IARIW 2021
Monday 23 – Friday 27 August
Statistisk sentralbyrå
Statistics Norway

Dreaming of a Brighter Future?

The Impact of Economic Vulnerability on University Aspirations

Barry Watson

(University of New Brunswick)

Nancy Kong

(The University of Queensland)

Shelley Phipps

(Dalhousie University)

Paper prepared for the 36th IARIW Virtual General Conference
August 23-27, 2021
Session 17: Inequalities in Opportunity for Income, Education and Health II
Time: Thursday, August 26, 2021 [14:00-16:00 CEST]

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

Barry Watson*
Faculty of Business, University of New Brunswick,

Nancy Kong
Faculty of Business, Economics and Law, The University of Queensland,

Shelley Phipps
Department of Economics, Dalhousie University

Abstract

A body of literature suggests that household socioeconomic status is a determinant of higher learning among youth, thus producing a social gradient in education. We examine whether this gradient represents an inequality of opportunity, partially explained by the educational aspirations for those age 12-15 who are economically vulnerable. Using four cycles of the Canadian National Longitudinal Survey of Children and Youth (2002-2008), we find that among households in poverty (measured as having an income, adjusted for household size, below 50 percent of the sample median), there are reduced aspirations of the youth attending post-secondary education from the perspective of both the youth and their mother. Although poverty is associated with comparable reductions in aspirations from the perspective of the youth regardless of their sex, mothers reduce their hopes for girls obtaining higher education to a greater degree than boys after adding controls for poverty depth. Compared with other circumstances, poverty contributes to about 10 percent of the observed inequality of opportunity gap, with the mother's education being the largest factor at about 30 percent. Controlling for the perceived importance of good grades and school performance does not change the impact of economic vulnerability on school aspirations. Hence, there does not appear to be a transmission mechanism such that poverty impacts school effort, which in turn, predicts educational aspirations. Our 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.

Keywords: Poverty; Economic Insecurity; Educational Aspirations; Social Gradient in Education; Youth

JEL Codes: I21, I24, I32

* Corresponding author

1 Introduction

Age earnings profiles consistently suggest the return from a university education exceeds that of a college, trade, or high school diploma.[1] However, the prospect of financial gains through more education may not be equally available to all socioeconomic classes, regardless of effort. For instance, Corak (2006, 2013) notes that about one-third of poor Canadian children become poor adults and Frenette (2007, 2017) demonstrates income gradients in youth post-secondary attendance. This study therefore examines the relationship between economic vulnerability and educational aspirations among Canadian youth age 12-15

In particular, we want to understand how 'identities' or 'sense of self' among poor or economically insecure 12-15 year old youth may not include the idea of 'I can/will be a university student'. Similarly, we examine how limited economic resources are associated with parents' perceptions of what their children may become. Why focus on aspirations, as opposed to say, academic achievement? As Fortin et al. (2015) find, the changing aspirations of US girls, compared to boys, is the single most important factor explaining the increased relative university education of young women relative to young men. Additionally, to our knowledge, no study has examined the determinants of educational aspirations given most of the literature focuses on the direct cost of post-secondary education.[2]

In examining the social gradient in educational aspirations, this research is motivated by the concept of equality of opportunity.[3] In his keynote address, "Inequality as Cholesterol", Ferreira (2019) demonstrates both the political importance and continued concern over equality of opportunity by highlighting the following two quotes. In his second inaugural address, Franklin D. Roosevelt noted: "Equality of individual ability has never existed and never will, but we do insist that equality of opportunity still must be sought" (20 January 1937). However, 75 years later, concerns over equality of opportunity remain, as argued by the late Alan Krueger, "Inequality in the United States over the last three decades has reached the point that inequality

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

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

[3] For a comprehensive examination of equality of opportunity, see Ferreira & Peragine (2016).

in incomes is causing an unhealthy division in opportunities, and is a threat to our economic growth" (Center for American Progress, 2012).

How does economic vulnerability impact university aspirations? In terms of direct resource channels, poverty may directly impact youth education outcomes, given a potential reduction in monetary investment. 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 thus 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 sentiment is associated with increased child neglect and abuse. However, there is no research to date that links parental economic insecurity to the post-secondary aspirations of their children. Hence, we examine whether a social gradient in education represents an inequality of opportunity, partially explained by the educational aspirations of those age 12-15 who are economically vulnerable.

Additionally, a youth may have educational aspirations which differ from what the person most knowledgeable (PMK) desires for this individual. Moreover, young people have to decide to put in the effort at school and parents have to support youth 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.

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 interviews both the youth, aged 12-15, and the 'person most knowledgeable' of this youth (typically the mother, which is used interchangeably with PMK throughout), about their aspirations with respect to the youth's future education.[4] For this analysis, economic vulnerability is defined using two separate measures: (i) poverty and (ii) economic insecurity. 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. The latter is captured by a 25 percent or greater decline in reported cycle-over-cycle household income (also adjusted for household size).[5] Both vulnerability measures are measured in terms of incidence and depth. Finally, our aspirations variable is categorical: high school completion (or less), a community college or trade school diploma, and a university degree (undergraduate, graduate, or professional).

Using four cycles of the NLSCY (2000-2008) and an ordinal probit specification, we find that the incidence of poverty is associated with mothers reducing their aspirations that the youth will attend university by 10 percent if the youth is a girl and by 12 percent if they are a boy. From the perspective of the youth in question, they too reduce their educational expectations. In this instance, poverty is associated with an 8 and 10 percent reduction in university aspirations for girls and boys respectively. The depth of household poverty does not seem to matter when the youth is reporting on their educational aspirations and this is also true when the mother is reporting on their educational hopes for a girl. However, it would seem poverty depth is important when the mother is reporting on a boy. More specifically, results suggest that when controlling for depth, the incidence of poverty reduces the mother's aspirations of university for girls by about 13 percent, and for the boy result to equal this decline, the depth of poverty must be 80 percent below the poverty threshold.

Interestingly, it would seem that economic insecurity is not associated with reduced educational aspirations. In fact, the only scenario whereby there is a statistically significant finding is when

[4]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.

[5]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.

the mother is reporting on their daughter, and this result suggests they have increased aspirations that she will pursue higher education. When we also observe the depth of insecurity, the mother's reporting on their son also reflects higher educational aspirations as the magnitude of the income drop rises.

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. While the mother's education seems to matter most, poverty is also important, explaining about 10 percent of the observed inequality of opportunity. Additionally, these findings are not impacted by controlling for perceived effort. That is, controls for the importance of getting good grades and perception of the child's school performance do not change the above findings. This is of particular interest as it would seem that economic vulnerability does not manifest in changed perceptions concerning effort which ultimately impacts aspirations for a higher level of education.

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 also includes controls for effort. Section 6 concludes.

2 Motivation - Inequality of Opportunity

The concept of equality of opportunity was renewed in 1971 with *A Theory of Justice*, whereby 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.[6] Thus, at the core, equality of opportunity is not arguing in favour of a society where everyone is equally well-off; but, has an

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

equal chance of achieving the resources they care about.

