation than those from **Table 3a**. More specifically, we compare the R-squared from different models and find that the unique contribution of parental income is smaller than the unique contribution of parental education (both parents taken together). The R-squared increases from 0.076 in Model 1 (parental income) to 0.161 in Model 7 (parental income and parental education), more than doubling. Also note that the parental income coefficient decreases by half in Model 7 relative to Model 1. On the other hand, the R-squared increases from 0.143 in Model 4 (parental education only) to 0.161 in Model 7, an increase of less than 0.02 points (a 13% increase). The parental education coefficients decrease by a relatively small amount (10 to 35% approximately).

Table 3a.

### Logistic regression of child bachelor's degree completion on parental background characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Parental income rank	0.0221*** (0.00214)				0.0164*** (0.00228)	0.0181*** (0.00223)	0.0152*** (0.00232)
<b>Father's education</b>							
Less than HS (ref.)		-		-	-		-
HS certificate or eq.		0.241 (0.173)		0.0965 (0.192)	0.0619 (0.175)		-0.0216 (0.192)
PSE credential below university		0.550*** (0.159)		0.307* (0.175)	0.331** (0.165)		0.159 (0.177)
University credential		1.731*** (0.168)		1.307*** (0.194)	1.337*** (0.177)		1.025*** (0.199)
<b>Mother's education</b>							
Less than HS (ref.)			-	-		-	-
HS certificate or eq.			0.552*** (0.156)	0.352** (0.178)		0.353** (0.163)	0.256 (0.182)
PSE credential below university			0.878*** (0.158)	0.498*** (0.180)		0.601*** (0.161)	0.375** (0.180)
University credential			1.806*** (0.190)	1.074*** (0.219)		1.400*** (0.198)	0.891*** (0.224)
Constant	-1.587*** (0.135)	-1.028*** (0.117)	-1.125*** (0.119)	-1.248*** (0.133)	-1.689*** (0.158)	-1.860*** (0.158)	-1.813*** (0.169)
Deviance	5721698.1	5488822.1	5697830.9	5373192.2	5307018.3	5458930.8	5222115.7
Likelihood-ratio	405346.4	460384.9	337825.4	544065.4	642188.7	576725.4	695141.9
McFadden's R-squared	0.066	0.077	0.056	0.092	0.108	0.096	0.117
AIC	2421.4	2405.3	2465.5	2376.5	2325.6	2362.2	2309.7
BIC	5703358.6	5471214.5	5679969.9	5355798.8	5289418.4	5441077.6	5204730.0

Source: LISA Wave 3 (2016) and T1FF (1982-2015).

Robust standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 3b.

## OLS regression of child's years of education completed on parental background characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Parental income rank	0.0345*** (0.00333)				0.0216*** (0.00348)	0.0243*** (0.00349)	0.0182*** (0.00351)
<b>Father's education</b>							
Less than HS (ref.)		-		-	-		-
HS certificate or eq.		0.387 (0.240)		-0.0296 (0.262)	0.152 (0.239)		-0.169 (0.259)
PSE credential below university		1.192*** (0.252)		0.527** (0.262)	0.887*** (0.259)		0.345 (0.265)
University credential		3.117*** (0.278)		2.131*** (0.313)	2.509*** (0.295)		1.742*** (0.316)
<b>Mother's education</b>							
Less than HS (ref.)			-	-		-	-
HS certificate or eq.			1.160*** (0.234)	0.880*** (0.262)		0.867*** (0.233)	0.751*** (0.258)
PSE credential below university			2.263*** (0.268)	1.609*** (0.265)		1.846*** (0.259)	1.442*** (0.258)
University credential			3.275*** (0.304)	1.928*** (0.358)		2.603*** (0.330)	1.662*** (0.366)
Constant	13.99*** (0.197)	14.68*** (0.172)	14.31*** (0.177)	14.18*** (0.195)	13.85*** (0.216)	13.39*** (0.223)	13.55*** (0.231)
R-squared	0.076	0.115	0.098	0.143	0.141	0.133	0.161

Source: LISA Wave 3 (2016) and T1FF (1982-2015).

Robust standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

### 5.1.3. Summary of educational attainment results

In sum, results from this first section show that parental income and parental education are significantly associated with a child's educational attainment. However, these variables are correlated together, and the unique contribution of parental education is more substantial than the unique contribution of parental income, by a relatively large margin, when both background characteristics are included in multivariate regression models. Our results lend support to previous studies focusing on similar dynamics and quantify more reliably the relative role of each parental background variable than these existing studies. However, we also find a non-negligible role for parental income. In contrast with previous studies that use less precise (sometimes categorical) measures of parental income, our study uses a more robust measure of permanent parental income. The parental income coefficients remain statistically significant across models and the unique contribution of parental income to model fit is not negligible.

