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IZA DP No. 15539

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ABSTRACT

Dreaming of a Brighter Future? The Impact of Economic Vulnerability on University Aspirations

We examine whether there is an inequality of opportunity to achieve higher education, partially explained by aspirations for youth age 12-15 in economically vulnerable households. Using a unique Canadian dataset (2002-2008), we find that poverty is associated with reduced university aspirations from the perspective of the youth and their mother. Further, poverty depth matters less than incidence. In terms of magnitude, poverty contributes to about 10-15 percent of the observed inequality of opportunity gap (mother's education being the largest factor at 30 percent). Interestingly, economic insecurity is not associated with educational aspirations, and this result persists regardless of how we measure insecurity. Controls for academic effort, including standardized test scores, daily reading, and getting good grades do not impact these findings. Results therefore suggest that alleviating child poverty and easing post-secondary financial barriers among the poor, may help offset reduced university aspirations at a critical time in a youth's life.

JEL Classification: I21, I23, I24, I32, D63

Keywords: education, aspirations, poverty, economic insecurity, inequality of opportunity

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1 Introduction

Age earnings profiles consistently suggest there is a wage premium for more education.[1] Likewise, Chetty et al. (2017) note that post-secondary schooling tends to "successfully 'level the playing field' across students with different socioeconomic backgrounds" (p. 2). However, the prospect of financial gains through more education may not be equally available to all socioeconomic classes, implying an inequality of opportunity that limits economic mobility. For instance, Frenette (2007, 2017) demonstrates income gradients in youth post-secondary attendance which corroborates the Corak (2006, 2013) finding that about one-third of poor Canadian children become poor adults. This paper examines whether economic vulnerability affects access to post-secondary education not only because it makes higher education difficult to afford, but also because, well before any tuition must be paid, family economic vulnerability affects the formation of educational aspirations. That is, children from poor families may have given up hope relatively early in life.[2]

In particular, we want to understand whether limited economic resources are associated with perceptions of what children may become. Why focus on aspirations, as opposed to say, academic achievement? As Croll (2009) finds, educational aspirations among UK youth are a major predictor of actual enrollment - hence, preference formation does not necessarily occur during the latter years of secondary school. Among Australia youth, ages 13-14, Khoo & Ainley (2005) report that aspirations for secondary school completion are a robust predictor of actual participation, and that "only 14 per cent of those who indicated that they did not intend to proceed to university eventually participated in university" (p. v). In the US, Kao & Tienda (1998) argue that not only does a high level of socioeconomic status predict increased educational aspirations for youth, but further, such aspirations tend to be maintained throughout secondary school. Lastly, Fortin et al. (2015) find that changing aspirations of US girls is the single most important factor explaining the increased university education of young women relative to young men, and this point is further emphasized by Lundberg (2020).

[1] See Lemieux (2006) for a comprehensive review of age earnings profiles extending back to Jacob Mincer's 1958 seminal work.

[2] We use the terms "hope" and "aspirations" interchangeably. For a deeper examination of "aspirational hope" versus "wishful hope", see Lybbert & Wydick (2018). Their work defines aspirational hope as a state of hope whereby the individual believes they can pursue their objective. On the other hand, wishful hope is a state of hope whereby the individual lacks such belief. Our model relies on the former definition.

As noted by Kunz & Staub (2020), most studies concerning demand for higher education focus on educational costs, rather than aspirations.[3] However, there is a growing interest in educational aspirations. Croll & Attwood (2013) suggest that while low socioeconomic status (measured by parental occupation) is related to reduced educational aspirations, a large proportion of this association is due to secondary school achievement. In turn, Christofides et al. (2015) find that post-secondary aspirations and academic performance are simultaneously determined. We extend the literature by examining how educational aspirations are impacted by both the level (i.e., poverty) and risk (i.e., economic insecurity) of economic vulnerability, independent of academic effort; and the extent to which such vulnerabilities cause an inequality of opportunity for higher education.[4]

How may poverty impact university aspirations? Dalton et al. (2016) argue that poverty causes a generalized "aspiration failure", thereby limiting economic mobility. That is, if resource constraints cannot satisfy certain levels of aspiration, then an individual will reduce such expectations in the long run.[5] This is supported by Oreopoulos et al. (2008) who note the presence of lower earnings for adult sons whose fathers experienced unexpected job displacement during the son's adolescence. As well, Huff-Stevens & Schaller (2011) also find that involuntary job loss increases the probability of the youth repeating a grade. In both instances, the findings support a causal mechanism and are not a reflection of an innate set of characteristics which pass from parent to child.

There is also a literature suggesting that the threat of economic loss, i.e., economic insecurity, impacts child outcomes. For instance, Brooks-Gunn & Duncan (1997) suggest a "family process" whereby the threat of severe economic loss and the resulting stress may affect children. This is supported by Schneider et al. (2017) who find that reduced consumer optimism is associated with increased child neglect and abuse. However, there is no research to date that links parental

[3]See: Belley et al. (2014); Cameron & Heckman (2001); Coelli (2009); Dooley et al. (2012).

[4]For a thorough examination of inequality of opportunity, see Ferreira & Peragine (2016).

[5]For example, Galiani et al. (2021) find that interventions designed to upgrade housing in poor neighbourhoods may initially improve aspirations among neighbouring non-treated areas; but, without direct intervention, aspirations revert to pre-policy levels and investment in these non-treated regions fails to transpire.

economic insecurity to the post-secondary aspirations of their children. Consequently, we examine whether a social gradient in education (i.e., lower levels of educational attainment by those from low socioeconomic status households) is partially explained by the educational aspirations of those age 12-15 who are economically vulnerable.

A youth may have educational aspirations which differ from what the parent desires for this individual. Moreover, young people have to decide to put in the effort at school and parents have to support that effort (e.g., by not overburdening the young person with home responsibilities) and to help with finances. Hence, the perspective of whom is aspiring matters, and to our knowledge, this is an avenue that has not been explored in the literature.[6]

We address this literature gap by examining the associations between circumstances and educational aspirations for youth, with a particular emphasis on economic vulnerability, using a unique Canadian data set, the National Longitudinal Survey of Children and Youth (NLSCY). This survey interviewed both the youth, aged 12-15, and the "person most knowledgeable" (PMK) of this youth (typically the mother, which is used interchangeably with PMK throughout), about their aspirations with respect to the youth's future education.[7]

The family of a youth is defined as "poor" if their reported income, adjusted for household size, is below 50 percent of the sample median for that cycle.[8] Economic insecurity is captured by a 25 percent or greater decline in reported cycle-over-cycle household income (also adjusted for household size), which is a measure of insecurity that is akin to methods suggested by Hacker et al. (2014).[9] Finally, our aspirations variable is ordinal in terms of the extent of schooling: high school completion (or less), a community college or trade school diploma, and a university degree

[6]Perhaps the most similar study is that by Ross (2019) who examines an "aspirations gap", measured as the difference between the occupation wage that a 12-year-old child aspires for and that earned by their parents. His findings suggest that "moderately high" aspirations are predictive of the human capital attained by the age of 19.

[7]Given almost 95 percent of PMKs are mothers, and restricting the sample to only mothers does not impact results, we will use these terms interchangeably throughout this paper.

[8]Typically, child poverty is assessed by comparing to 50 percent of median income for the entire population. Consequently, by using a sample consisting only of families with at least one child, who is age 12-15, we have a slightly different measurement of relative poverty.

[9]Notably, change in household size - e.g., a new baby, a child leaving home, marriage, etc. - may cause a household to become economically (in)secure even when the income of household members remains unchanged.

(undergraduate, graduate, or professional).[10]

Using four cycles of the NLSCY (2002-2008) and a pooled ordinal probit specification, results given an *ex-ante* framework (i.e., without observing academic effort) suggest that the incidence of poverty is associated with mothers reducing their aspirations that the youth will attend university by about 13 percentage points if the youth is a girl and by about 11 percentage points if they are a boy. The youth also reduce their educational aspirations - i.e., poverty is associated with approximately a 9 and 8 percentage point reduction in university aspirations for girls and boys respectively. Moreover, the depth of poverty matters less than its presence. Consequently, it is the incidence of poverty which matters most for educational aspirations from the perspective of both the PMK and youth.

Interestingly, neither the presence of economic insecurity, nor its depth, is associated with reduced educational aspirations. To account for the possibility that a negative income shock is not capturing the concept of economic insecurity, we explore alternative insecurity metrics, including a report by the PMK that they worry about money. In this instance, similar findings emerge with the exception of a 5 percentage point reduction in the PMK hoping the boy will attend university. Hence, it would seem that based on our proxies, economic insecurity is not an impactful determinant of university aspirations.

While the above results indicate reduced levels of educational aspirations, we also find that poverty is an impactful contributor to the distribution of aspirations, thereby representing an inequality of opportunity. For both PMK and youth, observed circumstances account for about 20 percent of the inequality in educational aspirations for girls, and for over one quarter of the inequality in educational aspirations for boys. Among the observed circumstances, the mother's education seems to matter most. However, poverty is also important, explaining about 10-15 percent of the observed inequality of opportunity. Once again, economic insecurity is not an important factor. These findings suggest a non-trivial amount of the heterogeneity in educational

[10]In Canada, high school typically consists of 12 years of primary and secondary schooling, diploma programmes are usually 2-3 years in length, and undergraduate degrees almost always take at least 4 years to complete.

aspirations is due to an inequality of opportunity, and poverty is among the primary circumstances contributing to this result.