These thoughts are extended in Roemer (1998), who models inequality of outcomes as driven by both differences in circumstances and efforts, with the former having policy implications, having been coined "ethically offensive" inequality by Checchi & Peragine (2010). While we may argue that inequalities along the dimension of circumstances be removed, 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.[7]

We hypothesize that while effort is associated with educational aspirations, economic circumstances are also impactful, representing an *inequality* of opportunity. In modeling this relationship, the absence of inequality of opportunity suggests some desirable outcome Y is distributed independent of a set of circumstances ($\boldsymbol{C}$): $f(Y|\boldsymbol{C}) = f(Y)$.[8] 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,[9] 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.[10] Incorporating effort allows us to examine inequality of opportunity in an *ex-post* framework, whereby Roemer (1998)

[7] 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, while Childs et al. (2018) find that family 'cultural capital' (e.g., eating together, reading, attending concerts) is a vital path from family circumstances to youth post-secondary attainment.

[8] In the context of our analysis, Y represents aspirations for a higher education and C denotes poverty and economic insecurity.

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

[10] 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.

argues that those producing the same level of effort be equally compensated, which is referred to in Ferreira & Gignoux (2011) as the 'strong definition' of inequality of opportunity. Thus, including a set of efforts ($\boldsymbol{E}$)[11] produces:

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

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 sample regression function:

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

whereby 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.

We can further 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,[12] providing a relative importance of each component in terms of the

[11] In terms of aspirations for a higher education, effort may be denoted by academic performance and/or endeavours.
[12] See: Shorrocks (2013)

impact on inequality of opportunity (Ferreira & Gignoux, 2014). 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 the indirect element which occurs as a result of changed efforts. To decompose this total effect, 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 efforts 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 analyses, Section 5, observes the extent to which such circumstances manifest in changed educational efforts, thereby impacting aspirations - i.e., an examination of Equation 6.

3 Data: National Longitudinal Survey of Children and Youth

This study uses cycles 5-8 (2002-2008) of the National Longitudinal Survey of Children and Youth (NLSCY). This survey asked children and the person most knowledgeable, typically their mother, several school-related questions, some of which directly reflect educational aspirations. Both the youth and person most knowledgeable were asked "How far do you hope (this child) will go in

school". Additionally, data regarding economic circumstances were also collected, which allows for the derivation of a series of metrics pertaining to economic vulnerability. These include: (i) poverty (household income - adjusted for household size using the Luxembourg Income Study equivalence scale - being below 50 percent of the sample median for that cycle)[13] and (ii) economic insecurity (a 25 percent, or greater, decline in cycle-over-cycle adjusted household income)[14].

In terms of effort, both the youth in question, and the mother, were asked to evaluate the importance of getting good grades and the importance of doing well in school. For this study, we derive two dummy variables equal to unity when the respondent agrees that respectively, good grades are 'very important' and that the child is doing 'very well' in school; zero otherwise. Although these variables are perception-based, we do not have direct measures of effort, such as test scores or attendance records. Thus, we regard the included variables as proxies for effort, while also testing a series of other effort-related controls such as time spent doing (from the perspective of the youth) and monitoring (from the perspective of the mother) homework,[15] along with time spent reading. Additionally, a host of variables pertaining to health, age, marital status, etc. exist within the NLSCY, which serve as important considerations in modeling the relationship between circumstances and aspirations.

As alluded to above, an interesting feature of the NLSCY is that both youth, age 12-15, and the mother were asked the same set of aspiration and effort questions. Thus, we are able model the association between economic vulnerability and hopes for a higher education from both of their perspectives. However, it is important to note that only the PMK was surveyed regarding household socioeconomic questions. 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.

[13]This threshold was chosen as it equates to Statistics Canada's "Low Income Measure", and is used in many OECD analyses.

[14]This is based on the work of Hacker et al. (2014) who suggest a 25 percent or greater income loss causes the average household considerable hardship.

[15]It is quite possible that time spent doing/monitoring homework may not only be correlated with effort but also could suggest the youth is academically struggling.

3.1 Dependent Variable - Educational Aspirations

Educational aspirations from the perspective of the mother 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.[16,17]

3.2 Circumstances

Economic Vulnerability

Consider that our first socioeconomic 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 - operationalized as household income, adjusted for household size (Y),[18] falling below the 50 percent of national median income threshold (H) for that particular cycle of data:

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

However, Equation 4 does not capture depth of poverty - for instance, an individual with a household income that is 1 dollar below the threshold is statistically treated the same as an individual reporting a household income of 1 dollar for the entire year. To account for poverty depth (Pov_Depth), we examine poverty intensity using a micro-level version of the Poverty Gap

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

[17] As suggested by Brunori (2016), it should be noted that we are maintaining an assumption that, at the mean, aspirations for a higher level of education are a desirable outcome among Canadians. Although this is likely an uncontroversial assumption, if certain groups have a tendency to feel otherwise, our results may prove misleading - however, this is quite an unlikely scenario.

[18] 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

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:[19]

$$Pov\_Depth_{it} = \begin{cases} \frac{H_t - Y_{it}}{H_{it}}, & \text{if } Pov_{it} = 1 \\ 0, & \text{otherwise.} \end{cases} \tag{8}$$

The metrics noted above capture a *level* of socioeconomic status - they do not, however, measure *variability*. Both Hacker et al. (2014) and Osberg (1998) have examined downward negative income shocks, with the former focusing on an *ex-post* definition, and the latter an *ex-ante* interpretation. For this study, we focus on Hacker's method by deriving a control for the incidence of economic insecurity ($Econ\_Ins$) which equals unity if the respondent *incurred* a 25 percent or greater negative income shock between cycles; zero otherwise:

$$Econ\_Ins_{it} = \begin{cases} 1, & \text{if } \frac{Y_{it} - Y_{it-1}}{Y_{it-1}} \leq -0.25 \\ 0, & \text{otherwise.} \end{cases} \tag{9}$$

Expanding this definition to that of Osberg's 1998 definition, i.e., "the inability to obtain protection against subjectively significant economic loss" (p.17), we explored the *probability* that a respondent experiences the negative income shock based on factors such as their education and region of residence. Results were virtually identical to those produced using Hacker's interpretation and are thus, excluded from the analysis.[20]

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 ($Econ\_Depth$). 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 household income falls below the insecurity threshold:

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

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

$$Econ\_Depth_{it} = \begin{cases} \frac{Y_{it-1}-Y_{it}}{Y_{it-1}} - .25, & \text{if } Econ\_Ins_{it} = 1 \\ 0, & \text{otherwise.} \end{cases} \tag{10}$$

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 their children's eventual schooling attainment. Thus, we posit that in terms of aspirations, parents with higher levels of education particularly desire the same for their children, 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 mother and youth respectively. In both cases, the variable is equal to unity if the respondent believes they are in poor health; zero otherwise.[21] Given the literature regarding the academic success of children of immigrants[22], a dummy variable is included if the mother 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 mother. 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.

[21] 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.