## 5.2. Child earnings and parental background characteristics

In this second part of the results, we extend our perspective to a focus on the mediating role of education in the relationship between parental background variables and child employment income. The objective of this analysis is to document whether inequalities in parental income translate into inequalities in child income in adulthood, net of parental education. This is especially important given that our analyses from the previous results section have shown that the relationship between parental income and child education is large and statistically significant, but that it is also spurious and weakens substantially in models also taking into account parental education. One can therefore ask whether, among children with similar educational attainment levels, any inequalities based on parental income are in fact driven by differences in parental education, or not. Finding that this is the case would require that we revisit our understanding of intergenerational income transmission and the role of child educational attainment in that process.

### 5.2.1. Baseline decomposition results

First, we estimate rank-rank regression models showing the association between parental and child income. In **Table 4a**, Model 1, we find a statistically significant estimate of 0.233, meaning that an increase of 10 percentile in parental income is associated with an increase of 2.33 percentile in child income.<sup>4</sup> Next, we present decomposition results. When controlling for child education in Model 2, we find a reduction of 36% in the parental income coefficient.<sup>5</sup> This is evidence that educational attainment is an important mediator of intergenerational income transmission. The results of our decomposition approach, presented in the appendix, are also reported at the bottom of the table. Columns labelled “Projection” report estimates from intermediate regressions using the projection of child income on child education as a dependent variable, allowing us to extract estimates corresponding to the association between parental background variables and child income that operates indirectly through child education. At the bottom of these columns, we report our estimate of that indirect effect, that is the share of the overall covariance between parental income or education (or both) and child income that operates indirectly through child education (the education-related component of child income). In this case, our estimate is also 36%, highlighting the reliability of our approach.

Second, we replicate the same exercise with parental education. We include mother’s and father’s education together in the models because we found in Section 5.1 that this specification had an improved fit over models including father’s or mother’s education alone.<sup>6</sup>

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4 These estimates are in line with those from Wave 2 of the LISA (Simard-Duplain and St-Denis 2020c), also at 0.193 to 0.228 for the most comparable specifications (see also Simard-Duplain and St-Denis 2020a), as well as those from the IID (Connolly, Haecck, and Lapierre 2021; Corak 2020).

5 More specifically,  $(1 - 0.150 / 0.233) * 100 = 36\%$ . Again in line with comparable findings of around 40% (Simard-Duplain and St-Denis 2020c).

6 Likewise, we find an improved fit (larger R-squared) in decomposition models using the educational attainment of both parents than in other models with various parental education measures reported in Table A2.

In **Table 4a**, Model 4, we find a 11.4 earnings percentile premium for children of fathers with a university credential relative to those with a father without a high school degree. We also find a 3.7 percentile premium for having a mother with a high school certificate or equivalent, net of father's education. No other parental education coefficient is statistically significant. Importantly, we find that 55% of the association between parental education and child income is accounted for by the educational attainment of the child (decomposition results in the model 6 column). In other words, the influence of parental education on their child's income in adulthood operates primarily in an indirect way, through its influence on their child's educational attainment.

Finally, we estimate multivariate models with both parental background variables together in the model. When comparing Model 1 to Model 7, we find that the parental income coefficient decreases by 0.042 points, or less than 20%. Meanwhile, the parental education coefficients decrease by a substantial share when comparing Model 4 to Model 7. That is, net of parental income, the relationship between parental education and child income is greatly attenuated. At the same time, we find that child education accounts for 27% of the parental income coefficient, and it accounts for 63% of the parental education coefficient. In other words, net of parental income, parental education influences a child's adult income primarily indirectly, through the child's educational attainment.

### **5.2.2. Parental background variables and education-related differences in child employment income**

Based on these results, what can we conclude regarding the relative importance of parental education and income for a child's educational attainment and income level? Narrowing in on our intermediate models regressing the projection of child education on child income on our parental background variables yield important findings.<sup>7</sup> First, the R-squared for the bivariate specifications are 0.087 for parental income (Model 3) and 0.127 for parental education (model 6). In the fully specified model, the R-squared is 0.156 (Model 9), meaning that the unique contribution of parental income is 0.029,<sup>8</sup> and the unique contribution of parental education is a little more than twice as large, at 0.069.<sup>9</sup> In other words, the explanatory power of parental education is larger than that of parental income in models using the income-related component of child educational attainment as a dependent variable. However, this difference is not of a magnitude that would warrant proclaiming the "primacy" of cultural and social capital and discounting the role of financial constraints as barriers to PSE access, at least as it pertains to the income-related component of child educational attainment.