Using an *ex-post* framework, economic vulnerability findings tend not to be impacted by controlling for various proxies of effort. This is of particular interest given that economic vulnerability does not appear to manifest in changed levels of effort, which in turn, influence educational aspirations. That said, controlling for standardized math scores does reduce the impact of poverty on hopes of a university education, particularly in the case of boys. However, in all other scenarios, poverty has a direct impact on educational ambitions, and this finding is not influenced by other effort-related variables (e.g., frequency of reading, doing well in school). Ultimately, these results support Dalton's 2016 theoretical contribution, implying that child poverty has an independent association with educational aspirations; thus, the alleviation of such a vulnerability (i.e., resource constraints) can improve upon economic mobility and lessen this apparent inequality of opportunity.

The rest of this paper is laid out as follows. Section 2 motivates our work, while Section 3 describes the dataset and defines the key variables. Sections 4 and 5 examine two different models - one which focuses solely on circumstances and a second which includes controls for effort. Section 6 concludes.

2 Background

The concept of equality of opportunity was renewed in 1971 with *A Theory of Justice*, where Rawls argued that such a concept extend to basic liberties, rights, and income. In 1980, Sen furthered our understanding by suggesting in his work "Equality of What" that individuals should have the *capability* to attain their goals. Moreover, Dworkin's 1981 works added to the equality discussion where he focused on a distribution of resources unaffected by circumstance, entitling every member of society to receive equal concern.[11] At the core, equality of opportunity is not arguing in favour of a society where everyone is equally well-off; but, a society where

[11] See: Dworkin (1981a,b)

everyone has an equal chance of achieving the outcomes they care about.

These thoughts are extended in Roemer (1998), who models inequality of outcomes as driven by both differences in circumstances and differences in effort. Checchi & Peragine (2010) have called differences in circumstances "ethically offensive" and argue that they should be removed through policy intervention. However, this requires a normative societal judgment as to which circumstances be equalized (e.g., genetics, household income/wealth, family culture, etc). For instance, Roemer (1993) focuses on removing inequalities resulting from: race, ethnicity, and gender. For our study, we focus on the circumstance of economic vulnerability - certainly a less contentious avenue of leveling the playing field - and the degree to which it impacts a sense of identity concerning aspirations of higher learning.[12]

We hypothesize that economic circumstances represent an inequality of opportunity. In modeling this relationship, it is assumed that in the absence of inequality of opportunity, some desirable outcome Y is distributed independent of a set of circumstances ($\boldsymbol{C}$): $f(Y|\boldsymbol{C}) = f(Y)$. To test this perhaps naive assumption, the desirable outcome is posited to be a function of circumstances:

$$Y = f(\boldsymbol{C}). \tag{1}$$

Thus, a characterization of Y which suggests at least some circumstances matter, would violate the equality of opportunity argument and is known as an *ex-ante* measure,[13] which suggests equal outcomes prior to the observation of effort. As noted in Jusot et al. (2013), given that effort is often difficult to observe, an *ex-ante* approach tends to be most popular.[14] Incorporating effort allows us to examine inequality of opportunity in an *ex-post* framework. Roemer (1998) argues that those exerting equal levels of effort be compensated for any outcome disparity, which is referred to in Ferreira & Gignoux (2011) as the "strong definition" of inequality of opportunity. Therefore, including a set of effort variables ($\boldsymbol{E}$) produces:

[12] In regard to circumstances perhaps beyond the control of policy, Finnie et al. (2004) emphasize parental education as a critical component for post-secondary attainment.

[13] See: Fleurbaey & Peragine (2013); Donni et al. (2014)

[14] Brunori et al. (2013) note that as of their writing, *ex-ante* inequality of opportunity studies had been published using data from over 40 different countries.

$$Y = f(\boldsymbol{C}, \boldsymbol{E}). \tag{2}$$

Implicitly, Equation 2 assumes separability between circumstances and effort. However, while direct resource channels may be a plausible explanation of the social gradient of education, effort may be, at least in part, endogenously determined as a result of circumstances. To explore further behavioural insights - that is, do circumstances manifest in changed effort, a further characterization yields:

$$Y = f(\boldsymbol{C}, \boldsymbol{E}(\boldsymbol{C})). \tag{3}$$

Econometrically, a linear *reduced* form of Equation 3 can be expressed for observation i using the following regression function:

$$Y_i = \boldsymbol{C_i'}\boldsymbol{\alpha} + e_i \tag{4}$$

where estimation produces a set of predicted outcomes, $\hat{Y}_i$, such that those with the same circumstances have the same predicted outcomes - hence, the variance of this vector is solely attributable to differences in circumstances. However, in the event Equation 3 is true, parameter estimates obtained from Equation 4 will be biased.

Regardless of bias, Equation 4 estimates do allow for a lower bound derivation of inequality of opportunity. That is, we can observe the degree to which circumstances influence the distribution of Y by applying an inequality metric (I) to $\hat{Y}_i$:

$$\theta = I(\hat{Y}_i). \tag{5}$$

A Shapley decomposition allows us to determine the individual impact of each set of circumstances in Equation 5, providing estimates of the relative importance of each component in terms of the impact on inequality of opportunity (Ferreira & Gignoux, 2014; Shorrocks, 2013). As noted in Juarez & Soloaga (2014), the Shapley decomposition begins by determining inequality for all possible permutations of circumstances and then computes the individual average marginal

impact on inequality of opportunity for each of these variables. Although computationally intensive, the Shapley decomposition is both path independent and additive (i.e., the sum of the circumstance contributions equals total inequality of opportunity, allowing for a determination of relative circumstance importance).

Equation 4 represents a "total effect" regarding circumstances, combining both the direct impact along with a potential indirect element that occurs through changed effort (i.e., the omitted aspect which may bias these results). To decompose this total effect (i.e., remove the potential bias), Equation 4 is compared with:

$$Y_i = \boldsymbol{C_i'}\boldsymbol{\alpha} + \boldsymbol{E_i'}\boldsymbol{\beta} + u_i \tag{6}$$

where α estimates capture the direct impact. Thus, a comparison of Equations 4 and 6, with an emphasis on $\boldsymbol{\alpha}$, allows for a richer understanding of the mechanism by which circumstances impact a particular outcome.

For this paper, we focus on economic circumstances using both the *ex-ante* and *ex-post* frameworks, with educational aspirations and effort observed from the perspective of both the mother and youth in question. In the former instance, Section 4, we examine the degree to which poverty and economic insecurity impact educational aspirations with a focus on Equations 4 and 5. In turn, the latter analysis, Section 5, observes the extent to which such circumstances manifest in changed educational effort, thereby impacting aspirations - i.e., an examination of Equation 6.

3 Data: National Longitudinal Survey of Children and Youth

This study pools cycles 5-8 (2002-2008) of the NLSCY. Previous cycles are omitted as they do not contain the variables under consideration; the survey was discontinued after cycle 8. While this is a longitudinal dataset, less than half of the respondents were observed twice, with the remaining only observed once. Therefore, exploiting panel data methods such as individual-level fixed effects produces noisy results, which we further address in Section 6. Discussed in greater detail below, the survey asked youth and PMKs several school-related questions, some of which directly reflect

educational aspirations. Further, data regarding economic circumstances were also collected, allowing for the derivation of two economic vulnerability metrics of direct interest: poverty and economic insecurity.

Detailed in Section 5.1, the NLSCY includes variables we use to proxy for effort. Specifically, youth were asked a series of behaviour-related questions concerning homework and reading. Additionally, a set of outcome-related proxies for effort are captured which include standardized math test results and perceptions (reported by both PMK and youth) of school performance. Finally, we are also able to control for effort based on attitudes towards the importance of learning and getting good grades. In terms of the youth getting good grades, this question was posed to both the youth and PMK.

As alluded to above, an interesting feature of the NLSCY is that for each observation in our sample, we have both a PMK and youth response concerning educational aspirations; however, only the PMK was surveyed regarding household socioeconomic questions. Therefore, we are able model the association between economic vulnerability and hopes for a higher education from both of their perspectives. Finally, given the longitudinal nature of the survey, population weights are applied to all analyses to account for attrition, and standard errors are clustered by household.

3.1 Dependent Variable - Educational Aspirations

Educational aspirations from the perspective of the PMK are captured based on response to the question "How far do you hope this child will go in school?". Similarly, the youth was asked "How far do you hope to go in school". For the mother, responses range from "primary/elementary school" to "university"; for the youth, "middle school/junior high" to "more than a university degree". Given the slight differences in response options and small observation totals pertaining to education levels lower than high school completion, we cluster responses from the perspective of both the mother and the youth into the following groups: (1) high school or less, (2) college or trade school, and (3) university or higher.[15,16] As noted in footnote 6, our outcome variable is

[15] Less than 1 percent of youth and mothers responded with "other", which we omit from the analysis.

[16] As suggested by Brunori (2016), we are maintaining an assumption that, at the mean, aspirations for a higher level of education are a desirable outcome among Canadians.

ordinal based on the extent to which someone aspires to attain more education.