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

3.3 Descriptive Statistics

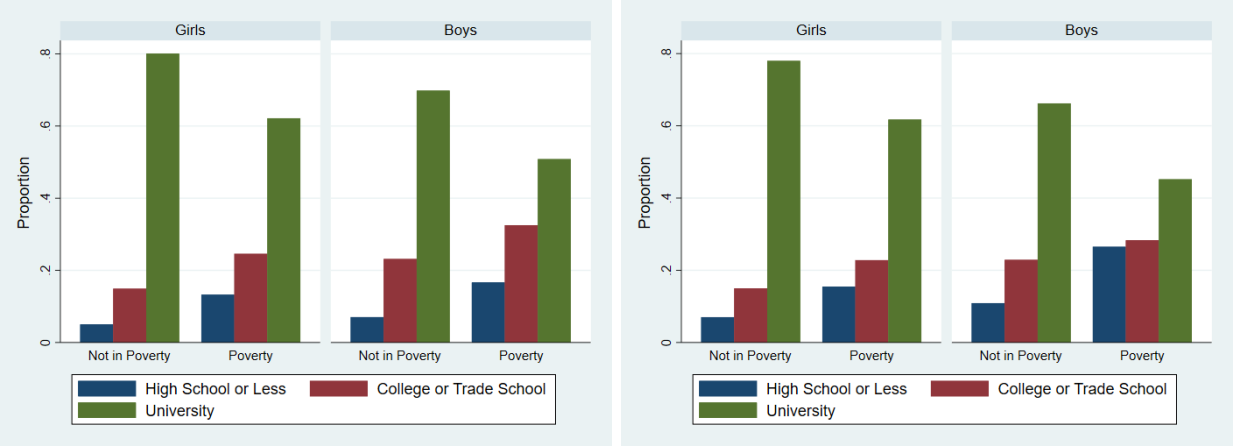
Sample means consisting of 11,050 observations from PMKs regarding their household level of economic vulnerability, along with their educational aspirations for 5,510 girls and 5,540 boys, age 12-15 respectively, are presented in Table 1. Additionally, we present the educational aspirations of 4,050 girls and 3,800 boys, both age 12-15, which are matched with their respective household's level of economic vulnerability.[23] For the youth in question, aspirations are overwhelmingly in favour of a university education.[24] However, perspective matters, as does gender. Relative to youth reporting, mothers, on average, report a 2-3 percentage point higher aspiration of university pursuit. Additionally, from either perspective, there tends to be a higher university aspiration for girls ($\approx$ 75 percent) than boys ($\approx$ 66 percent) - a difference of about 11-12 percentage points. However, aspirations regarding college or trade school are about 8 percentage points higher for boys (16 percent vs. 24 percent), regardless of perspective. Based on the sample of households, about 15 percent report the incidence of poverty (based on Canada's Low Income Measure) and about 13 percent experienced a reduction in cycle-over-cycle income (adjusted for household size) of 25 percent or more.

Table 1. Pooled Means (%)

	PMK		**Youth**	
	Girls	**Boys**	**Girls**	**Boys**
Educational Aspirations:				
High School or Less	6.26	8.47	8.26	12.74
College or Trade School	16.38	24.55	16.13	23.52
University	77.36	66.98	75.61	63.73
Incidence of Poverty	15.17	14.96	14.68	14.81
Incidence of Economic Insecurity	13.55	12.69	13.47	13.83
Observations	5,510	5,540	4,050	3,800

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. Poverty is defined as household income, adjusted for household size, falling below 50 percent of the sample median for that particular cycle. Economic insecurity is expressed as the occurrence of a 25 percent or greater decrease in cycle-over-cycle household income, also adjusted for household size.

[23] Sample sizes are rounded to the nearest ten given Statistics Canada confidentiality rules.
[24] Sosu (2014) finds a similar finding among parental aspirations in a Scotish study



(a) PMK Reported

(b) Youth Reported

Figure 1: Educational Aspirations - Adjusted for Poverty

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 age 12-15 will attend university. This is apparent for both boys and girls and whether it is the mother 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 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, difference seem rather small, suggesting economic insecurity may not be overly impactful regarding educational aspirations.

4 Method: *Ex-Ante* Estimation of Inequality of Opportunity

We begin with an *ex-ante* approach which captures the degree of inequality of opportunity resulting from the impact of economic circumstances (C) on 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:

(a) PMK Reported (b) Youth Reported

Figure 2: Educational Aspirations - Adjusted for Economic Insecurity

$$Prob(ASP_{it}^{j} = k|Z_{it}) = \phi\left(\alpha + \sum_{n}^{2} \beta_n C_{nit} + PMK\_Educ_{it}'\delta + Health_{it}'\pi + SD_{it}'\epsilon + \eta_t\right). \quad (11)$$

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 is a discrete set of fixed effects.

Our regression model is run separately for boys and girls. Additionally, it is also worth noting that j captures the perspective from which the outcome variable is reported, given questions regarding educational aspirations were asked to both the youth in question and their mother - a unique feature of the dataset and one which is discussed in grater detail in Section 3.

Equation 11 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, as discussed in Section 2.[25] Given the ordinal nature of our categorical variable for level of educational

[25]To put this in context, consider a Mincer equation which captures the returns to education, experience, etc.

aspiration, we use a dissimilarity index for our inequality measure:

$$I(\widehat{ASP}) = \frac{1}{n}\sum_{i=1}^{n}\left|\widehat{ASP}_i - \overline{ASP}\right|. \tag{12}$$

This index captures dissimilarity regarding educational aspirations, due to a set of circumstances, relative to the mean aspirations for the entire sample.[26] If there is no inequality of opportunity, the correspondence between sample and opportunity distributions should be exact. 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. The dissimilarity index ranges from 0 to 1, increasing in equality of opportunity.

4.1 *Ex-Ante* Results - Vulnerability Incidence Variables

With separate analyses based on gender, results from pooled ordinal probit regressions are presented in Table 2 regarding our sample of 11,050 mother observations and 7,850 youth observations. In each case, the left panel (columns 2 and 3) is based on the mother's perspective, while the right panel (columns 4 and 5) is from the view of the child in question. For intuition purposes, the presented coefficients are average marginal effects (AME) regarding the probability of university aspirations.

In terms of economic vulnerability, being in poverty matters and is quite impactful, regardless of perspective or child's gender. However, for girls, the degree to which it matters depends on who is reporting. That is, poverty reduces the mother's aspiration that a girl will attend university by about 12 percentage points, while for the girl in question, being in poverty is associated with an 8 percentage point decline in university aspirations. For boys, whether it is them or the mother reporting, the result is quite consistent, whereby the incidence of poverty is associated with a 10 percentage point decrease in hopes of a university education.

While these results produce a set of estimates that examine the impact of how advanced degrees and more experience contribute to the level of income, they do not necessarily provide insight on income inequality. Thus, further methods are needed to examine the degree to which these variables impact the distribution of income.