Moreover, the R-squared for model 1 is 0.054 relative to 0.036 for model 4, suggesting a much stronger role for parental income relative to parental education as correlates of child income (their unique contributions are 0.031 and 0.013 respectively, given an R-squared of 0.067 in model 7). This can be explained by the fact that parental education operates mostly indirectly through child educational attainment while parental income retains a large and statistically significant direct effect.

7 These models appear under columns with the "Projection" label in table 4a.

8 That is,  $0.156 - 0.127 = 0.029$

9 That is,  $0.156 - 0.087 = 0.069$ .



Table 4a.

## Rank-Rank regression (OLS) of child employment income percentile on parental background variables, and decomposition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable	Child Inc	Child Inc	Projection	Child Inc	Child Inc	Projection	Child Inc	Child Inc	Projection
Parental income rank	0.233*** (0.0287)	0.150*** (0.0294)	0.0829*** (0.00759)				0.191*** (0.0323)	0.139*** (0.0313)	0.0516*** (0.00787)
<b>Father's education</b>									
Less than HS (ref.)				-	-	-	-	-	-
HS certificate or eq.				0.279 (2.439)	0.163 (2.318)	0.116 (0.730)	-1.169 (2.385)	-0.860 (2.301)	-0.309 (0.649)
PSE credential below university				3.589 (2.231)	1.990 (2.199)	1.599** (0.671)	1.653 (2.214)	0.726 (2.196)	0.927 (0.606)
University credential				11.39*** (2.601)	6.079** (2.611)	5.313*** (0.762)	7.245*** (2.707)	3.540 (2.637)	3.705*** (0.711)
<b>Mother's education</b>									
Less than HS (ref.)				-	-	-	-	-	-
HS certificate or eq.				3.744* (2.166)	2.306 (2.080)	1.438** (0.676)	2.597 (2.155)	1.620 (2.077)	0.977 (0.610)
PSE credential below university				3.849 (2.379)	1.907 (2.272)	1.942*** (0.703)	2.185 (2.370)	0.915 (2.279)	1.270** (0.627)
University credential				4.619 (3.074)	0.355 (2.967)	4.264*** (0.848)	1.948 (3.013)	-1.176 (2.965)	3.125*** (0.772)
<b>Child's education</b>									
HS certificate or less		-							
Trade/voc/ apprenticeship		8.253*** (2.700)			8.364*** (2.751)			8.105*** (2.718)	
College/cegep/university below bachelor		5.243** (2.262)			5.618** (2.308)			4.948** (2.281)	
Bachelor		19.07*** (2.426)			20.22*** (2.465)			18.39*** (2.464)	
Graduate/professional		21.21*** (2.875)			22.33*** (2.954)			20.36*** (2.945)	
Constant	38.76*** (1.683)	32.27*** (2.129)	38.76*** (0.460)	43.89*** (1.603)	35.99*** (2.182)	43.89*** (0.477)	37.23*** (1.968)	31.81*** (2.349)	37.23*** (0.514)
R-squared	0.054	0.125	0.087	0.036	0.112	0.127	0.067	0.128	0.156
<b>Decomposition:</b>									
Parental income: Share indirect			0.355						0.271
Parental education: Share indirect						0.550			0.627

Source: LISA Wave 3 (2016) and T1FF (1982-2015).

Robust standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 4b.

