Non-cognitive skills and labour market outcomes in Canada:

New evidence using the BFI

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ABSTRACT

This report presents an analysis of the relationship between "non-cognitive" skills and employment, earnings, and workplace activities in Canada. Using data from the Longitudinal and International Study of Adults, we address four main research questions:

1. How are non-cognitive skills related to employment status and earnings both before and after controlling for a range of individual characteristics, educational attainment, and cognitive skills?

2. Does the association between non-cognitive skills and these labour market outcomes differ by gender, age, and immigration background?

3. Do non-cognitive skills matter more or less among high, mid, and low earnings individuals?

4. How are non-cognitive skills related to the probability of engaging in various constructive workplace activities, again both before and after controlling for the individual characteristics and educational attainment?

To measure non-cognitive skills, we employ the Big Five Inventory (BFI), a widely used assessment that measures "individual differences in people's characteristic patterns of thinking, feeling, and behaving" (Soto & John, 2017, p. 69) across five dimensions: openness, conscientiousness, extraversion, agreeableness, and emotional stability. We investigate the relationship between each BFI domain and employment status, earnings, and workplace activities using a series of regression models which include variables representing the five BFI domains first on their own and then along with various combinations of the control variables.

Among the main findings, individuals who have high conscientiousness scores are more likely to be employed and to earn more, but these effects are largely driven by the results for women and the effects are much more limited for men. Conversely, emotional stability is also positively related to employment and earnings, but in the case of employment only without controlling for other factors for the entire sample taken together, and when looked at separately the effects are confined to men and are not significant for women. Extraversion is positively related to earnings for young adults and higher engagement in productive workplace activities across the entire sample. Individuals with high openness scores earn less but are more likely to engage in a range of constructive workplace activities. Finally, people with high agreeableness scores also earn less — an earnings penalty that is more pronounced among low earners.

Policy focused on skill development usually targets cognitive and other essential skills, including essential skills such as literacy and numeracy, but the evidence presented here suggests that

non-cognitive skills also matter and should potentially be considered in education and training policy, while further research is needed to help further inform these and related discussions.

1. INTRODUCTION

This report presents an analysis of the relationship between "non-cognitive" skills and labour market outcomes in Canada. Broadly speaking, non-cognitive skills are attributes that represent "personality traits, persistence, motivation" (Heckman, Stixrud, & Urzua, 2006, p. 412). Using the term "social and emotional" skills, the Organisation for Economic Co-operation and Development (OECD) defines these as the ability to "regulate one's thoughts, emotions, and behaviour" (2018, p. 5).

The international literature consistently finds that non-cognitive skills are related to a range of employment and social outcomes (e.g., Cobb-Clark & Tan, 2011; Duckworth et al., 2012; Heckman & Kautz, 2012; Kautz et al., 2014; Wichert & Pohlmeier, 2010). For example, using the Rotter Locus of Control Scale and Rosenberg Self Esteem Scale as measures of non-cognitive skills, Heckman, Stixrud, and Urzua (2006) find that non-cognitive skills are related to earnings, social behaviour, and occupational opportunities.

Using data from the Longitudinal and International Study of Adults (LISA), including a subsample that completed the Program for International Assessment of Adult Competencies (PIAAC), this study addresses the following main research questions:

1. How are non-cognitive skills related to employment status and earnings both before and after controlling for a range of individual characteristics, educational attainment, and cognitive skills?

2. Does the association between non-cognitive skills and these labour market outcomes differ by gender, age, and immigration background?

3. Do non-cognitive skills matter more or less among high, mid, and low earnings individuals?

4. How are non-cognitive skills related to the probability of engaging in various constructive workplace activities both before and after controlling for the individual characteristics and educational attainment?

While previous studies use a variety of non-cognitive skill measures, we employ the Big Five Inventory (BFI). Organized into five domains, the BFI captures "individual differences in people's characteristic patterns of thinking, feeling, and behaving" (Soto & John, 2017, p. 69) in terms of their level of: openness, conscientiousness, extraversion, agreeableness, and emotional stability.[1]

[1] Although the language used to describe the BFI is changing, the domains originally formed the well-known "OCEAN" mnemonic (John & Srivastava, 1999): Openness, Conscientiousness, Extraversion, Agreeableness, and Negative emotionality. The term "emotional stability" corresponds to "negative

The field of psychology largely characterizes the BFI domains as personality traits, dispositions, or basic tendencies. Some scholars also recognize that each domain is related to specific types of skill development and (characteristic) adaptation; that is, they are malleable traits that may change with age, interventions, or life circumstances (Costa & McCrae, 2017; Cunha & Heckman, 2008; Cunha, Heckman, & Schennach, 2010). Recent work published by the OECD suggests that a range of strategies may promote the development of non-cognitive skills, from interventions in early-childhood education to later programs for adults (Kautz et al., 2015).