3.2 Circumstances

Economic Vulnerability

Consider that our first economic circumstance, the incidence of poverty, can be empirically captured with a dummy variable equal to unity if individual i in time period t is in poverty (Pov); zero otherwise. Poverty is defined based on Canada's Low Income Measure methodology (that is also used in many OECD analyses) - operationalized as household income, adjusted for household size (Y),[17] falling below the 50 percent of median income threshold (H) for that particular cycle of data:

$$Pov_{it} = \begin{cases} 1, & \text{if } Y_{it} \leq H_t \\ 0, & \text{otherwise.} \end{cases} \tag{7}$$

Poverty captures a *level* of vulnerability - it does not, however, measure down-side *variability*. Hacker et al. (2014), suggest a 25 percent or greater income loss causes the average household considerable hardship. Consequently, we derive a measure of economic insecurity ($EconIns$) which equals unity if the household incurred such a negative income shock between cycles; zero otherwise:

$$EconIns_{it} = \begin{cases} 1, & \text{if } \frac{Y_{it}-Y_{it-1}}{Y_{it-1}} \leq -0.25 \\ 0, & \text{otherwise.} \end{cases} \tag{8}$$

PMK Education

In addition to circumstances concerning economic vulnerability, we also include controls for the PMK's highest level of education. Finnie et al. (2005) find that parental education is a major determinant of a child's eventual schooling attainment. Accordingly, we posit that in terms of aspirations, parents with higher levels of education particularly desire the same for their children,

[17] We adopt the Luxembourg Income Study strategy, controlling household resource pooling, by dividing total household income after transfers and before taxes by the square root of household size

regardless of income. Thus, with the reference category being a Bachelor's degree or higher, a set of three dummy variables are specified: (i) less than high school education, (ii) high school completion, and (iii) some post-secondary and/or completion of a 2-year diploma.

Health and Socio-Demographic Circumstances

Two health dummy variables are derived for the PMK and youth respectively. In both cases, the variable is equal to unity if the respondent believes they are in poor health; zero otherwise.[18] Given the literature regarding the academic success of children of immigrants[19], a dummy variable is included if the PMK is a first-generation immigrant; zero otherwise. Additional controls for household demographic circumstances include: whether or not the youth in question was the firstborn child, the number of siblings in the household, if the parents have remained together over the youth's life, and the age of both the youth and PMK. Although in about 95 percent of cases the PMK is the youth's mother, we also control for the sex of the person most knowledgeable. Moreover, in addition to regional controls (Atlantic Canada, Quebec, the Prairies, and British Columbia, with Ontario being the reference category), we also control for whether or not the youth lives in a rural setting. Finally, time fixed effects are included based on the cycle during which the observation occurred, with cycle 8 (2008) being the reference category.

3.3 Descriptive Statistics

Tabulations concerning educational aspirations from the perspective of the PMK and youth, are presented in Table 1. Sample sizes are rounded to the nearest ten given Statistics Canada confidentiality rules and consist of 3,730 girl and 3,450 boy observations. For the youth in question, aspirations are overwhelmingly in favour of a university education - a finding similar to that of Sosu (2014) concerning parental aspirations in a Scottish study. However, perspective matters, as does gender. Relative to the youth reporting, mothers have a 4-6 percentage point higher aspiration of university pursuit. Additionally, from either perspective, there is a higher degree of university aspirations for girls ($\approx$ 76-81 percent) than boys ($\approx$ 64-71 percent) - a

[18] Currie & Goodman (2020) recently suggest that the transmission mechanism upon which family background impacts educational attainment is in part due the association between child health and parental socioeconomic status.

[19] See: Aydemir & Skuterud (2005); Finnie & Mueller (2009); Corak (2008).

difference of about 10-12 percentage points. Aspirations regarding college or trade school are about 7-8 percentage points higher for boys (15-16 percent vs. 22-23 percent), regardless of perspective.

Further, Table 1 also presents mean levels of economic vulnerability. Based on the sample of households, about 14-15 percent report the incidence of poverty and about 13-14 percent experienced economic insecurity. Although income and economic insecurity are negatively correlated, less than 4 percent of the sample report being in both economic vulnerability categories, implying there is plenty of unique variation within each variable.

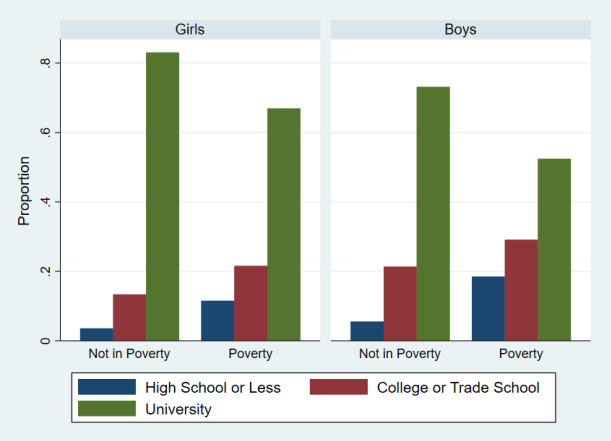
Table 1. Descriptive Statistics (%)

	Girls	**Boys**
Educational Aspirations (PMK Response):		
High School or Less	4.72	6.99
College or Trade School	14.54	22.22
University or Higher	80.74	70.79
Educational Aspirations (Youth Response):		
High School or Less	7.41	12.44
College or Trade School	16.14	23.22
University or Higher	76.45	64.34
Economic Circumstances:		
Is in Poverty	14.41	14.89
Is Economically Insecure	13.99	13.26
Observations	3,370	3,450

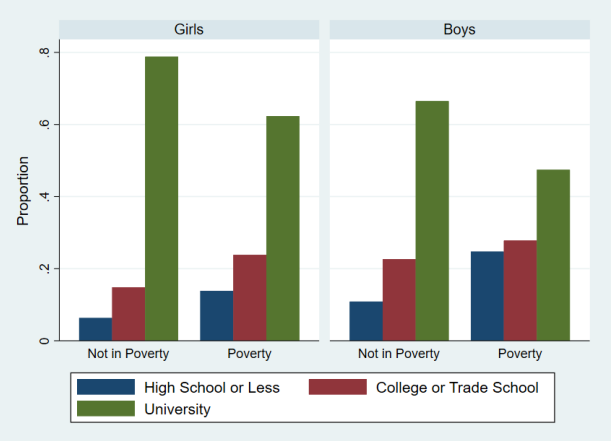
Notes: Dataset: four cycles of NLSCY data (cycles 5-8). Given confidentiality rules with Statistics Canada data, observation totals are rounded to the nearest 10. PMK = person most knowledgeable, which almost 95 percent of the time is the mother. Poverty is defined as household income, adjusted for household size, falling below 50 percent of the sample median for that particular cycle. Economically insecure is expressed as the occurrence of a 25 percent or greater decrease in cycle-over-cycle household income, also adjusted for household size.

Cross-tabulations, regarding the above variables are presented in Figure 1 for poverty and Figure 2 for economic insecurity. Households which fall below Canada's low income threshold are less likely to report a hope that youth will attend university. This is apparent for both boys and girls and whether it is the PMK or the youth who is reporting - i.e., aspirations are shifted toward either high school or college/trade school education when the household is in poverty. However, the same is not true for households experiencing a significant fall in income. In some cases,

although statistically insignificant, there is a rise in university aspirations when comparing the economically insecure with those who did not experience a negative income shock. Otherwise, differences seem rather small, suggesting economic insecurity may not be overly impactful regarding educational aspirations.

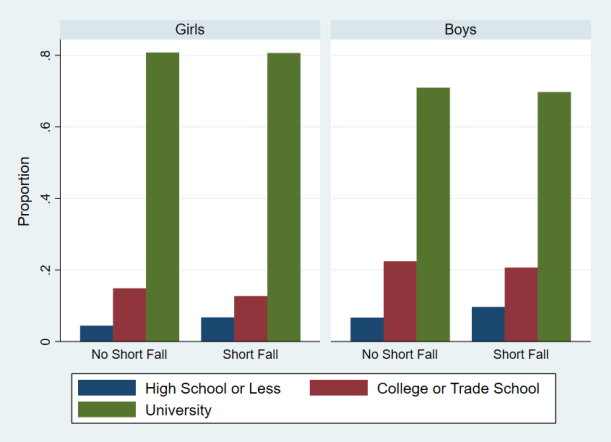


(a) PMK Reported

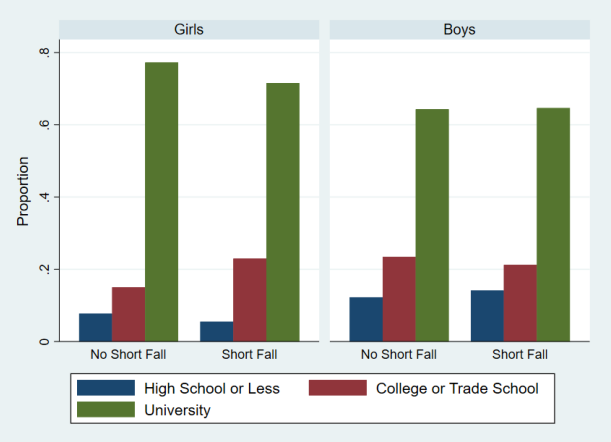


(b) Youth Reported

Fig. 1 Educational Aspirations - Adjusted for Poverty



(a) PMK Reported



(b) Youth Reported

Fig. 2 Educational Aspirations - Adjusted for Economic Insecurity

4 Method: *Ex-Ante* Framework

We begin with an *ex-ante* approach which captures the relationship between economic circumstances (C) and educational aspirations (ASP), prior to observing effort. Said differently, using a pooled ordinal probit specification, the level of educational aspiration ($k = 1, 2, 3$) for person i in time period t is regressed on a set of economic vulnerability variables along with a series of additional circumstances:

$$Prob(ASP_{it}^{j} = k|Z_{it}) = \phi\left(\alpha + \sum_{n=1}^{2} \beta_n C_{nit} + PMK\_Educ_{it}'\delta + Health_{it}'\pi + SD_{it}'\epsilon + \eta_t\right). \quad (9)$$

In particular, C controls for economic vulnerability (i.e., poverty and economic insecurity), PMK_Educ captures the mother's level of education, $Health$ controls for both youth and mother health, SD includes a set of socio-demographic factors, and η denotes time fixed effects. Further, j captures the perspective from which the outcome variable is reported, and our regression model is run separately for boys and girls.