## Rank-Rank regression (OLS) of daughter's employment income percentile on parental background variables, and decomposition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable	Child Inc	Child Inc	Projection	Child Inc	Child Inc	Projection	Child Inc	Child Inc	Projection
Parental income rank	0.249*** (0.0368)	0.126*** (0.0368)	0.124*** (0.0122)				0.216*** (0.0415)	0.127*** (0.0379)	0.0882*** (0.0141)
<b>Father's education</b>									
Less than HS (ref.)				-	-	-	-	-	-
HS certificate or eq.				-1.365 (3.381)	-2.716 (2.918)	1.351 (1.394)	-3.685 (3.255)	-4.030 (2.922)	0.345 (1.244)
PSE credential below university				3.366 (3.011)	-0.0775 (2.645)	3.443*** (1.249)	1.447 (2.922)	-0.963 (2.624)	2.410** (1.125)
University credential				9.882*** (3.365)	2.151 (3.250)	7.731*** (1.330)	4.972 (3.419)	-0.179 (3.196)	5.151*** (1.226)
<b>Mother's education</b>									
Less than HS (ref.)				-	-	-	-	-	-
HS certificate or eq.				6.458** (2.845)	5.284** (2.595)	1.174 (1.249)	4.955* (2.783)	4.444* (2.562)	0.511 (1.129)
PSE credential below university				4.546 (3.016)	2.239 (2.690)	2.307* (1.295)	2.864 (2.922)	1.356 (2.666)	1.508 (1.147)
University credential				6.039 (3.844)	0.260 (3.628)	5.779*** (1.495)	3.031 (3.579)	-1.131 (3.545)	4.162*** (1.321)
<b>Child education</b>									
HS certificate or less		-							
Trade/voc/apprenticeship		1.213 (3.572)					1.225 (3.637)	0.291 (3.565)	
College/cegep/uni below bachelor		7.084** (2.808)					7.010** (2.795)	6.419** (2.705)	
Bachelor		24.96*** (3.099)					26.38*** (3.082)	24.44*** (3.080)	
Graduate/professional		26.27*** (3.959)					28.60*** (4.032)	26.17*** (4.024)	
Constant	30.42*** (2.142)	22.10*** (2.623)	30.42*** (0.783)	36.14*** (2.049)	25.52*** (2.842)	36.14*** (0.968)	28.50*** (2.410)	21.96*** (2.860)	28.50*** (0.984)
R-squared	0.068	0.204	0.110	0.040	0.197	0.130	0.084	0.211	0.177
<b>Decomposition:</b>									
Parental income: Share indirect			0.496						0.409
Parental education: Share indirect						0.747			0.815

Source: LISA Wave 3 (2016) and T1FF (1982-2015).

Robust standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 4c.

## Rank-Rank regression (OLS) of son's employment income percentile on parental background variables, and decomposition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable	Child Inc	Child Inc	Projection	Child Inc	Child Inc	Projection	Child Inc	Child Inc	Projection
Parental income rank	0.237*** (0.0414)	0.158*** (0.0427)	0.0785*** (0.0117)				0.190*** (0.0450)	0.147*** (0.0447)	0.0426*** (0.0116)
<b>Father's education</b>									
Less than HS (ref.)				-	-	-	-	-	-
HS certificate or eq.				1.591 (3.446)	1.710 (3.408)	-0.118 (1.098)	0.711 (3.380)	1.039 (3.366)	-0.328 (1.008)
PSE credential below university				2.708 (3.170)	1.241 (3.261)	1.466 (1.025)	0.589 (3.196)	-0.291 (3.285)	0.880 (0.949)
University credential				11.44*** (3.773)	6.187 (3.804)	5.251*** (1.156)	7.505* (3.918)	3.549 (3.819)	3.957*** (1.105)
<b>Mother's education</b>									
Less than HS (ref.)				-	-	-	-	-	-
HS certificate or eq.				1.945 (3.193)	-0.284 (3.077)	2.229** (1.049)	0.860 (3.208)	-0.959 (3.091)	1.819* (0.973)
PSE credential below university				6.239* (3.369)	3.618 (3.175)	2.621** (1.067)	4.351 (3.401)	2.371 (3.217)	1.980** (0.978)
University credential				4.546 (4.480)	-0.278 (4.217)	4.824*** (1.241)	1.815 (4.510)	-2.015 (4.306)	3.831*** (1.164)
<b>Child education</b>									
HS certificate or less		-							
Trade/voc/apprenticeship		8.798*** (3.275)					8.837*** (3.333)	8.858*** (3.284)	
College/cegep/uni below bachelor		10.14*** (3.099)					10.78*** (3.131)	9.930*** (3.127)	
Bachelor		21.35*** (3.503)					22.65*** (3.503)	20.91*** (3.505)	
Graduate/professional		22.65*** (3.876)					23.32*** (3.913)	21.81*** (3.913)	
Constant	45.10*** (2.376)	37.20*** (2.881)	45.10*** (0.705)	50.16*** (2.321)	41.62*** (2.906)	50.16*** (0.673)	43.65*** (2.827)	37.08*** (3.217)	43.65*** (0.763)
R-squared	0.056	0.132	0.075	0.041	0.118	0.139	0.071	0.136	0.158
<b>Decomposition:</b>									
Parental income: Share indirect			0.332						0.225
Parental education: Share indirect						0.550			0.652

Source: LISA Wave 3 (2016) and T1FF (1982-2015).