Table 1 provides an overview of the BFI, including the types of non-cognitive skill development each domain promotes.

Table 1 Overview of the BFI domains

	Openness	Conscientiousness	Extraversion	Agreeableness	Emotional stability
Trait definition	"cognitive flexibility, sensitivity to aesthetics, depth of feeling, and preference for novelty" (Sutin, 2017, p. 83).	"the propensity to be self-controlled, responsible to others, hardworking, orderly, and rule abiding" (Jackson & Roberts, 2017, p. 134).	"tendencies to experience and exhibit positive affect, assertive behavior, decisive thinking, and desires for social attention" (Wilt & Revelle, 2017, p. 58).	"the motivation to maintain positive relations with others" (Graziano & Tobin, 2017, p. 106).	"tendencies toward [positive] affect… and individual responses to threat, frustration, or loss" (Tackett & Lehey, 2017, p. 40).
Skill-based definition	Promotes curiosity, creativity, and tolerance.	Promotes high achievement, responsibility, and task performance.	Promotes assertiveness, leadership, and sociability.	Promotes trust, cooperation, empathy, and collaboration.	Promotes emotional regulation, stress resistance, and optimism.

Note: BFI skill-based definitions are adapted from Kankaraš and Suarez-Alvarez (2019).

emotionality" or "neuroticism" in the original BFI (John & Srivastava, 1999). To generate greater alignment with the other BFI domain, "emotional stability" essentially reverses this domain to also be a positive attribute.

Each BFI dimension also has more detailed facets that capture more specific traits: extraversion (sociability, assertiveness, and energy level), agreeableness (compassion, respectfulness, and trust), conscientiousness (organization, productiveness, and responsibility), emotional stability (little anxiety, depression, and emotional volatility), and open-mindedness (intellectual curiosity, aesthetic sensitivity, and creative imagination) (Soto & John, 2017, p. 69).

From the emerging Canadian literature, McLean et al. (2019) use the LISA to find that individuals with higher scores in the conscientiousness and emotional stability domains have higher wages, a result that holds after controlling for a range of individual characteristics and employment variables. In contrast, the extraversion and agreeableness domains have negative returns to wages, while openness has no effect.[2] Because openness is correlated with cognitive skills, the extent to which it is associated with earnings is often dependent on whether a model accounts for highest education level or more direct measures of cognitive ability (Heineck, 2011).

Using other measures of non-cognitive skills (e.g., the Rosenberg scale of self-worth, the self-efficacy scale, and the sense of mastery scale), Kottelenberg and Lehrer (2019) find non-cognitive skills are significantly associated with university completion in Canada. Among those who complete university, these same skills are also related to earnings at age 25 (at least prior to controlling for parental valuation of education). Vergunst et al. (2019) examine childhood behaviours and adult outcomes in Canada and find that low aggression-opposition and high prosociality in early childhood are also associated with higher earnings in adulthood.

The various dimensions of the BFI are also relevant to The Office of Literacy and Essential Skills' Essential Skills Framework. For example, connecting to the foundational skill of collaboration, people with high conscientious BFI scores tend to be more willing to take on additional work roles to contribute to the overall success of a workplace team (Morgeson, Reider, & Campion, 2005). Individuals with high extraversion scores are more likely to report a greater desire to work with others (Barrick et al., 2018). Those with high agreeableness scores are more likely to work cooperatively rather than competitively (LePine & Van Dyne, 2001). People with high openness scores are more likely to have positive receptivity to working in groups (Homan et al., 2008). Finally, individuals with high emotional stability scores are more likely to make social adjustments to support positive workplace relationships (Nehra & Rangnekar, 2017).

This study builds on our prior research that analyzes the relationship between cognitive skills and labour market outcomes in Canada using the 2012 PIAAC data (Pullman, Sweetman, & Finnie, 2020). Using the 2014 and 2016 LISA-PIAAC, we now focus on the relationship between non-cognitive skills, as measured by the BFI, and employment status and earnings, while also adding an analysis of the relationship between non-cognitive skills and various constructive workplace activities.