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

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

	PMK		Youth	
	Girls	**Boys**	**Girls**	**Boys**
Economic Circumstances:				
Incidence of Poverty	-0.1239***	-0.1020***	-0.0789**	-0.1028***
	(0.03)	(0.03)	(0.04)	(0.04)
Incidence of Economic Insecurity	0.0486**	0.0210	0.0022	0.0286
	(0.02)	(0.03)	(0.03)	(0.03)
Maternal Education:				
PMK's Education: Less than HS	-0.2219***	-0.3056***	-0.1981***	-0.3233***
	(0.03)	(0.04)	(0.04)	(0.04)
PMK's Education: High School	-0.1071***	-0.1778***	-0.1078***	-0.1655***
	(0.03)	(0.02)	(0.03)	(0.03)
PMK's Education: Some Post-Secondary	-0.0335	-0.0676**	-0.0867***	-0.1298***
	(0.03)	(0.03)	(0.03)	(0.04)
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	0.0615***	0.0509**	0.0305	0.0505**
	(0.02)	(0.02)	(0.02)	(0.02)
Number of Siblings	-0.0021	0.0089	-0.0117	0.0032
	(0.01)	(0.01)	(0.01)	(0.01)
PMK is Married	0.0147	0.0442*	0.0624**	0.0453
	(0.03)	(0.02)	(0.03)	(0.03)
PMK is an Immigrant	0.0932***	0.1236***	0.0941***	0.1280***
	(0.03)	(0.03)	(0.03)	(0.04)
Age of Child	-0.0172**	-0.0278***	-0.0073	-0.0411***
	(0.01)	(0.01)	(0.01)	(0.01)
Age of PMK	0.0032*	0.0052**	0.0074***	0.0080***
	(0.002)	(0.002)	(0.003)	(0.002)
PMK is Male	0.0318	-0.0010	-0.0082	0.0249
	(0.04)	(0.05)	(0.04)	(0.06))
Region of Residence: Atlantic Canada	0.0930***	0.0821***	0.0780***	0.0697***
	(0.02)	(0.02)	(0.02)	(0.03)
Region of Residence: Quebec	-0.0737***	-0.1044***	-0.0326	-0.0718**
	(0.03)	(0.03)	(0.03)	(0.03)
Region of Residence: Prairies	0.0022	0.0533**	0.0001	0.0070
	(0.02)	(0.02)	(0.03)	(0.03)
Region of Residence: British Columbia	-0.0477	0.0286	-0.0209	-0.0115
	(0.04)	(0.04)	(0.04)	(0.04)
Resides in a Rural Area	-0.0727***	-0.1313***	-0.0559**	-0.1355***
	(0.02)	(0.02)	(0.02)	(0.02)
Time Fixed Effects:				
Year of Survey: 2002	-0.0117	0.0066	0.0148	0.0359
	(0.02)	(0.03)	(0.03)	(0.03)
Year of Survey: 2004	-0.0040	-0.0116	0.0084	-0.0209
	(0.02)	(0.02)	(0.03)	(0.03)
Year of Survey: 2006	0.0109	-0.0308	0.0159	-0.0264
	(0.02)	(0.02)	(0.03)	(0.03)
Observations	5510	5,540	4,050	3,800

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

With respect to economic insecurity, aspirations only seem to change when it is the mother reporting on their hopes the youth in question will pursue a university education, and that youth is female. Perhaps surprisingly, a realized negative income shock increases their aspirations by about 5 percentage points. Results regarding economic insecurity are otherwise both statistically, and economically, insignificant.

Table 3. *Ex Ante* Results: Average Marginal Effects Incorporating Vulnerability Depth

	PMK		**Youth**	
	Girls	**Boys**	**Girls**	**Boys**
Economic Circumstances:				
Incidence of Poverty	-0.1345***	-0.0618*	-0.0738*	-0.0764*
	(0.04)	(0.03)	(0.04)	(0.04)
Poverty Depth	0.0002	-0.0009**	-0.0001	-0.0005
	(0.0004)	(0.0004)	(0.0003)	(0.0004)
Incidence of Economic Insecurity	0.0435	-0.0365	0.0003	0.0163
	(0.03)	(0.04)	(0.04)	(0.04)
Insecurity Depth	0.0002	0.0038***	0.0002	0.0010
	(0.0014)	(0.0014)	(0.0015)	(0.0019)
Additional Controls?	Yes	Yes	Yes	Yes
Observations	5,510	5540	4,050	3,800

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Dataset: four cycles of NLSCY data (cycles 5-8). Given confidentiality rules with Statistics Canada data, observation totals are rounded to the nearest 10. Estimates are derived using an ordinal probit specification where average marginal effects are presented in reference to university aspirations. Robust standard errors are in parentheses. Poverty is defined as household income, adjusted for household size, falling below 50 percent of the sample median for that particular cycle. Economic insecurity 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.

Key coefficients of comparison tend to be statistically significant and are in the hypothesized direction of association. In particular, a low level maternal education has a larger negative association with educational aspirations than poverty. Specifically, 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 22 percentage point reduction in aspirations the girl in question will pursue university education. For boys, this association is somewhat larger in magnitude at 30 percentage points. The same impact occurs from the perspective of the youth in question with the magnitudes being similar at 20 percentage points for girls and 30 percentage points for boys. Unsurprisingly, there is a monotonic reduction in association as the mother's education level rises.

In terms of a mother having a high school diploma, the reduction in university aspiration falls to 11 percentage points when the youth in question is a girl. For boys, the magnitude is about a 17-18 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 lower at about 5 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 akin to the mother-reported result at about 5 percentage points.

For both boys and girls, their health is a significant predictor of their hopes of higher education. Poor health reduces the probability of their university aspirations by about 8 percentage points and 16 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 9 percentage points for girls and 12 percentage points for boys. Results from the perspective of the youth in question are very similar at roughly the same magnitudes. Regarding region, aspirations for a university education tend to be highest in the Atlantic provinces and lowest in Quebec - an interesting result as those residing in the latter tend to observe the lowest levels of tuition. 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 13 percentage points from either perspective. For girls, while still statistically significant, the result is much smaller in magnitude at about a 7 percentage point reduction from the opinion of the mother and about 6 percentage points from that of the youth.

We may ask, relative to other control variables, how much do economic circumstances matter? 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 good health. For girls, economic circumstances seem to be somewhat higher in importance - poverty matters more than residing in a rural residence and from the perspective of the mother, is more impactful 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 slightly 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 attainment.

4.2 *Ex-Ante* Results - Vulnerability Incidence & Depth Variables

While poverty is negatively associated with aspirations of youth, age 12-15, attaining a higher education, our previous specification implicitly treats households which are only slightly under the threshold the same as those who experience severe poverty. Therefore, in this section, we include our economic vulnerability depth variables (Equations 8 and 10) in our regression model to examine if aspirations change differently for those who are very poor. As a result, we now include four economic circumstance variables: poverty incidence and depth, along with insecurity incidence and depth with key results presented in Table 3 (the entirety of results are presented in Table A.1 of the Appendix).

Interestingly, from the perspective of 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 (albeit slightly smaller), results suggest that depth variables are statistically insignificant at conventional levels. While poverty depth does not matter for girls, when observing the mother, it is indeed impactful of educational aspirations for boys. For girls, the parameter estimate regarding poverty incidence is similar to that in the previous specification at about a 13 percentage point decline in university aspirations. However, for boys, the incidence

variable falls to about a 6 percentage point decline and for every one-percent decrease below the threshold, aspirations fall by about 0.1 percentage points. Thus, for a mother's aspirations of a boy attending university to fall to that of a girl who is in poverty, the household must be about 80 percent below this threshold.

Once depth variables are added, economic insecurity is no longer associated with educational aspirations from the viewpoint of the mother when it comes to girls. While the magnitude of incidence is about the same as previously, the result is not statistically significant at conventional levels. However, insecurity depth does matter when mothers are reporting on boys and direction of association is positive. That is, for every one-percentage point below the threshold that household income falls, university aspirations rise by about 0.4 percentage points. Once again, it would seem there is a positive association between downward income shocks and aspirations of the youth pursuing higher education when the mother is reporting.

4.3 *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 outcome variable. Hence, the larger the segment, the more that particular circumstance contributes to an inequality of opportunity concerning educational aspirations.