Robust standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

### 5.2.3. Gender differences

In **tables 4b** and **4c**, we replicate all of the analyses above by gender. We find similar overall patterns in terms of the relative importance of parental education and parental income across genders. Nevertheless, we find that a greater share of the association between parental background variables and child income is mediated by child educational attainment for daughters relative to sons. For example, 82% of the association between parental education and a daughter's income is accounted for by child education, with the parental education coefficients decreasing to small, non-statistically significant values. In the case of sons, the mediation effect is lower, at 65%.<sup>10</sup>

### 5.2.4. Summary of decomposition results

In this section, we find that parental income and parental education are both strongly and significantly related to child income in adulthood, with parental total family income playing a substantially larger role in accounting for the variation in child income. That said, parental education operates primarily through child educational attainment while the opposite is true for child income, especially among daughters.

We interpret this evidence of two dynamics. First, parental education is strongly related to child's income to the extent that it is associated with an increased likelihood of achieving a postsecondary education, which is itself associated with a large income advantage. Second, among children with the same level of educational attainment, we find significant differences in income based on parental income levels (the direct association between parental and child income not accounted for, or mediated, by child educational attainment). This is true net of parental education. In other words, a large proportion of the disparities that emerge among children with similar educational attainment is driven by inequalities in parental income. These disparities may emerge as a result of different educational trajectories and experiences among lower- and higher-income students, including as their transition to the labour force.

In other words, our analysis suggests that although parental education is more strongly associated with child educational attainment (although our results also indicate that parental income plays a significant role), this does not mean that parental income has limited influence on educational inequalities overall. In fact, as discussed in the previous paragraph, the large direct association between parental and child income may capture disadvantages that emerge in education among lower- and higher-income children and translate into earnings gaps later in adulthood. Note that our results do not allow to quantify what share of the direct association is driven by purely education-related factors, and what share is driven by dynamics specific to other stages of the life course.

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<sup>10</sup> Note that the overall association between parental education and child income is similar for daughters and sons, as shown by similar R-squared in Model 4 of **table 4b** and **4c**, at 0.041 and 0.040 respectively. Therefore, the difference is driven primarily by the mediating effect of child educational attainment.

## 5.3. Measurement error

One hypothesis of this paper was that measurement error in parental income may have been driving findings of a more limited role of parental income relatively to parental education in studies of PSE access and achievement. Our results from the first part of the results section are broadly in line with the previous literature, suggesting that measurement error may not have been a major driver of findings from the earlier literature.

We conduct further checks on the sensitivity of our estimates from the second part of the results section to measurement error by estimating rank-rank regression models with different parental and child income definitions. More specifically, we estimate regressions of all possible configurations of the following measures:

Child income:

- Mean from 30 to 34 years old
- At 30 years old
- At 34 years old

Parental income:

- Mean when child is 15 to 19 years old
- Mean when child is 15 years old
- Mean when child is 19 years old

Results from **Table A3** show that in some specifications, the rank-rank coefficients ( $\rho$ , coefficients in models similar to **Equation 1** but without the education parameter) suffer from a downward bias driven by measurement error. However, that effect is small and unlikely to be at the source of any large discrepancies in findings across studies. We interpret this as evidence that parental income data from surveys such as the YITS is of sufficient quality for the decomposition analyses we conduct in this paper, in line with findings from Drolet (2005) on models focusing on child educational attainment. However, we warn against the use of a categorical measure of parental income instead of the continuous measure we use in this paper since our estimates remain statistically significant across specifications.



# Conclusions

In this paper, we provide evidence on the relative importance of two family background variables for the educational attainment and income level achieved by Canadians: parental education and parental income. We find that parental education is more strongly related to a child's educational attainment than parental income, although parental income also plays a significant role both statistically and substantively. These findings call into question less nuanced interpretations of some existing studies, which often appear to discount the role of parental income and financial obstacles to PSE participation. At the same time, we provide further evidence of the independent role of parental education, hinting at important non-financial obstacles to educational attainment. To that extent, our findings are in line with recent research leveraging experimental data on financial (financial aid) and non-financial (career education programs) interventions to show that non-financial interventions have substantial impacts on educational attainment (Renée 2021).

Going beyond the literature focusing only on PSE access, we also provide results on the way through which each parental background variable influences child income. Here, child income is an outcome of interest to the extent that it is a relatively direct measure of socioeconomic wellbeing, especially given the fact that we use a measure attenuating the impact of transitory volatility (an approximation of permanent child income, averaging annual income between 30 and 34 years old). In multivariate models, we find a large indirect effect and a small direct effect of parental income (27% of the association between parental and child income rank operates indirectly through child's educational attainment). On the other hand, we find that parental education operates primarily indirectly through child's educational attainment (63% of the association between parental and child income rank operates indirectly through child's educational attainment). This is evidence that cultural or informational capital (as captured by parental education) is a resource of special importance for PSE access and educational/academic achievement, and that economic resources (as measured by parental income) have an impact beyond PSE.