Equation 9 captures the degree to which circumstances such as poverty and PMK education impact the *level* of aspirations for a higher education. Additionally, we examine the degree to which these circumstances impact the *distribution* of educational scores by developing an index of aspiration inequality and performing a Shapley decomposition of this index. Given the ordinal nature of our categorical variable for level of educational aspiration, we use a dissimilarity index for our inequality measure:

$$I(\widehat{ASP}) = \frac{1}{n}\sum_{i=1}^{n}\left|\widehat{ASP}_i - \overline{ASP}\right|. \quad (10)$$

This index captures dissimilarity regarding educational aspirations, due to a set of circumstances, relative to the mean aspirations for the entire sample.[20] The dissimilarity index ranges from 0-1, increasing in inequality of opportunity. If there is no inequality of opportunity, the correspondence

[20] See: Paes de Barros et al. (2008) for a complete examination of this index.

between sample and opportunity distributions should be exact, producing an index value of zero. For instance, if 10 percent of our sample aspire to finish high school, 30 percent wish to complete college or trade school, and the remaining 60 percent hope to earn a Bachelor's degree or higher, then such aspirations should be distributed similarly within each circumstance.

4.1 *Ex-Ante* Results - Incidence of Vulnerability

With separate analyses based on gender, results from pooled ordinal probit regressions are presented in Table 2 for our samples of 3,370 girl observations and 3,450 boy observations. In each case, the left panel (result columns 1 and 2) is based on the PMK's perspective, while the right panel (result columns 3 and 4) is from the viewpoint of the youth. For ease of interpretation, presented estimates are average marginal effects regarding the probability of university aspirations.

In terms of educational aspirations, being in poverty matters and is quite impactful, regardless of perspective or child's gender. However, the degree to which it matters depends on who is reporting. That is, poverty reduces the mother's aspiration that the child will attend university by 11-13 percentage points, while for the youth in question, being in poverty is associated with an 8-9 percentage point decline in university aspirations. Perhaps surprisingly, results regarding economic insecurity are both statistically and economically insignificant. Moreover, this result persists, even when excluding poverty from the model, implying that this finding is not necessarily due to concerns over multicolinearity.

A low level maternal education has a larger negative association with educational aspirations than poverty. Relative to those who have completed a Bachelor's degree or higher, mothers with less than a high school diploma are predicted to have a 21 percentage point reduction in aspirations that the girl in question will pursue university education. For boys, this association is somewhat larger in magnitude at 33 percentage points. The same impact occurs from the perspective of the youth with the magnitudes being similar at 20 percentage points for girls and 34 percentage points for boys. Unsurprisingly, there is a monotonic reduction in magnitude of association as the mother's education level falls. In terms of a mother having a high school diploma, from either

Table 2. *Ex-Ante* Results: Average Marginal Effects
Re. Prob(University Aspirations)

	PMK		Youth	
	Girls	**Boys**	**Girls**	**Boys**
Economic Circumstances:				
Is in Poverty	-0.1344***	-0.1101***	-0.0889**	-0.0834**
	(0.039)	(0.037)	(0.037)	(0.040)
Is Economically Insecure	0.0421	0.0045	0.0094	0.0212
	(0.026)	(0.030)	(0.029)	(0.031)
PMK Education:				
PMK's Education: Less than HS	-0.2098***	-0.3313***	-0.1980***	-0.3391***
	(0.039)	(0.056)	(0.037)	(0.041)
PMK's Education: High School	-0.0870***	-0.1875***	-0.1080***	-0.1692***
	(0.028)	(0.030)	(0.028)	(0.030)
PMK's Education: Some Post-Secondary	-0.0481	-0.0693**	-0.0671**	-0.1395***
	(0.030)	(0.032)	(0.032)	(0.041)
Health Circumstances				
Child Health is Poor	-0.0905***	-0.0333	-0.1622***	-0.0828**
	(0.03)	(0.03)	(0.04)	(0.03)
PMK Health is Poor	-0.0373*	-0.0599***	0.0232	-0.0486**
	(0.02)	(0.02)	(0.02)	(0.02)
Socio-Demographic Circumstances:				
Child is Firstborn	0.0585***	0.0707***	0.0375	0.0516**
	(0.020)	(0.023)	(0.025)	(0.025)
Number of Siblings	0.0004	0.0074	-0.0099	0.0029
	(0.010)	(0.013)	(0.013)	(0.014)
PMK is Married	0.0033	0.0369	0.0601**	0.0481
	(0.027)	(0.027)	(0.029)	(0.031)
PMK is an Immigrant	0.0756**	0.1098***	0.1045***	0.1349***
	(0.032)	(0.036)	(0.031)	(0.043)
Age of Child	-0.0096	-0.0311***	-0.0091	-0.0440***
	(0.008)	(0.009)	(0.010)	(0.011)
Age of PMK	0.0017	0.0059**	0.0069**	0.0078***
	(0.002)	(0.002)	(0.003)	(0.002)
PMK is Male	0.029	-0.035	-0.0204	0.0219
	(0.042)	(0.062)	(0.047)	(0.065)
Region of Residence: Atlantic Canada	0.0685***	0.1061***	0.0753***	0.0831***
	(0.022)	(0.026)	(0.025)	(0.027)
Region of Residence: Quebec	-0.0614**	-0.0991***	-0.0476	-0.0624*
	(0.027)	(0.033)	(0.030)	(0.032)
Region of Residence: Prairies	0.0081	0.0448	-0.0001	0.0106
	(0.027)	(0.030)	(0.029)	(0.034)
Region of Residence: British Columbia	-0.0284	0.0102	-0.0388	-0.0001
	(0.038)	(0.042)	(0.039)	(0.043)
Resides in a Rural Area	-0.0644***	-0.1347***	-0.0449*	-0.1241***
	(0.024)	(0.027)	(0.024)	(0.026)
Time Fixed Effects:				
Year of Survey: 2002	-0.0146	0.0129	0.0246	0.018
	(0.029)	(0.031)	(0.031)	(0.035)
Year of Survey: 2004	0.0011	-0.0389	0.0054	-0.0327
	(0.026)	(0.028)	(0.029)	(0.031)
Year of Survey: 2006	0.0141	-0.0395*	0.0128	-0.0422
	(0.022)	(0.024)	(0.027)	(0.029)
Observations	3,730	3,450	3,730	3,450

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Coefficients are derived using an ordinal probit specification where average marginal effects are presented in reference to university aspirations. Robust standard errors are in parentheses. Dataset: four cycles of NLSCY data (cycles 5-8). Given confidentiality rules with Statistics Canada data, observation totals are rounded to the nearest 10. PMK = person most knowledgeable, which almost 95 percent of the time is the mother. Poverty is defined as household income, adjusted for household size, falling below 50 percent of the sample median for that particular cycle. Economically insecure is expressed as the occurrence of a 25 percent or greater decrease in cycle-over-cycle household income, also adjusted for household size.

perspective, the reduction in university aspiration falls by 9-11 percentage points when the youth is a girl, and for boys, there is a 17-19 percentage point reduction in such hopes.

Interestingly, mothers tend to be more likely to hope their firstborn child attends university (relative to those born after). The increase for firstborn youth who are girls is about 6 percentage points, and for boys, slightly higher at 7 percentage points. However, when the firstborn child is a girl, they themselves are no more likely to have university aspirations than those born after. For boys who are firstborn, the increase is about 5 percentage points. Also for boys, university expectations fall as they get older. When the mother is interviewed, each year reduces aspirations by 3 percentage points; when the boy is surveyed, the decrease is about 4 percentage points.

Among youth, their health is a significant predictor of educational ambitions. Poor health reduces the probability of their university aspirations by about 16 percentage points and 8 percentage points for girls and boys respectively. However, from the perspective of the mother, child health is not as impactful. For girls, poor health means the mother's aspirations for them attending university are likely to fall by about 9 percentage points, and for boys, the result is statistically insignificant at conventional levels.

If the PMK is a first-generation immigrant, then there is an expectation that the youth will attend university. More specifically, the increase when the mother is interviewed is about 8 percentage points for girls and 11 percentage points for boys. Increases from the perspective of the youth in question are about 10 and 13 percentage points for girls and boys respectively. Regarding region, aspirations for a university education tend to be highest in the Atlantic provinces followed by Quebec, the latter of which tends to have the lowest levels of university tuition in the country. Finally, for those who reside in a rural residence, educational aspirations are tempered relative to those in urban settings. For boys, this is particularly true where the reduction in university aspirations is about 12-13 percentage points from either perspective. For girls, while still statistically significant, the result is much smaller in magnitude at about a 6 percentage point reduction from the opinion of the mother and about 4 percentage points from that of the youth.

Based on these results, how much do economic vulnerabilities matter relative to other circumstances? For boys, being in poverty is not quite as impactful as having a mother with a low level of education, nor is it as impactful as residing in a rural setting. However, in absolute terms, it does matter more than both being a firstborn child and having poor health. For girls, economic circumstances seem to be a bit higher in importance - poverty matters more than residing in a rural residence, and from the perspective of the mother, is more influential than the situation of them having a high school diploma (though not as large in magnitude as when they have not completed high school). Lastly, when the girl's health is poor, this is about twice the magnitude as being in poverty when it comes to a reduction in the girl's university aspirations - however, poverty is larger in impact when it is the mother reporting. Thus, while it is clear that the mother's education seems to matter most, poverty is quite impactful and broadly in line with several other factors often associated with educational pursuits.