However, as previously mentioned, this decomposition is computationally intensive, requiring 2^c computations for c circumstances. Unfortunately, entering each variable independently is not possible and thus, we derive the following groups, each consisting of a set of variables: (i) Poverty (incidence and depth), (ii) Economic Insecurity (incidence and depth), (iii) Mother's Education, (iv) Youth Demographics (firstborn, age, and number of siblings), (v) Mother Demographics (married, age, and immigrant), (vi) Geographic Location (rural/urban location, region of residence), (vii) Poor Youth and Mother Health, and (viii) Year of Survey.

Although not presented, from the perspective of the mother, about 23 percent and 28 percent of the heterogeneity in educational aspirations can be explained by observed circumstances for girls

and boys respectively. When the child is observed, these values fall to about 20 and 27 percent. Thus, of the inequality in educational aspiration scores, about one-quarter may be explained by observed circumstances.

When examining the mother'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 ($\approx 31\%$) along with geographic region of residence ($\approx 30\%$). When the mother is reporting on a girl, the next two most impactful factors are household poverty ($\approx 13\%$) and health ($\approx 12\%$). When referring to a boy, household poverty is a bit further down this list ($\approx 8\%$), with health and the mother's demographics having larger contributions to inequality of opportunity ($\approx 10\%$ each).

From the perspective of the child, it is the mother's level of education that once again matters most ($\approx 35\%$ for girls and $\approx 28\%$ for boys). Region of residence also matters, but is not quite as impactful, especially when it is the girl that is observed ($\approx 14\%$). Aside from economic insecurity and year of survey variables, which matter very little ($< 2\%$), contributions from each category seem to be more equally distributed with each grouping contributing about 10-15 percent to total observed inequality of opportunity. Thus, household poverty has a relatively similar impact when compared with mother and child demographics along with health.

5 Method: *Ex-Post* Examination of Inequality of Opportunity

While the *ex-ante* approach is the most common method of investigating inequality of opportunity given the difficulty in observing effort, our dataset contains questions pertaining to perceived school effort. Thus, we are able to examine inequality of opportunity, in terms of educational aspirations by controlling for both circumstances and perceived effort. Effort (E) is captured using the following two questions (with subsequent additional effort-related variables included as robustness checks below), the first from the perspective of the youth and the second from the viewpoint of the PMK.

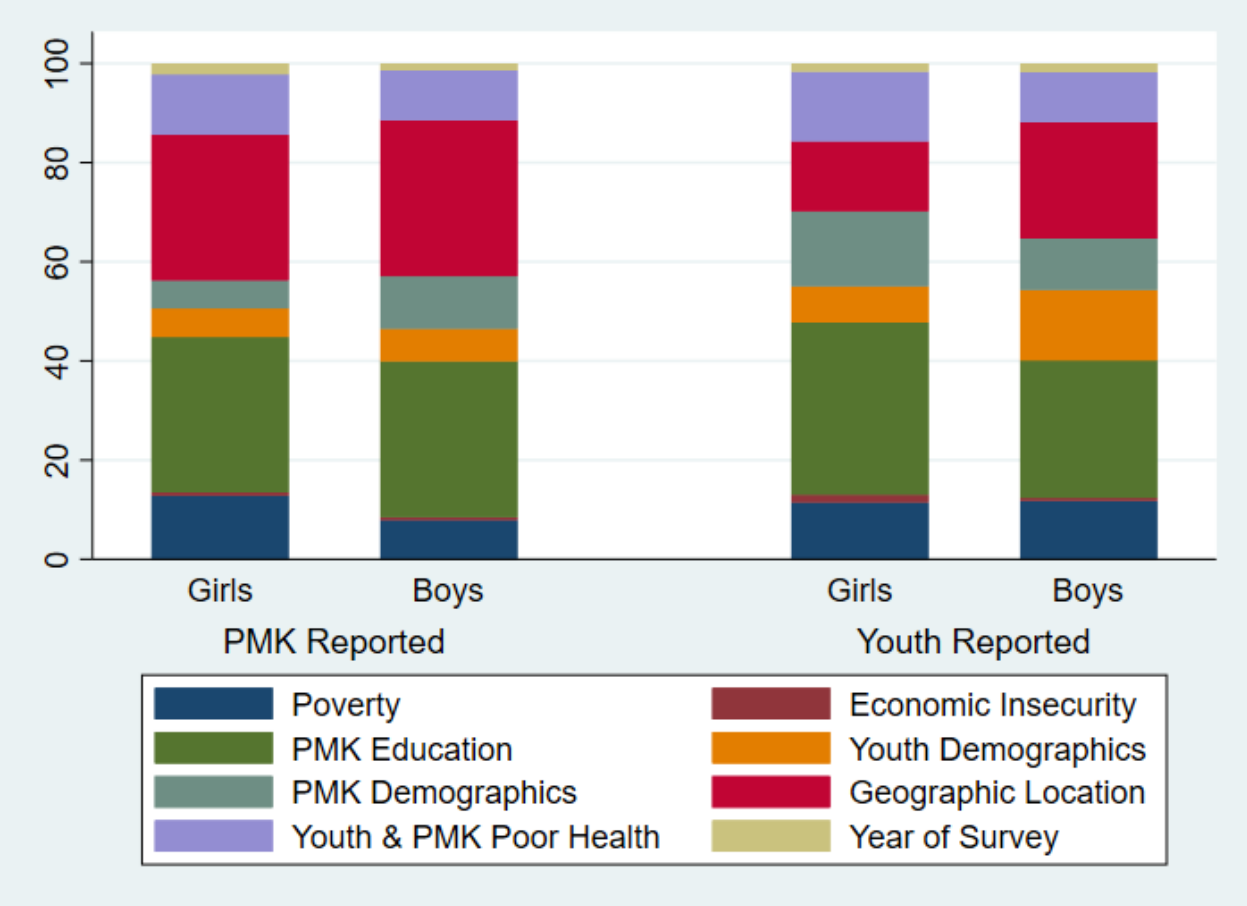


Figure 3: Relative Impacts of Circumstances to the Inequality of Opportunity Regarding University Aspirations Using a Shapley Decomposition (%)

Youth:

1. How well do you think you are doing in your school work?

2. How important is it to you to do the following in school: get good grades?

Person Most Knowledgeable:

1. Based on your knowledge of his / her school work, including his / her report cards: How is he / she doing overall?

2. How important is it to you that this child has good grades in school?

These questions are evaluated on five point scales, with the question on school work ranging from *very well* (1) to *very poorly* (5) and the question concerning grades ranging from *very important* (1) to *not important at all* (5). In both instances there is a skew toward a perception of strong academic performance, regardless of who is reporting. Thus, from each perspective, we derive two dummy variables. The first equals unity if the individual responded with "*very well*" regarding school performance (zero otherwise). The second equals unity if the individual believes good grades are "*very important*" (zero otherwise). As a result, we extend our previous regression model as follows:

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

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 - this would be akin to an *ex-ante* examination of inequality of opportunity. 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 - hence, capturing the *ex post* concept inequality of opportunity. 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 circumstance and aspirations, a sufficient condition for circumstance variables to differ in

the case of Equations 7 and 8, 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 circumstance into both a direct and indirect effect for non-linear models (Karlson et al., 2012).