In sum, our results show that while parental education seems to play a greater role than parental income as a determinant of child's educational attainment, parental income remains a more important determinant of child's overall socioeconomic status attainment, including net of child's educational attainment. This can be interpreted as evidence that parental education plays an important role in PSE access, but that parental income is an important driver of inequalities emerging among children with similar levels of educational attainment.

In contrast, most of the relationship between parental education and child income is mediated by a child's educational attainment, meaning that parental resources derived from their educational attainment influence in large respects the educational achievement of their children, and most likely their PSE pathways at earlier stages of their life courses, but play a much more limited role after education is completed.

In other words, our results indicate that one should not discount the role of parental financial resources and parental income more generally in analyses of educational inequalities.

## 6.1. Future research avenues

More is needed to unpack our findings. First, factors related to parental education appear to play an important role in the completion of Bachelor's education (as shown in Table 3a), and therefore in achievements at earlier educational stages leading to PSE as well as during PSE (the pathway to Bachelor's graduation). In contrast with approaches focusing on educational sequences (Mare 1981; Chow and Guppy 2021), our results do not allow to quantify the role of parental education (or parental income) at different transition points of educational trajectories.

At the same time, our approach has the benefit of highlighting disparities that emerge based on parental income among children with similar educational attainment. Future research should explore the sources of such differences, such as choice of program of study or institution (see Goyette and Mullen 2006; Triventi, Vergolini, and Zanini 2017; Zarifa 2012), transfers between programs or delays in time to completion (Zarifa et al. 2018; St-Denis, Boujija, and Sartor 2021), or inequalities emerging during school-to-work transitions and on the labour market (see Lehmann 2019; Simard-Duplain and St-Denis 2020c; St-Denis and Yang 2022), including career decisions that may be influenced by student loan debt, for example. In Canada, the research that has investigated those dynamics tends to focus on parental income or parental education in isolation. More could be done to parse out the relative role of both background characteristics, especially given findings of the importance of parental income in the emergence of earnings disadvantages within educational attainment groups.

## 6.2. Policy implications

In terms of policy implications, our findings contribute to highlight the need for interventions targeting non-financial obstacles to PSE access. At the same time, they also call for exploring interventions addressing disadvantages emerging during PSE as well as during school-to-work transitions among students from lower-income families. This is especially important given that a child's educational attainment accounts for no more than 40% of the relationship between parental and child income in our different models, with most intergenerational income transmission being unrelated to educational attainment.

Finally, to the extent that our findings may inform policy, two caveats must be discussed. First, what is measured by our focal variables is complex. Parental education is often presented as a measure of cultural or social capital and of informational resources. Nevertheless, this may include ease of access to financial support and other material resources necessary for PSE access and success. On the other hand, that parental income may also be correlated with other markers of class or socioeconomic status such as occupation or social capital, and should not be viewed exclusively as a measure of economic resources or financial capacity, especially in the absence of additional parental background variables capturing more directly network or informational effects.

This first limitation is compounded by a second one: our data is observational, and our research design is descriptive, not allowing to attribute causality to one or another factor. In other words, our findings should not be viewed as an identification of the potential effect of interventions targeting financial or non-financial obstacles to PSE access, achievement, and success. The evidence we present here call for exploring a broad range of policy options targeting both lower-income and first-generation (those without university-educated parents) children, and designing interventions with potential impact throughout educational trajectories including at the stage of school-to-work transitions.

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# Appendix

## Decomposition with categorical variables

In **Step 1**, we estimate the relationship between parental background variables and child income using multivariate OLS regression. This way, we obtain estimates of the overall relationship between each variable (net of the other) and our outcome of interest: the relationship between parental income,  $y_p$ , as well as parental education,  $k_p$ , and child income,  $y_c$ . The equation below shows the transmission of socioeconomic advantage stemming from two background measures:

$$y_c = \alpha_1 + \rho_1 y_p + \rho_2 k_p + \varepsilon_1 \quad (1)$$

In **Step 2**, we estimate a separate regression showing the relationship between the two same parental background variables and another measure of child socioeconomic attainment, education, denoted as  $k_c$ . In this case, child education is an intermediate outcome that is related to family background characteristics and to our main outcome for this part of the analysis, child income.

$$k_c = \alpha_2 + \lambda_1 y_p + \lambda_2 k_p + \varepsilon_2 \quad (2)$$

We expect that  $\rho_1$  and  $\rho_2$  from **Equation 1** can be decomposed into an “indirect” component that operates through child educational attainment and a component that is “direct”, i.e., net of child educational attainment. In our regression tables, the “indirect” component will be expressed as a proportion, which is the proportion of  $\rho_1$  or  $\rho_2$  accounted for by child education.