4.2 *Ex-Ante* Results - Inequality of Opportunity

Inequality of opportunity estimation using a Shapley decomposition is presented in Figure 3. This figure depicts the relative contribution of observed circumstances, in percentage terms, to the distribution of our predicted outcome variable. Hence, the larger the segment, the more that particular circumstance contributes to an inequality of opportunity concerning educational aspirations.

This decomposition is computationally intensive, requiring 2^c computations for c circumstances. To reduce dimensionality, we specify the following groups: (i) Poverty Incidence, (ii) Economic Insecurity Incidence, (iii) Mother's Education, (iv) Youth Demographics (firstborn, age, and number of siblings), (v) PMK Demographics (married, age, and immigrant), (vi) Geographic Location (rural/urban location, region of residence), (vii) Poor Youth and PMK Health, and (viii) Year of Survey.

Although not presented, from the perspective of the mother, about 21 percent and 27 percent of the heterogeneity in educational aspirations can be explained by observed circumstances for girls and boys respectively. From the perspective of the youth, these values slightly fall to about 19

and 26 percent. Thus, of the inequality in educational aspiration scores, about 20 percent is explained by observed circumstances for girls, and about one-quarter is explained for boys.

When examining the PMK's responses, of this explained heterogeneity and regardless of whether they are referring to a boy or girl, the bulk of it is due to their own level of education ($\approx$ 28-32%) along with geographic region of residence ($\approx$ 33-34%). When the mother is reporting on a girl, the next two most impactful factors are household poverty ($\approx$ 14%) and the health of mother and youth ($\approx$ 12%). When referring to a boy, household poverty is a bit further down this list ($\approx$ 8%), with the mother's demographics having a slightly larger contribution to inequality of opportunity ($\approx$ 10%). Economic insecurity does not appear to influence the inequality of opportunity regarding educational aspirations ($<$ 1%).

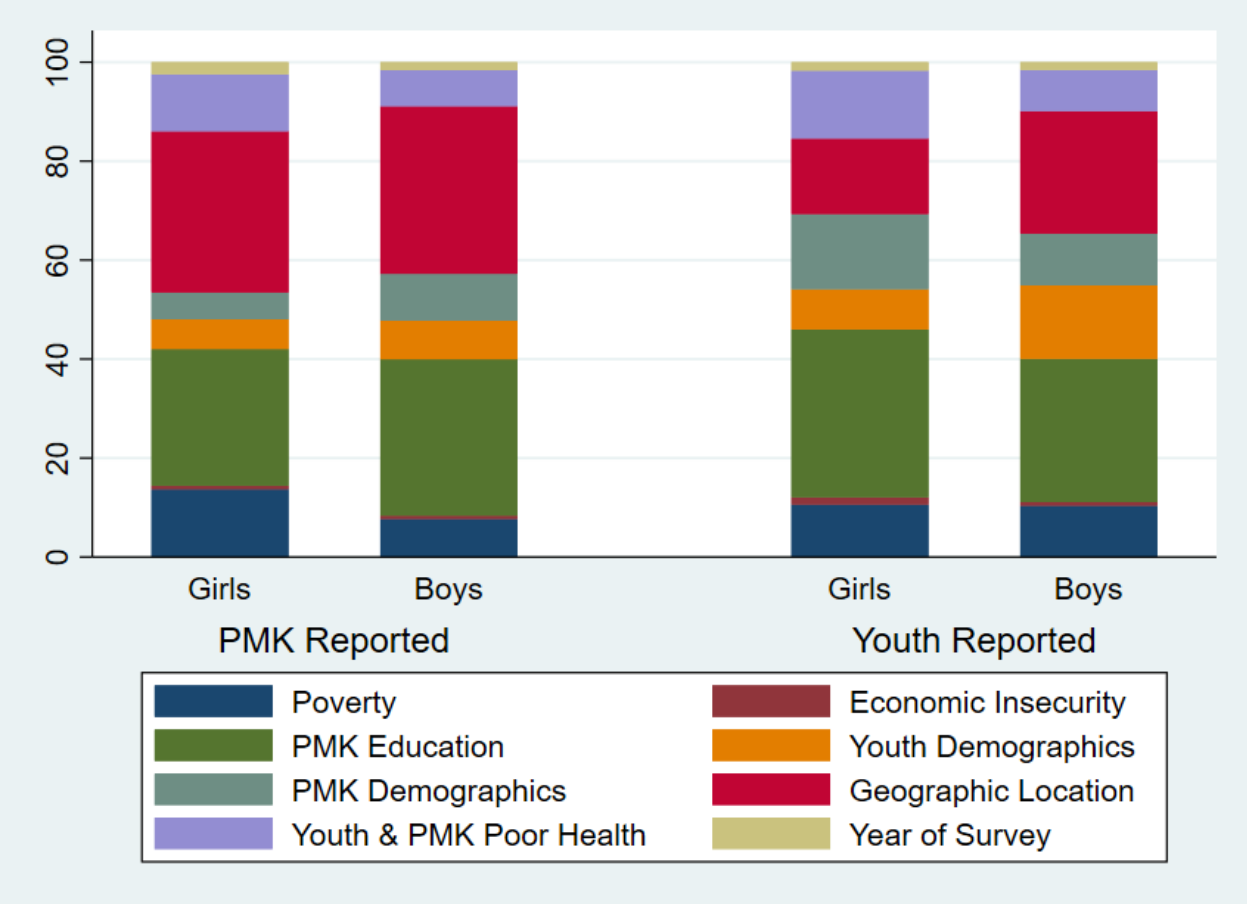


Fig. 3 A Shapley Decomposition Concerning the Relative Impacts of Observable Circumstances on the Inequality of Opportunity of Education Aspirations (%)

From the perspective of the youth, it is the mother's level of education that once again matters most ($\approx 34\%$ for girls and $\approx 29\%$ for boys). Region of residence also matters, but is not quite as impactful, especially when it is the girl that is observed ($\approx 15\%$). Aside from economic insecurity and year of survey variables, which matter very little ($< 2\%$), contributions from each group seem to be more equally distributed, all explaining about 10-15 percent of total observed inequality of opportunity. Thus, household poverty has a relatively similar impact when compared with PMK and child demographics along with health.

4.3 Robustness Checks

Accounting for Vulnerability Incidence & Depth

Consider an individual with a household income that is 1 dollar below the threshold and another reporting a household income of 1 dollar for the entire year. By only controlling for poverty incidence, these individuals are treated the same in statistical terms. Thus, to account for poverty depth ($PovDepth$), we examine poverty intensity using a micro-level version of the Poverty Gap Index. A continuous variable, ranging from 0-1 and increasing in poverty depth, this metric observes the degree to which a household's income falls below the poverty threshold:[21]

$$PovDepth_{it} = \begin{cases} \frac{H_t - Y_{it}}{H_{it}}, & \text{if } Pov_{it} = 1 \\ 0, & \text{otherwise.} \end{cases} \tag{11}$$

We also extend our economic insecurity examination by deriving a variable which captures the degree to which those who are economically insecure fall below the 25 percent threshold ($EconDepth$). This variable is calculated in the same manner as that of poverty depth with the exception that we subtract 25 percentage points in order to put the metric in the same units as that of the poverty depth variable - i.e., the degree to which an income shock falls below the insecurity threshold:

[21] Known as the FGT indices, Foster et al. (1984) derive a set of poverty metrics typically examined within a macroeconomic context. Our two metrics are based on their headcount and poverty gap index.

$$EconDepth_{it} = \begin{cases} \frac{Y_{it-1}-Y_{it}}{Y_{it-1}} - .25, & \text{if } EconIns_{it} = 1 \\ 0, & \text{otherwise.} \end{cases} \tag{12}$$

As a robustness check, we add economic vulnerability depth variables (Equations 11 and 12) to our regression model and examine if aspirations change differently for those who are very poor. Thus, we now include four economic circumstance variables: poverty incidence and depth, along with insecurity incidence and depth. Key average marginal effects, concerning the probability of university aspirations, are presented in the upper panel of Table 3.

From the perspective of both the PMK and youth, it would seem that being in poverty is what matters and the extent to which a family is below the threshold is not impactful. With poverty incidence coefficients akin to those in Table 2, results suggest that depth variables are statistically insignificant at conventional levels. Moreover, accounting for depth does not change our previous finding concerning an insignificant relationship between economic insecurity and educational aspirations. Perhaps this is an indication that once a university education no longer seems affordable, a family adjusts their aspirations accordingly. Hence, from an educational expectation standpoint, falling further below this threshold does not necessarily matter.

To visually appreciate this result, we plotted the relationship between both measures of economic vulnerability and aspirations in Figure 4. These were determined by computing the prevalence of university aspirations at each decile of poverty depth among the poor. We then did the same thing for economic insecurity. These results suggest that, among the poor, as poverty depth rises, aspirations for a university education (regardless of perspective) remain fairly consistent. This is also true for insecurity.