Given the very real possibility that school efforts are correlated with educational aspirations, we cannot simply difference the economic vulnerability parameter estimates in Equation 13 from those in Equation 11 in order to determine the degree to which the importance of school work and grades 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 these school-related efforts are correlated with educational aspirations, the inclusion of such variables will decrease the error variance. Hence, naively comparing Equations 11 and 13 may lead to an erroneous underestimation of the mediating impact regarding perceptions of school performance.

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 $\boldsymbol{C}$. 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 getting good grades, our residuals would equal:[27]

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

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

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

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

Given that the only difference between Equations 15 and 13 is that efforts have been purged of their potential correlation with economic circumstances, the two models are equally predictive, thus 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 the two parameter estimates produces the indirect impact - i.e., the degree to which vulnerability impacts school performance, which in turn impacts educational aspirations.

Applying the above method to our ordinal probit specification allows us to examine the extent to which the economic vulnerability and educational aspiration relationship runs through 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 efforts, 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 be overly impactful.

5.1 *Ex-Post* Results

Before addressing the degree to which circumstances may impact effort and ultimately aspirations, key results are presented in Table 4 when only vulnerability incidence variables are included and in Table 5 when controls for depth are also included. As in the case of Tables 2 and 3, the left panel (columns 2 and 3) is based on the mother's perspective, while the right panel (columns 4 and 5) is from the view of the child in question. Moreover, average marginal effects (AME) are reported for intuitive purposes, and only economic circumstance and effort parameter estimates are presented - the entirety of the results are available in Appendix Tables A.2 and A.3.

As expected, efforts are important correlates of aspirations for a higher education, especially among boys. In particular, the mother believing the boy is doing very well in school is associated

with a 22 percentage point increase in educational aspirations. When they believe it is very important for the boy to get good grades, there is an associated increase in aspirations of about 12 percentage points. In the case of the youth in question being a girl, the association from the perspective of the mother is slightly dampened - a 17 percentage point increase in the former case and a 10 percentage point increase in the latter. From the youth's perspective, results regarding school performance are somewhat smaller relative to when their mother is reporting - at about a 12 percentage point increase in the case of the boy doing very well in school and 8 percentage points in the case of the girl doing very well. Regarding grades, results are similar to those of the mother, with the importance of good grades being associated with a 13 percentage point increase in university aspirations for both girls and boys.

For the most part, inclusion of perceived effort variables does not disrupt our previous findings, described above. Although there is a slight decrease in magnitude for most of these results, statistical significance and relative size comparisons remain akin to those previously presented. For instance, if the mother has less than a high school education, then their aspirations for a boy attending university fall from about 31 percentage points to about 28 percentage points once we include controls for effort. This is also true regarding our economic vulnerability variables, however, direct comparisons are not advisable without first addressing the issue of rescaling - i.e., the focus of our next section.

5.2 *Ex-Post* Results - the KHB Method

This section examines how economic circumstance results change when controls for effort are included. Interestingly, Tables 4 and 5 suggest there is only a small change in economic vulnerability magnitudes once we include effort. Thus, it would appear that the assumption of separability can be maintained (see Equation 2). However, as noted above, when variables are introduced to an ordinal probit specification, previous results may change not only as a result of colinearity, but also as a result of rescaling - especially when the newly introduced variables are quite correlated with the outcome variable.

Table 4. *Ex Post* Results: Average Marginal Effects Re. Prob(University Aspirations) - Incorporating Effort

	PMK		Youth	
	Girls	**Boys**	**Girls**	**Boys**
Economic Circumstances:				
Incidence of Poverty	-0.1131***	-0.0939***	-0.0855**	-0.1071***
	(0.03)	(0.03)	(0.04)	(0.04)
Incidence of Economic Insecurity	0.0484**	0.0278	0.0026	0.0323
	(0.02)	(0.02)	(0.03)	(0.03)
Effort:				
Doing Very Well in School	0.1747***	0.2225***	0.0766***	0.1163***
	(0.02)	(0.02)	(0.02)	(0.03)
Very Important to Get Good Grades	0.0958***	0.1175***	0.1333***	0.1292***
	(0.02)	(0.02)	(0.03)	(0.02)
Additional Controls?	Yes	Yes	Yes	Yes
Observations	5,510	5540	4,050	3,800

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

Thus, a more focused test is presented in Table 6 whereby the KHB method allows us to compare economic vulnerability parameter estimates from both an *ex ante* and *ex post* model. 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. In terms of poverty and when the mother is reporting, there is a slight drop in the magnitude of association once school performance and the importance of good grades are included, however, the difference is not statistically significant at conventional levels. From the perspective of the child, there is actually a slight increase in the magnitude of the poverty estimate, but again, this change is not statistically significant. Finally, an income shock is only impactful from the perspective of the mother regarding girls and the change in magnitude when controlling for effort is negligible.

As a robustness check, we included a series of other effort-related variables including reading frequency and homework completion - in all cases, our economic vulnerability estimates did not

Table 5. *Ex Post* Results: Average Marginal Effects Incorporating Effort & Vulnerability Depth

	PMK		Youth	
	Girls	**Boys**	**Girls**	**Boys**
Economic Circumstances:				
Incidence of Poverty	-0.1230***	-0.0535*	-0.0802**	-0.0734*
	(0.04)	(0.03)	(0.04)	(0.04)
Poverty Depth	0.0001	-0.0009***	-0.0001	-0.0006
	(0.0003)	(0.0003)	(0.0003)	(0.0004)
Incidence of Economic Insecurity	0.0334	-0.0308	-0.0027	0.0307
	(0.03)	(0.04)	(0.04)	(0.04)
Insecurity Depth	0.0008	0.0039***	0.0004	0.0006
	(0.0013)	(0.0015)	(0.0014)	(0.0019)
Effort:				
Doing Very Well in School	0.1749***	0.2221***	0.0765***	0.1168***
	(0.02)	(0.02)	(0.02)	(0.03)
Very Important to Get Good Grades	0.0960***	0.1201***	0.1335***	0.1303***
	(0.02)	(0.02)	(0.03)	(0.02)
Additional Controls?	Yes	Yes	Yes	Yes
Observations	5,510	5540	4,050	3,800

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Dataset: four cycles of NLSCY data (cycles 5-8). Given confidentiality rules with Statistics Canada data, observation totals are rounded to the nearest 10. Estimates are derived using an ordinal probit specification where average marginal effects are presented in reference to university aspirations. Robust standard errors are in parentheses. Poverty is defined as household income, adjusted for household size, falling below 50 percent of the sample median for that particular cycle. Economic insecurity 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.

change. As noted previously, these variables are not direct indicators of academic achievement as they are self-reported - unfortunately, such objective measures are not captured by this survey. Nevertheless, it would appear that economic circumstances are not changing perceived efforts which in turn are associated with changes in university aspirations. Lastly, for brevity purposes, we have only presented results from the model which includes the incidence of economic vulnerabilities, however, results when including the depth variables are indeed much the same as those presented in Table 5.