The size of this “indirect” association between parental background variables and child income depends on two elements:

1. The strength of the association between a parental background variable and child educational attainment, captured by the  $\lambda_1$  and  $\lambda_2$  parameters in **Equation 2**, and
2. The strength of the association between child educational attainment,  $k_c$ , and child income,  $y_c$ , captured by the  $\beta$  parameter in **Equation 3**, below. For that reason, **Equation 3** is the third step of our decomposition analysis.

$$y_c = \alpha_3 + \gamma_1 y_p + \gamma_2 k_p + \beta k_c + \varepsilon_3 \quad (3)$$

There are two “indirect” components, one for each of the parental background variables, which can be expressed as a percentage of  $\rho_1$  and of  $\rho_2$ . Any remaining “direct” association, captured by  $\gamma_1$  and  $\gamma_2$ , is an estimate of the average level of intergenerational income transmission among individuals with the same educational attainment level.

As per standard decomposition approaches with continuous variables:  $\rho_1 = \gamma_1 + \lambda_1 \beta$  and  $\rho_2 = \gamma_2 + \lambda_2 \beta$ , where  $\gamma_1$  and  $\gamma_2$  are the direct effects of parental income and education on child income, and  $\lambda_1 \beta$  and  $\lambda_2 \beta$  are the effects going through child education.

In sum,  $\lambda_1 \beta / \rho_1$  is the share of the parental income-child income relationship that is going through the influence of parental income on child education and  $\lambda_2 \beta / \rho_2$  is the share of the parental education-child income relationship that is going through the influence of parental education on child education.

In our case, we use categorical measures of parental and child education.<sup>10</sup> This means that we need to implement a slightly different version of the decomposition described above to address the fact that we don't have continuous variables. That is, if parental and child education are categorical variables, the **equations 1 and 3** become:

$$y_c = \alpha'_1 + \rho'_1 y_p + \sum_{\text{level } l \text{ of } k_p} \rho'_{2l} k_{pl} + \varepsilon'_1 \quad (4)$$

$$y_c = \alpha'_3 + \gamma'_1 y_p + \sum_{\text{level } l \text{ of } k_p} \gamma'_{2l} k_{pl} + \sum_{\text{level } l \text{ of } k_c} \beta_l k_{cl} + \varepsilon'_3 \quad (5)$$

To decompose the relationships between the two parental background variables and child income we proceed as follows:

1. We first estimate **Equation 4**.
2. We then estimate **Equation 5** and we compute  $\sum_l \hat{\beta}_l k_{cl}$ , the projection of child income on child education.
3. We finally regress  $\sum_l \hat{\beta}_l k_{cl}$  on the parental income and education variables:

$$\sum_l \hat{\beta}_l k_{cl} = \alpha_4 + \theta_1 y_p + \sum_{\text{level } l \text{ of } k_p} \theta_{2l} k_{pl} + \varepsilon_4 \quad (6)$$

This projection method has the benefit of avoiding estimating **Equation 2** in the case where child education is categorical and non-continuous. The  $\theta$  coefficients capture the indirect effects of the parental background variables and are equivalent to  $\lambda_1 \beta$  and  $\lambda_2 \beta$  in the case of continuous variables.

<sup>10</sup> **Equation 3** could also be used to estimate this direct effect of parental income,  $y_p$ , and parental education,  $k_p$ , on child income if both variables were continuous. In that case, the direct effects would simply be the association between each of the background variables and child income net of child education, as expressed by the parameters  $\gamma_1$  and  $\gamma_2$  in **Equation 3**, divided by  $\rho_1$  and of  $\rho_2$ .

Because parental education is also a categorical variable, we obtain more than one coefficient for the relationship between parental education and child income. To capture the overall relationship between parental education and child income, we compute the variance of  $\sum_l \rho_{2l} k_{pl}$  which we compare to the variance of  $\sum_l \theta_{2l} k_{pl}$ .

Specifically, the share of the parental income-child income relationship that is going through the influence of parental income on child education is then equal to:

$$\text{Sd}(\theta_1 y_p) / \text{Sd}(\rho_1 y_p) = \theta_1 / \rho_1$$

And the share of the parental education-child income relationship that is going through the influence of parental education on child education is equal to:

$$\text{Sd}(\sum_l \theta_{2l} k_{pl}) / \text{Sd}(\sum_l \rho_{2l} k_{pl})$$



## Appendix Tables

Table A1.