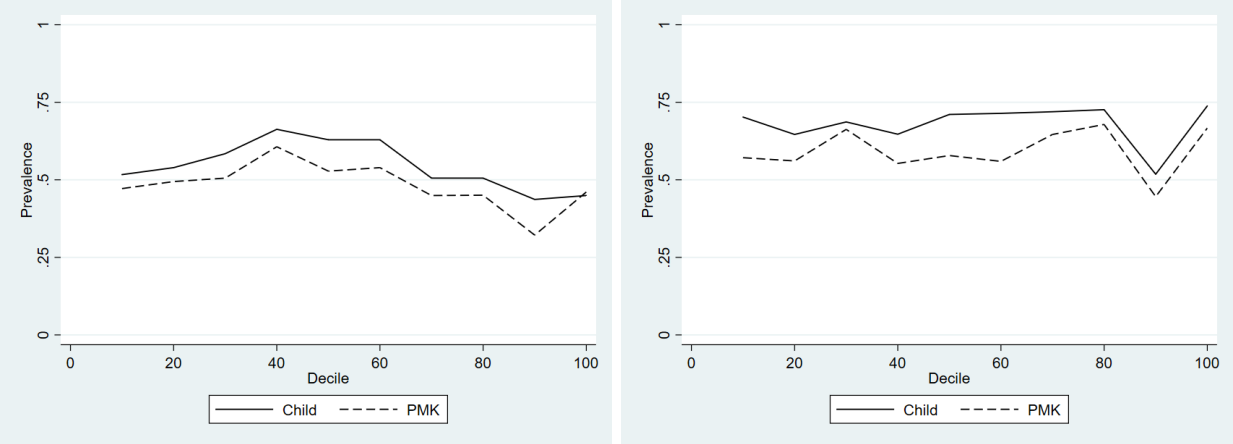
Alternative Measures of Economic Insecurity

As noted by Rohde et al. (2016), economic insecurity is a multifaceted concept that can be operationalized using a host of concepts, such as the worry over money and the probability of a significant shortfall in household income. Therefore, we derive a dummy variable equal to unity if

Table 3. *Ex-Ante* Results: Robustness Checks

	PMK		Youth	
	Girls	**Boys**	**Girls**	**Boys**
	Incidence & Depth Variables			
Economic Circumstances:				
Is in Poverty	-0.1603***	-0.1028**	-0.0868**	-0.0650
	(0.049)	(0.041)	(0.042)	(0.043)
Poverty Depth	0.0003	-0.0003	-0.0000	-0.0004
	(0.0004)	(0.0003)	(0.0003)	(0.0004)
Is Economically Insecure	0.0127	-0.0384	0.0079	0.0068
	(0.037)	(0.047)	(0.039)	(0.044)
Insecurity Depth	0.0014	0.0024	0.0001	0.0011
	(0.002)	(0.002)	(0.002)	(0.002)
Additional Controls?	Yes	Yes	Yes	Yes
Observations	3,730	3,450	3,730	3,450
	Economically Insecure = Worrying About Money			
Economic Circumstances:				
Is in Poverty	-0.1138***	-0.0998***	-0.0872**	-0.0767**
	(0.040)	(0.035)	(0.036)	(0.039)
Is Economically Insecure	-0.0085	-0.0521*	0.0149	-0.0115
	(0.027)	(0.029)	(0.026)	(0.032)
Control Variables?	Yes	Yes	Yes	Yes
Observations	3,730	3,450	3,730	3,450

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Coefficients are derived using an ordinal probit specification where average marginal effects are presented in reference to university aspirations. Robust standard errors are in parentheses. Dataset: four cycles of NLSCY data (cycles 5-8). Given confidentiality rules with Statistics Canada data, observation totals are rounded to the nearest 10. PMK = person most knowledgeable, which almost 95 percent of the time is the mother. Poverty is defined as household income, adjusted for household size, falling below 50 percent of the sample median for that particular cycle. Economically insecure in the top panel is expressed as the occurrence of a 25 percent or greater decrease in cycle-over-cycle household income, also adjusted for household size. Depth variables capture the percent that a household falls below the respective poverty and insecurity thresholds; zero otherwise. Control variables include: PMK education, child and PMK health circumstances, socio-demographics, and time fixed effects.



(a) Poverty (b) Economic Inecurity

Fig. 4 Prevalence of University Aspirations

the respondent agreed with the statement "You worry about whether the money you have will be enough to support your family"; zero otherwise. Key average marginal effects using this economic insecurity metric, in lieu of a severe income drop, are presented in the lower panel of Table 3. Once again, in terms of economic vulnerability, it is only poverty which matters. The one exception is regarding the PMK reporting on their education aspirations for a boy, whereby economic insecurity predicts a 5 percentage point drop in hopes he will attain a university degree.

Further, expanding our working definition to that of Osberg's 1998 definition, i.e., "the inability to obtain protection against subjectively significant economic loss" (p.17), we also explore the *probability* that a respondent experiences the negative income shock based on factors such as their education and region of residence. Using this definition, we regress the incidence of a 25 percent or greater income drop on a series of explanatory variables, and subsequently use the estimates, along with observational data, to predict individual-level probabilities of being economically insecure. Results concerning economic insecurity are in all cases statistically (and economically) insignificant and are excluded for brevity purposes.[22]

[22]These results are available from the lead author upon request.

5 Method: *Ex-Post* Framework

5.1 Effort Variables

While the *ex-ante* approach is the most common method of investigating inequality of opportunity given the difficulty in observing effort, our dataset contains a rich set of questions regarding academic effort. By deriving three separate effort domains, based on educational: (i) behaviours, (ii) outcomes, and (iii) attitudes, we are able to examine the extent to which the vulnerability-aspiration link is mediated by effort. With respect to behaviours, we include the following two questions, from the perspective of the youth:

1. How often do you read for fun?
2. When my teachers give me homework, I do it

The first question is on a 6-point scale, ranging from *every day* to *almost never*. Likewise, the second question, is on a 5-point scale, ranging from *all of the time* to *never*. We derive two dummy variables that capture (1) daily reading (zero otherwise), and (2) always completing assigned homework (zero otherwise).

The second domain consists of the youth's score on a standardized math test, along with perceptions regarding the youth's academic performance. Known as the Mathematics Proficiency Test, and administered to those age 8-15, the assessment consists of 20 questions concerning: addition, subtraction, multiplication, division, and order of operations. Given results from the test range from 200-800, we specify this variable in natural logarithm terms for interpretation purposes. Asked to both the youth and PMK respectively, the academic performance question is framed as:

1. How well do you think you are doing in your school work?
2. Based on your knowledge of his / her school work, including his / her report cards: How is he / she doing overall?

Responses to this question, regardless of perspective, are on a 5-point scale ranging from *very well* to *very poorly*. We derive a dummy variable indicating that the individual responded with "doing very well" (zero otherwise).

The last domain, attitudes, also consists of two questions, whereby the first asks the youth:

1. How important is it to you to do the following in school: Learn new things?

The second question is posed to both the youth and PMK as:

1. How important is it to you to do the following in school: Get good grades?
2. How important is it to you that this child has good grades in school?

In all cases, these questions are evaluated on a 4-point scale, ranging from *very important* to *not important at all*. We define a set of dummy variables equalling unity when a response of *very important* is given; zero otherwise. Thus, across all three domains, variables either denote, or are increasing in, effort.

5.2 Regression Model

Given the above set of effort variables (E), we estimate pooled ordinal probit models which consist of the variables in Equation 9, along with the respective effort domains of: (i) behaviours, (ii) outcomes, and (iii) attitudes:

$$Prob(ASP_{it}^{j} = k|Z_{it}) = \phi\Bigg(\alpha + \sum_{n=1}^{2}\beta_n C_{nit} + \sum_{k=1}^{2}\gamma_k E_{kit}^{j} + PMK\_Educ_{it}'\delta + Health_{it}'\pi + SD_{it}'\epsilon + \eta_t\Bigg). \quad (13)$$

It is quite possible that parameter estimates concerning effort variables possess an upward bias as a result of simultaneity. Christofides et al. (2015) suggest that while educational aspirations may be upwardly revised as a result of strong academic performance, it is also true that a high degree of educational ambition predicts increased levels of student effort and/or achievement. However, the objective of this section is not to purge effort variables of their potential endogeneity; it is to observe the degree to which the vulnerability-aspiration relationship is mediated by effort.

In a linear model such as OLS, the exclusion of effort means circumstance variables are estimated by implicitly considering both the direct effect on the outcome variable, along with any indirect effect resulting from circumstances impacting effort. Inclusion of effort disentangles these competing associations and a comparison of the full and reduced-form models allows for a more complete understanding of how circumstances are related to an outcome. However, unlike OLS estimation, an ordinal probit specification ensures response probabilities remain within a bounded 0-1 interval, and thus models composed of different sets of explanatory variables are not measured on the same scale, and are therefore not directly comparable.

As noted by Kohler et al. (2011), "in nested nonlinear probability models, uncontrolled and controlled coefficients can differ not only because of confounding but also because of a rescaling of the model that arises whenever the mediator variable has an independent effect on the dependent variable" (p. 421). That is, regardless of the impact effort variables have on the relationship between circumstances and aspirations, a sufficient condition for circumstance variables to differ in the case of Equations 9 and 13, is that effort be associated with the dependent variable. We address this concern by using the Karlson-Holm-Breen (KHB) method which decomposes the impact of circumstances into both a direct and indirect effect for non-linear models (Karlson et al., 2012).

Given the very real possibility that academic effort is correlated with educational aspirations, we cannot simply difference the economic vulnerability parameter estimates in Equation 13 from those in Equation 9 in order to determine the degree to which factors such as reading every day and doing very well in school mediate this relationship. Because parameter estimates are partly

determined by the error variance of the model, changing the composition of the regression will impact estimated coefficients and assuming effort is correlated with educational aspirations, its inclusion will decrease the error variance. Hence, naively comparing Equations 9 and 13 may lead to an underestimation of the mediating impact of academic effort.