6 Discussion & Conclusion

This paper examines the association between economic vulnerability and aspirations for a higher education among youth age 12-15. Our results are based on four cycles of Canadian longitudinal

Table 6. Mediation Analysis - The KHB Method

	PMK		Youth	
	Girls	**Boys**	**Girls**	**Boys**
Household is in Poverty:				
Reduced Model (Equation 13)	0.4325***	-0.3542***	-0.2768**	-0.2977***
	(0.09)	(0.08)	(0.11)	(0.11)
Full Model (Equation 11)	0.4136***	-0.3076***	-0.2894***	-0.3221***
	(0.09)	(0.08)	(0.11)	(0.11)
Difference	-0.0189	-0.0466	0.0125	0.0244
	(0.04)	(0.04)	(0.03)	(0.03)
Household is Economically Insecure				
Reduced Model (Equation 13)	0.2048**	0.0737	0.0173	0.0909
	(0.10)	(0.09)	(0.10)	(0.09)
Full Model (Equation 11)	0.2050**	0.0966	0.0096	0.1030
	(0.10)	(0.09)	(0.10)	(0.09)
Difference	0.0002	0.0229	0.0077	0.0121
	(0.04)	(0.04)	(0.03)	(0.03)
Observations	5,510	5540	4,050	3,800

Notes: *** $p < 0.01$, ** $p < 0.05$. Dataset: four cycles of NLSCY data (cycles 5-8). Given confidentiality rules with Statistics Canada data, observation totals are rounded to the nearest 10. Robust standard errors are in parentheses. Poverty is defined as household income, adjusted for household size, falling below 50 percent of the sample median for that particular cycle. Economic insecurity is expressed as the occurrence of a 25 percent or greater decrease in cycle-over-cycle household income, also adjusted for household size.

data, covering the years 2000-2008, and aspirations are observed from both the perspective of the child 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 variable consists of three categories: (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 from both perspectives, 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 if anything, there is some evidence to suggest that aspirations among insecure mothers increases. Finally, there also appears to be a greater reduction in aspirations from the perspective of mothers in poverty, when the child in question is a girl.

The above finding is exemplified when we include controls for not only the incidence of vulnerabilities, but also depth. In particular, it would seem that the mere presence of poverty is the motivating force behind reduced aspirations among mothers of girls. However, when they are reporting on boys, it is more so the depth of poverty which matters. Specifically, to match the magnitude of decreased aspirations that result from the incidence of poverty among girls, a household's income must fall 80 percent below the poverty threshold for the boy's result to equate. Lastly, neither economic insecurity incidence, nor depth, appear to reduce educational aspirations.

Within an inequality of opportunity framework, poverty contributes to about 10 percent of the observed inequality of educational aspirations, representing a rather substantial component and similar to Peragin and Serlenga's 2008 finding concerning Italy and post-secondary achievement. By far, the largest contributor is the mother's level of education, capturing about 30 percent of the heterogeneity in aspirations, with geographical factors accounting for the next largest component of observed inequality. 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. The question becomes, what is the transmission mechanism upon which poverty is associated with reduced aspirations of a higher education?

To examine this question, we included responses to a set of perceived effort questions which examine attitudes toward getting good grades and the child's performance in school - both from the perspectives of the mother and child in question. We were thus able to observe the degree to which the association between economic vulnerability and educational aspirations manifests in a change regarding perceived efforts. Perhaps surprisingly, our findings suggest there is a degree of separability between economic circumstances and educational efforts. That is, our results concerning poverty and economic insecurity were not statistically (nor economically) impacted by the inclusion of perceived effort variables. Akin to this result, Schutz et al. (2008) examined the impact of family background on educational outcomes among OECD countries, finding that this

association was relatively small in Canada - especially relative to the US and UK.[28]

This final result suggests that policies which increase educational opportunities among the poor could improve upon equality of opportunity. This is echoed in a US paper which argues in favour of an affirmative action promgramme, regarding university enrollment, which includes those from low-income households (Carnevale & Rose, 2003). Had a transmission mechanism been present such that poor circumstances were associated with a reduction in perceived efforts, then immediate impacts of such a policy would unlikely occur. However, given perceptions of effort do not alter our results, it would seem there is a direct association between economic vulnerability and educational aspirations.

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. Although evidence tends to suggest that child poverty is associated with poor test scores,[29] and Phipps & Lethbridge (2006) shows this to also be true in Canada, our results suggest the perception of effort does not mediate the relationship between economic vulnerability and aspirations for a higher education. Although we do not have data on specific test scores, future research may wish to examine efforts from an observed perspective - e.g., does poverty impact test scores which in turn impacts educational aspirations? Finally, 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.

References

Aydemir, A., & Skuterud, M. (2005). Explaining the deteriorating entry earnings of Canada's immigrant cohorts, 1966 – 2000. *Canadian Journal of Economics*, *38*(2), 641-671.

[28] Additionally, Willms (2004) finds that not only did Canadian youth tend to perform better than their US counterparts on internationally comparable literacy assessments, but inequality in scores resulting from socioeconomic differences was also far less pronounced.

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

Belley, P., Frenette, M., & Lochner, L. (2014). Post-secondary attendance by parental income in the U.S. and Canada: Do financial aid policies explain the differences? *Canadian Journal of Economics*, *47*(2), 664-696.

Brooks-Gunn, J., & Duncan, G. J. (1997). The Effects of Poverty on Children. *The Future of Children*, *7*(2), 55-71.

Brunori, P. (2016). *How to Measure Inequality of Opportunity: A Hands-On Guide* (Tech. Rep. No. 2016-04). Life Course Centre.

Brunori, P., Ferreira, F., & Peragine, V. (2013). Inequality of opportunity, income inequality and mobility: some international comparisons. In E. Palgrave (Ed.), *Getting development right: Structural transformation, inclusion and sustainability in the post-crisis era.* Macmillan.

Cameron, S. V., & Heckman, J. J. (2001). The dynamics of educational attainment for black, hispanic, and white males. *Journal of Political Economy*, *109*(3), 455-499.

Carnevale, A., & Rose, S. (2003). *Socioeconomic status, race/ethnicity and selective college admissions.* New York: Center on Education and the Workforce.

Checchi, D., & Peragine, V. (2010). Inequality of opportunity in Italy. *Journal of Economic Inequality*, *8*, 429-450.

Childs, S., Finnie, R., & Mueller, R. E. (2018). Assessing the importance of cultural capital on post-secondary education attendance in Canada. *Journal of Further and Higher Education*, *42*(1), 57-91.

Coelli, M. B. (2009). Tuition fees and equality of university enrolment. *Canadian Journal of Economics*, *42*(3), 1072-1099.

Corak, M. (2006). *Do Poor Children Become Poor Adults? Lessons from a Cross Country Comparison of Generational Earnings Mobility.* Bonn, Germany: IZA Discussion Paper 1993.

Corak, M. (2008). Immigration in the Long Run: The Education and Earnings Mobility of Second-Generation Canadians. *IRPP Choices*, *14*(13), 1-30.

Corak, M. (2013). Income Inequality, Equality of Opportunity, and Intergenerational Mobility. *Journal of Economic Perspectives*, *27*(3), 79-102.

Currie, J., & Goodman, J. (2020). Chapter 18 - parental socioeconomic status, child health, and human capital. In S. Bradley & C. Green (Eds.), *The economics of education (second edition)* (Second Edition ed., p. 239 - 248). Academic Press.

Donni, P. L., Peragine, V., & Pignataro, G. (2014). Ex-ante and ex-post measurement of equality of opportunity in health: A normative decomposition. *Health Economics*, *23*(2), 182-198.

Dooley, M. D., Payne, A. A., & Robb, A. L. (2012). The impact of cost on the choice of university: evidence from Ontario. *Canadian Journal of Economics*, *45*(2), 755-783.