### Cross-tabulation of father's and mother's educational attainment

	Father's education			
	Less than high school	High school certificate or eq.	PSE credential below university	University credential
<b>Mother's education</b>				
Less than HS	67.7	23.3	14.1	9.5
HS diploma or eq.	12.1	38.0	15.2	5.5
PSE credential below university	14.9	22.6	40.1	20.7
University credential	5.3	16.1	30.6	64.2
<b>Total</b>	100.0	100.0	100.0	100.0

Source: LISA Wave 3 (2015) and T1FF (1982–2015)

Table A2.

## Rank-Rank regression (OLS) of child employment income percentile on various parental education measures, and decomposition-tabulation of father's and mother's educational attainment

Dependent variable	(1) Child Inc	(2) Child Inc	(3) Projection	(4) Child Inc	(5) Child Inc	(6) Projection	(7) Child Inc	(8) Child Inc	(9) Projection
<b>Father's education</b>									
Less than HS (ref.)	-	-	-						
HS certificate or eq.	1.831 (2.317)	1.096 (2.168)	0.735 (0.679)						
PSE credential below university	5.253** (2.079)	2.641 (2.034)	2.612*** (0.621)						
University credential	13.65*** (2.272)	6.478*** (2.338)	7.174*** (0.630)						
<b>Mother's education</b>									
Less than HS (ref.)				-	-	-			
HS certificate or eq.				5.294*** (2.047)	3.019 (1.901)	2.275*** (0.650)			
PSE credential below university				7.641*** (2.230)	3.734* (2.103)	3.908*** (0.678)			
University credential				11.50*** (2.753)	3.570 (2.713)	7.931*** (0.753)			
<b>Parent with highest education</b>									
Less than HS (ref.)							-	-	-
HS certificate or eq.							4.758* (2.454)	2.852 (2.279)	1.905** (0.749)
PSE credential below university							7.349*** (2.298)	4.115* (2.197)	3.235*** (0.675)
University credential							13.97*** (2.466)	5.858** (2.437)	8.110*** (0.691)
<b>Child education</b>									
HS certificate or less		-			-				-
Trade/Voc/Apprent		8.437*** (2.756)			8.487*** (2.744)			8.451*** (2.759)	
College/cegep/uni below bachelor		5.828** (2.317)			5.792** (2.291)			5.658** (2.315)	
Bachelor		20.37*** (2.474)			21.18*** (2.411)			20.55*** (2.479)	
Graduate/professional		22.39*** (2.985)			23.71*** (2.839)			22.89*** (2.938)	

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable	Child Inc	Child Inc	Projection	Child Inc	Child Inc	Projection	Child Inc	Child Inc	Projection
Constant	45.56*** (1.366)	36.73*** (2.028)	45.56*** (0.431)	45.09*** (1.472)	36.28*** (2.151)	45.09*** (0.469)	43.12*** (1.809)	35.49*** (2.289)	43.12*** (0.537)
R-squared	0.034	0.111	0.109	0.017	0.107	0.080	0.029	0.109	0.119
Decomposition:									
Parental education: Share indirect			0.530			0.653			0.606

Source: LISA Wave 3 (2016) and T1FF (1982-2015).  
Robust standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A3.

### Sensitivity analysis, income measure definition

Child income definition:	Mean, 30-34 years old			At 30 years old			At 34 years old		
Parental income definition:	Mean, 15-19 years old	At 15 years old	At 18 years old	Mean, 15-19 years old	At 15 years old	At 18 years old	Mean, 15-19 years old	At 15 years old	At 18 years old
<b>Child income: Total family income</b>									
Slope	0.264***	0.236***	0.245***	0.224***	0.193***	0.206***	0.254***	0.243***	0.239***
Intercept	37.16***	39.58***	38.33***	39.18***	41.53***	40.30***	37.58***	38.83***	38.46***
R-squared	0.070	0.056	0.060	0.049	0.037	0.042	0.063	0.059	0.056
<b>Child income: Individual employment income</b>									
Slope	0.228***	0.221***	0.234***	0.231***	0.215***	0.224***	0.203***	0.196***	0.214***
Intercept	39.08***	40.12***	38.94***	38.74***	40.39***	39.36***	40.13***	40.74***	39.75***
R-squared	0.052	0.049	0.055	0.052	0.045	0.049	0.041	0.039	0.045

Source: LISA Wave 3 (2016) and T1FF (1982-2015).  
Robust standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1