The KHB method derives a process to overcome this issue, allowing for the unbiased comparison of impacts across nested non-linear probability models. The first step is to run a seemingly unrelated regression of $\boldsymbol{E}$ on $\boldsymbol{C}$.[23] In doing so, we capture a set of residuals which allow us to purge effort of its correlation with circumstances. For instance, in terms of poverty and doing very well in school, our residuals would equal:

$$R = \hat{E}_{school} - (\hat{\pi}_0 + \hat{\pi}_1 C_{poverty}). \tag{14}$$

The residuals are then used in lieu of effort variables to produce:

$$Prob(ASP_{it}^{j} = k|Z_{it}) = \phi\Bigg(\alpha + \sum_{n=1}^{2} \tilde{\beta}_n C_{nit} + \sum_{k=1}^{2} \gamma_k R_{kit}^{j} + PMK\_Educ_{it}'\tilde{\delta} + Health_{it}'\tilde{\pi} + SD_{it}'\tilde{\epsilon} + \eta_t\Bigg). \tag{15}$$

Given that the only difference between Equations 15 and 13 is that effort has been purged of its potential correlation with economic circumstances, the two models are equally predictive, having the same error variance. As a result, while Equation 13 captures the direct impact of economic vulnerability on university aspirations, Equation 15 captures the total magnitude of the association. Thus, differencing respective vulnerability estimates produces the indirect impact - i.e., the degree to which vulnerability impacts effort, which in turn influences educational aspirations.

Applying the above method to our ordinal probit regression model allows us to examine the extent to which the economic vulnerability and educational aspiration relationship runs through

[23] Of particular note, this purging of effort is identical to Roemer's concept of inequality of opportunity as illustrated by Jusot et al. (2013).

effort. If better economic circumstances are associated with higher educational aspirations, then from a policy perspective, Equations 2 and 3 have very different implications, making it essential to understand the transmission mechanism. In the former case (Equation 2), more subsidization of higher education would likely produce salient results. However, in the event the linear separability assumption is violated (Equation 3), circumstances may have already negatively impacted effort, suggesting early-child-education initiatives may be a better alternative. Hence, policies that, for example, make university cheaper for those coming from an impoverished background may not, on their own, be overly impactful.

5.3 *Ex-Post* Results

Average marginal effects concerning the probability of university aspirations are presented in Table 5, with the top and bottom panels from the viewpoint of the PMK and youth respectively. For both girls and boys, three columns of results are presented, each capturing a unique domain of effort. For brevity purposes, only economic circumstance and effort estimates are presented.

As expected, effort, defined in behavioural terms, is an important correlate of aspirations for a higher education. In particular, daily reading among girls is associated with a 6 percentage point increase in university aspirations from the perspective of the PMK. When the girl reports always doing her homework, there is also an associated increase in PMK aspirations of about 6 percentage points. For boys, the associations from the perspective of the mother are somewhat larger - a 12 percentage point increase in the former case and a 7 percentage point increase in the latter. Concerning girls, results are somewhat similar relative to when their mother is reporting - i.e., a 7 percentage point increase in the case of daily reading and 8 percentage points in the case of always doing their homework. Regarding boys, while always doing their homework is associated with a 12 percentage point increase in university aspirations, the impact of daily reading is statistically insignificant.

Likewise, outcome-related efforts are very much associated with educational aspirations, especially when examining boys. When surveying the PMK, a 1 percent increase on a girl's standardized math test is associated with a 0.28 percentage point rise in expectations that the

Table 5. *Ex-Post* Results: Average Marginal Effects
Re. Prob(University Aspirations) - Incorporating Effort

	Girls			**Boys**		
			PMK			
Economic Circumstances:						
Is in Poverty	-0.1307***	-0.1210***	-0.1365***	-0.1112***	-0.0882**	-0.1056***
	(0.037)	(0.037)	(0.037)	(0.036)	(0.034)	(0.037)
Is Economically Insecure	0.0413	0.0403	0.0448*	0.0082	0.0177	0.0160
	(0.026)	(0.025)	(0.025)	(0.029)	(0.027)	(0.028)
Effort - Behaviours:						
Child Reads Daily	0.0589***			0.1202***		
	(0.018)			(0.024)		
Always Does Homework	0.0643***			0.0713***		
	(0.018)			(0.021)		
Effort - Outcomes:						
ln(Math Score)		0.2824***			0.6337***	
		(0.094)			(0.067)	
Doing Very Well in School		0.1316***			0.1594***	
		(0.024)			(0.021)	
Effort - Attitudes:						
Learning is Very Important			0.0178			0.0227
			(0.019)			(0.019)
Grades are Very Important			0.1096***			0.1348***
			(0.020)			(0.023)
Control Variables?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,730	3,450	3,730	3,450	3,730	3,450
			Youth			
Economic Circumstances:						
Is in Poverty	-0.0857**	-0.0726**	-0.0926***	-0.0843**	-0.0549	-0.0870**
	(0.036)	(0.036)	(0.036)	(0.040)	(0.038)	(0.040)
Is Economically Insecure	0.0092	0.0096	0.0055	0.0286	0.0237	0.0245
	(0.028)	(0.028)	(0.029)	(0.030)	(0.030)	(0.030)
Effort - Behaviours:						
Child Reads Daily	0.0731***			0.0484		
	(0.024)			(0.032)		
Always Does Homework	0.0837***			0.1249***		
	(0.020)			(0.024)		
Effort - Outcomes:						
ln(Math Score)		0.6090***			0.7362***	
		(0.072)			(0.063)	
Doing Very Well in School		0.0745***			0.0942***	
		(0.022)			(0.029)	
Effort - Attitudes:						
Learning is Very Important			0.060***			0.074***
			(0.022)			(0.023)
Grades are Very Important			0.1346***			0.1263***
			(0.027)			(0.024)
Control Variables?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,730	3,450	3,730	3,450	3,730	3,450

Notes: *** $p < 0.01$, ** $p < 0.05$. Coefficients are derived using an ordinal probit specification where average marginal effects are presented in reference to university aspirations. Robust standard errors are in parentheses. Dataset: four cycles of NLSCY data (cycles 5-8). Given confidentiality rules with Statistics Canada data, observation totals are rounded to the nearest 10. PMK = person most knowledgeable, which almost 95 percent of the time is the mother. Poverty is defined as household income, adjusted for household size, falling below 50 percent of the sample median for that particular cycle. Economically insecure is expressed as the occurrence of a 25 percent or greater decrease in cycle-over-cycle household income, also adjusted for household size. Control variables include: PMK education, child and PMK health circumstances, socio-demographics, and time fixed effects.

girl pursues a university education. However, for boys, this result is much higher at 0.63 percentage points. Doing very well in school also matters, predicting a 13-16 percentage point increase in expectations of a university degree for the youth in question. From the youth's perspective, test results are even more influential at about 0.61 and 0.74 percentage points for girls and boys respectively. However, the reverse is true when it comes to doing very well in school, with gains of about 7-9 percentage points.

From the perspective of the PMK, when they believe that getting good grades is very important, hopes that the girl pursues a university education increase by 11 percentage points. The result is similar for boys at about 13 percentage points. Results concerning the importance of learning, from the perspective of the PMK, are statistically insignificant. When the youth is observed, both attitude variables matter. While the magnitude of association concerning the importance of good grades is similar to the PMK's perspective, believing that learning is very important is associated with a 6 and 7 percentage point increase in university aspirations for girls and boys respectively.

For the most part, controlling for academic effort does not disrupt our previous findings. For instance, when surveying PMKs in poverty, aspirations are still predicted to fall by about 12-13 percentage points for girls and 9-11 percentage points for boys. The only instance whereby poverty becomes a statistically insignificant predictor is when outcome-related efforts are included and the perspective of the boy is under consideration. However, direct comparisons are not advisable without first addressing the issue of rescaling.

5.4 *Ex-Post* Results - the KHB Method

Table 5 results suggest that changes to economic vulnerability magnitudes, after controlling for effort, are negligible, Thus, it would appear that the assumption of separability can be maintained (see Equation 2). However, when variables are introduced to an ordinal probit specification, previous results may change as a result of both colinearity and rescaling - the latter is especially true when the introduced variables correlate with the outcome.

A more focused test is presented in Table 6 whereby the KHB method allows us to compare

economic vulnerability parameter estimates (*not* average marginal effects) from both an *ex-ante* and *ex-post* framework. Regardless of who is being interviewed, and regardless of whether the person in question is a boy or girl, there is statistically no difference between vulnerability coefficients with and without effort-related variables. However, the result concerning outcome-related efforts from the perspective of the boy does warrant further investigation given the statistically insignificant poverty result in Table 5. When only including the math test score, it becomes evident that it is indeed this effort variable that produces this finding. Moreover, the KHB decomposition confirms this finding, as it suggests the reduced and full model difference is statistically significant at the 10 percent level.[24]

Controls for effort do not appear to mediate the relationship between economic circumstances and aspirations of a higher education. The only instance where this is not true, is when examining the impact of poverty on boy responses when outcome-related efforts are included - a finding that corroborates Caro et al. (2009) concerning the strong statistical relationship between socioeconomic status and academic achievement. Lastly, we have only presented results from the model which includes the incidence of economic vulnerabilities; however, results when including the depth variables and alternative definitions of economic insecurity are indeed much the same as those presented in Tables 3 and 4.