Dworkin, R. (1981a). What is equality? Part I: Equality of resources. *Philosophy & Public Affairs*, *10*, 283-345.

Dworkin, R. (1981b). What is equality? Part I: Equality of welfare. *Philosophy & Public Affairs*, *10*, 185-246.

Ferguson, H. B., Bovaird, S., & Mueller, M. P. (2007). The impact of poverty on educational outcomes for children. *Paediatrics & Child Health*, *12*(8), 701-706.

Ferreira, F. (2019). *Inequality as cholesterol: Attempting to quantify inequality of opportunity.* Inequality of Opportunity Conference.

Ferreira, F., & Gignoux, J. (2011). The measurement of inequality of opportunity: Theory and an application to Latin America. *Review of Income and Wealth*, *57*, 622-657.

Ferreira, F., & Gignoux, J. (2014). The measurement of educational inequality: Achievement and opportunity. *World Bank Economic Review*, *28*, 210-246.

Ferreira, F., & Peragine, V. (2016). Equality of Opportunity: Theory and Evidence. In M. Adler & M. Fleurbaey (Eds.), *Oxford Handbook of Well-Being and Public Policy.* Oxford University Press, Oxford.

Finnie, R., Laporte, C., & Lascelles, E. (2004). *Family Background and Access to Post-Secondary Education: What Happened Over the 1990s?* Ottawa, Canada: Statistics Canada.

Finnie, R., Lascelles, E., & Sweetman, A. (2005, January). *Who Goes? The Direct and Indirect Effects of Family Background on Access to Post-secondary Education* (Analytical Studies Branch Research Paper Series No. 2005237e). Statistics Canada, Analytical Studies Branch.

Finnie, R., & Mueller, R. E. (2009). They came, they saw, they enrolled: Access to post-secondary education by the children of Canadian immigrants. In R. Finnie, M. Frenette, R. Mueller, & A. Sweetman (Eds.), *Pursuing Higher Education in Canada: Economic, Social, and Policy Dimensions.* McGill-Queen's University Press, Queen's Policy Studies Series.

Fleurbaey, M., & Peragine, V. (2013). Ex Ante Versus Ex Post Equality of Opportunity. *Economica*, *80*, 118-130.

Fortin, N., Phipps, S., & Oreopoulos, P. (2015). Leaving Boys Behind: Gender Disparities in High Academic Achievement. *Journal of Human Resources*, *50*(Summer), 549-583.

Foster, J., Greer, J., & Thorbecke, E. (1984). A class of decomposable poverty measures. *Econometrica*, *52*(3), 761-766.

Frenette, M. (2007). *Why are Youth from Lower-income Families Less Likely to Attend University? Evidence from Academic Abilities, Parental Influences, and Financial Constraints.* Ottawa, Canada: Statistics Canada.

Frenette, M. (2017). *Post-Secondary Enrollment by Parental Income: Recent National and Provincial Trends.* Ottawa, Canada: Statistics Canada.

Gamboa, L., & Waltenberg, F. (2012). Inequality of opportunity for educational achievement in Latin America: Evidence from PISA 2006–2009. *Economics of Education Review*, *31*(5), 694-708.

Hacker, J. S., Huber, G. A., Nichols, A., Rehm, P., Schlesinger, M., Valletta, R., & Stuart, C. (2014). The Economic Security Index: A New Measure for Research and Policy Analysis. *The Review of Income and Wealth*, *60*(S1), S5-S32.

Huff-Stevens, A., & Schaller, J. (2011). Short-run effects of parental job loss on children's academic achievement. *Economics of Education Review*, *30*, 289-299.

Juarez, F., & Soloaga, I. (2014). iop: Estimating ex-ante inequality of opportunity. *The Stata Journal*, *14*(4), 830-846.

Jusot, F., Tubeuf, S., & Trannoy, A. (2013). Circumstances and Efforts: How Important is their Correlation for the Measurement of Inequality of Opportunity in Health? *Health Economics*, *22*(12), 1470-1495.

Karlson, K. B., Holm, A., & Breen, R. (2012). Comparing Regression Coefficients Between Same-sample Nested Models Using Logit and Probit: A New Method. *Sociological Methodology*, *42*(1), 286-313.

Kohler, U., Karlson, K. B., & Holm, A. (2011). Comparing coefficients of nested nonlinear probability models. *The Stata Journal*, *11*(3), 420-438.

Lacour, M., & Tissington, L. D. (2011). The effects of poverty on academic achievement. *Educational Research and Reviews*, *6*(7), 522-527.

Lemieux, T. (2006). The "Mincer Equation" Thirty Years After Schooling, Experience, and Earnings. In S. Grossbard (Ed.), *Jacob Mincer: A Pioneer of Modern Labor Economics.* Springer, Boston, MA.

Mincer, J. (1958). Investment in Human Capital and Personal Income Distribution. *Journal of Political Economy*, *66*, 281-302.

Oreopoulos, P., Huff Stevens, A., & Page, M. (2008). The Intergenerational Effects of Worker Displacement. *Journal of Labor Economics*, *3*, 455-483.

Osberg, L. (1998). *Economic Insecurity (Discussion paper No. 88).* Syndey, Australia: Social Policy Research Center.

Paes de Barros, R. M., Molinas Vega, J. R., & Saavedra Chanduvi, J. (2008). Measuring Inequality of Opportunities for Children. In R. M. Paes de Barros, F. Francisco, J. R. Molinas Vega, & J. Saavedra Chanduvi (Eds.), *Measuring Inequality of Opportunity in Latin America and the Caribbean - Volume 2.* The World Bank.

Peragine, V., & Serlenga, L. (2007). *Higher education and equality of opportunity in Italy.* Bonn, Germany: IZA Discussion Paper 3163.

Phipps, S., & Lethbridge, L. (2006). *Income and the outcomes of children.* Ottawa: Statistics Candaa.

Rawls, J. (1971). *A Theory of Justice.* Cambridge, MA: Harvard University Press.

Roemer, J. (1993). A Pragmatic Theory of Responsibility for the Egalitarian Planner. *Philosophy & Public Affairs*, *10*, 146-166.

Roemer, J. (1998). *Equality of Opportunity.* Boston, MA: Harvard University Press.

Schneider, W., Waldfogel, J., & Brooks-Gunn, J. (2017). The Great Recession and risk for child abuse and neglect. *Children and Youth Services Review*, *72*, 71-81.

Schutz, G., Ursprung, H. W., & Wossmann, L. (2008). Education policy and equality of opportunity. *Kyklos*, *61*(2), 279-308.

Sen, A. (1980). Equality of What? In S. McMurrin (Ed.), *The Tanner Lectures on Human Values.* University of Utah Press, Salt Lake City.

Shorrocks, A. (2013). Decomposition procedures for distributional analysis: A unified framework based on the Shapley value. *Journal of Economic Inequality*, *11*, 99-126.

Sosu, E. M. (2014). Predicting maternal aspirations for their children's education: The role of parental and child characteristics. *International Journal of Educational Research*, *67*, 67 - 79.

Tienken, C. H. (2014). Poverty and Test Performance. *Kappa Delta Pi Record*, *50*(3), 106-108.

Willms, J. D. (2004). *Reading Achievement in Canada and the United States: Findings from the OECD Programme for International Student Assessment.* Ottawa, ON: Human Resources and Skills Development Canada.