6 Discussion & Conclusion

This paper examines the association between economic vulnerability and educational aspirations for youth age 12-15. Results are obtained using four cycles of Canadian data, for the years 2002-2008, and aspirations are observed from both the perspective of the youth in question and the person most knowledgeable (which almost 95 percent of the time is their mother). Economic vulnerability is identified by the inclusion of two separate controls: (i) poverty (income, adjusted for household size, falling below 50 percent of the sample median) and (ii) economic insecurity (a 25 percent or greater decline in cycle-over-cycle adjusted income), and our educational aspiration

[24]These results are available from the lead author upon request.

Table 6. Mediation Analysis - The KHB Method

	Behaviours		Outcomes		Attitudes	
	Girls	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**
			PMK			
Is in Poverty:						
Reduced Model	-0.4833***	-0.3577***	-0.5025***	-0.3882***	-0.4888***	-0.3635***
	(0.117)	(0.109)	(0.120)	(0.116)	(0.117)	(0.112)
Full Model	-0.4737***	-0.3625***	-0.4664***	-0.3215**	-0.4953***	-0.3455***
	(0.117)	(0.109)	(0.123)	(0.115)	(0.117)	(0.113)
Difference	-0.0096	0.0048	-0.0361	-0.0667	0.0065	-0.0180
	(0.023)	(0.027)	(0.046)	(0.067)	(0.026)	(0.029)
Is Economically Insecure:						
Reduced Model	0.1920*	0.0150	0.1919	0.0219	0.1948*	0.0221
	(0.117)	(0.103)	(0.120)	(0.109)	(0.116)	(0.103)
Full Model	0.1804	0.0288	0.1857	0.0695	0.1977*	0.0569
	(0.118)	(0.103)	(0.120)	(0.109)	(0.116)	(0.103)
Difference	0.0116	-0.0138	0.0062	-0.0476	-0.0029	-0.0348
	(0.023)	(0.027)	(0.045)	(0.067)	(0.026)	(0.029)
Observations	3,730	3,450	3,730	3,450	3,730	3,450
			Youth			
Is in Poverty:						
Reduced Model	-0.3014***	-0.2472**	-0.3105***	-0.2472**	-0.3040***	-0.2426**
	(0.111)	(0.115)	(0.118)	(0.120)	(0.114)	(0.115)
Full Model	-0.2903***	-0.2525**	-0.2591**	-0.1762	-0.3155***	-0.2629**
	(0.111)	(0.115)	(0.119)	(0.119)	(0.114)	(0.115)
Difference	-0.0111	0.0053	-0.0514	-0.0710	0.0115	0.0203
	(0.026)	(0.022)	(0.041)	(0.052)	(0.027)	(0.031)
In Economically Insecure:						
Reduced Model	0.0469	0.0693	0.0390	0.0620	0.0360	0.0617
	(0.101)	(0.098)	(0.106)	(0.105)	(0.104)	(0.097)
Full Model	0.0337	0.0899	0.0367	0.0789	0.0203	0.0779
	(0.101)	(0.098)	(0.106)	(0.105)	(0.104)	(0.097)
Difference	0.0131	-0.0207	0.0023	-0.0169	0.0157	-0.0162
	(0.025)	(0.022)	(0.041)	(0.051)	(0.027)	(0.031)
Observations	3,730	3,450	3,730	3,450	3,730	3,450

Notes: *** $p < 0.01$, ** $p < 0.05$. Coefficients represent parameter estimates derived from an ordinal probit specification. Robust standard errors are in parentheses. Dataset: four cycles of NLSCY data (cycles 5-8). Given confidentiality rules with Statistics Canada data, observation totals are rounded to the nearest 10. PMK = person most knowledgeable, which almost 95 percent of the time is the mother. Poverty is defined as household income, adjusted for household size, falling below 50 percent of the sample median for that particular cycle. Economically insecure is expressed as the occurrence of a 25 percent or greater decrease in cycle-over-cycle household income, also adjusted for household size. The "Reduced Model" is in reference to Equation 13; "Full Model" implies Equation 11.

variable consists of three ordinal categories based on years of schooling: (i) high school completion or less, (ii) community college or trade school, and (iii) a Bachelor's degree or higher.

Separately examining boys and girls, our results from a pooled ordinal probit model, suggest that poverty is associated with reduced educational aspirations. Concerning economic insecurity, it would seem that negative income shocks do not reduce aspirations for a higher education, and

alternative insecurity specifications produce similar findings. Further, when we include controls for not only the incidence of vulnerabilities, but also depth, it appears that the mere presence of poverty is the motivating force behind reduced aspirations. Lastly, neither economic insecurity incidence, nor depth, appear to be correlated with educational aspirations. Thus, it is the level (not variation) of vulnerability which is most associated with educational aspirations.

Within an inequality of opportunity framework, poverty contributes to about 10-15 percent of the observed circumstantial inequality concerning educational aspirations, representing a rather sizable component and similar to Peragin and Serlenga's 2008 finding concerning post-secondary achievement in Italy. By far, the largest contributor is the mother's level of education, capturing about 30 percent of observed inequality of opportunity, with geographical factors being the next largest factor. Comparably, using an inequality of opportunity framework, Gamboa & Waltenberg (2012) find that parental education is among the most important factors regarding educational achievement in Latin America. Although tuition for the bulk of Canada's higher education institutions is subsidized, our results suggest that poverty still produces an inequality of opportunity.

It is plausible that academic effort mediates the degree to which poverty is associated with reduced aspirations of a higher education. To examine this possibility, we include a set of effort-based variables concerning behaviours, outcomes, and attitudes. We are therefore able to observe the degree to which the association between economic vulnerability and educational aspirations manifests in a change regarding effort. Our findings suggest there is a degree of separability between economic circumstances and educational effort. That is, our results concerning poverty and economic insecurity are generally not statistically (nor economically) impacted by the inclusion of effort variables. Akin to this result, Schutz et al. (2008) examine the impact of family background on educational outcomes among OECD countries, finding that this association is relatively small in Canada - especially relative to the US and UK. Additionally, Willms (2004) argues that inequality in literacy scores, resulting from socioeconomic differences, are also far less pronounced in Canada relative to the US.

This final result suggests that policies which increase educational opportunities among the poor could reduce inequality of opportunity. This is echoed in a US paper which argues in favour of an affirmative action promgramme regarding university enrollment that is inclusive of those from low income households (Carnevale & Rose, 2003). Had a transmission mechanism been present such that poor circumstances were associated with a reduction in effort, then immediate impacts of such a policy would unlikely occur. However, given that effort does not appear to have a strong impact on our pre-existing results, it would seem there is a direct association between economic vulnerability and educational aspirations.

One possible transmission mechanism, as past research suggests, is that poverty induces a high discount rate (Carvalho et al., 2016; Handa et al., 2020; Lawrance, 1991; Yang, 2016). That is, those in poverty are unable to trade short-term costs, in the form of tuition and foregone earnings, for long-term benefits such as more income, job security, and access to work that best aligns with their preferences. Notably, there have been large reductions in child poverty since the expansion of the Canada Child Benefit in 2015 (Baker et al., 2021). Also, the newly implemented $10/day childcare programmes should also reduce child poverty. Consequently, these policies will likely promote increased educational aspirations among the poor, thereby improving upon this inequality of opportunity. Based on our findings, we argue that such policies continue moving forward. That said, future research may wish to explore this mechanism should data on inter-temporal time preference be available.

Our findings are not causal, and while it is unlikely that educational aspirations cause a family to experience economic hardship, an omitted variable bias is possible. For instance, one may posit that the poverty-aspiration link is at least partially the result of genetic endowments and/or social connections that are not available to the poor. To address this concern, we pursued individual-level fixed effects estimation. However, only 45 percent of the sample are observed twice and results are noisy given a lack of within variation; thus, it is not possible to make meaningful inference. In particular, among those observed twice, poverty tends to be "sticky" (insecurity is not). The same is true for aspirations (and unsurprisingly PMK education).[25]

[25]For example, of children who aspired for university in the first period, 82 percent aspired for the same level of

We argue that economic buffers that prevent transitory shocks may not impact educational aspirations, but policies designed to bring children out of poverty may be quite impactful in breaking the intergenerational poverty trap. The latter is supported by Croll (2009) who finds that educational preference formation tends to develop early in one's life - i.e., prior to high school. Given we only examine youth during the ages of 12-15, we are unable to examine the age at which educational aspirations approach a steady-state. Thus, future studies may wish to investigate the crucial age as to when aspirations reflect a future reality - i.e., when are aspirations more malleable and when do they become "sticky"?

Finally, although evidence tends to suggest that child poverty is associated with poor test scores,[26] and Phipps & Lethbridge (2006) shows this to be true in Canada, our results tend to suggest that academic effort does not mediate the relationship between economic vulnerability and aspirations for a higher education. Hence, the results of this paper emphasize the importance of alleviating child poverty. In particular, reducing financial barriers to university among low income households may improve aspirations at a critical time in a youth's life.

Declarations

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Data Availability: The data used in this analysis are not publicly available due to Statistics Canada's confidentiality requirements. Housed at Statistics Canada Research Data Centres located throughout Canada, this dataset can only be accessed upon acceptance of a research proposal. For more information, see: https://www.statcan.gc.ca/en/microdata/data-centres.

education in the following period; for mothers, this value rises to 87 percent. Likewise, of those who were in poverty in time period 1, over two-thirds were also in poverty in time period 2; 95 percent of those who were not in poverty in the first time period remained out of poverty. In contrast, only about 4 percent remained insecure in the subsequent time period.

[26] See: Ferguson et al. (2007); Lacour & Tissington (2011); Tienken (2014).

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