[2] We use the terms "returns" and "effects" throughout this report to represent the empirical relationship between non-cognitive skills and earnings. "Positive returns [or effects]" denotes that individuals with higher BFI scores in a given domain earn more on average than those with lower scores, while "negative returns [effects]" means they earn less. This term does not, in particular, refer to a rate of return as conventionally defined, nor is causality necessarily implied. The same terminology is used for the other outcomes of interest (employment status and job activities).

2. DATA AND ANALYTICAL APPROACH

2.1. DATA

This study uses data from Statistics Canada's Longitudinal and International Study of Adults (LISA), a biannual household survey that began in 2012 and re-surveyed participants in 2014, 2016, and 2018.[3] Through a voluntary computer-assisted interview conducted in-person or by telephone, it gathers information on employment, education, skills, and individual and household attributes on people age 15 or older living in Canada's ten provinces.[4] LISA participants also completed the BFI assessment in 2014.

Using a stratified multi-stage, multi-phase design, the sample selection of LISA participants is based on households that responded to the 2011 Census. It represents approximately 98% of the Canadian population over the age of 15. The target population excludes individuals living in Canadian territories and on First Nations reserves, as well as in religious communities, communal living situations, and congregate living (e.g., nursing homes, jails, and hospitals). Additionally, it excludes foreign representatives/delegates living in Canada and individuals who work for the Canadian Armed Forces.

A portion of wave one LISA participants also completed the Programme for the International Assessment of Adult Competencies (PIAAC) study in 2012.[5] Among all LISA respondents, approximately one third answered the PIAAC background questionnaire and completed skill assessments in literacy, numeracy, and problem solving in technology-rich environments. We refer to these participants as the PIAAC-LISA sample.

The LISA survey data are also linked to individuals' tax data based on the T1 Family File (T1FF), an administrative data source constructed from Canada Revenue Agency files made available to Statistics Canada. This includes yearly individual- and family-level earnings and before- and after-tax income taken from individuals' annual tax submissions. Tax data from the T1FF are

3 In 2020, Statistics Canada collected additional survey data for the fifth wave of the LISA; however, at the time of undertaking this study, these data were not yet available to researchers.

4 The LISA also includes basic information (e.g., gender, age) on enumerated non-respondents — such as children age 14 or under or non-respondents — who live in the same household as LISA participants. Because these individuals do not complete the LISA survey, they are excluded from our analysis.

5 The PIAAC-LISA sample differs from the broader full LISA sample in terms of the sample selection strategy and the characteristics of respondents (e.g., the PIAAC survey is an individual-based survey in comparison to the household basis of the LISA, and it includes respondents age 16 to 64 only). Depending on the sample used, we use either the "all respondent" or "PIAAC respondent" sampling and bootstrap weights to reflect each sampling strategy.

currently available from 1982 through 2017. Although T1FF coverage is very high (i.e., over 95% for the LISA sample), not all respondents are linked to their tax data for all years. In particular, tax data are not available for the years in which individuals do not file tax forms, and young people come into scope only as they enter the labour force.

2.2. SAMPLE SELECTION

All analysis presented in this report is based on a sample comprised of LISA respondents who were age 25 to 64 in 2016 and did not self-report to be retired, in school, or out of the labour force due to personal health reasons. LISA participants are also excluded from the analysis if they are missing information on any outcome, explanatory, or weighting variables.

There are three main analysis samples that correspond to the three outcomes of interest, all measured as of 2016 and described further below:

1. Employment status: the entire LISA sample after the restrictions mentioned above.
2. Earnings: excludes respondents who do not file taxes or who have before-tax earnings of less than $1,000.[6]
3. Workplace activities: excludes individuals who are not employed during the reference period and therefore do not answer these questions.[7]

To examine the relationships between the BFI and labour market outcomes we first use the entire LISA samples defined above. We also explore how these relationships differ by gender, age, and immigration background by estimating separate models for different samples corresponding to these sets of characteristics. Finally, the models that include a measure of cognitive skills are based on the smaller PIAAC-LISA samples described above.

Both weighted and actual sample sizes are reported, rounded to the nearest 10 as required by Statistics Canada disclosure rules.

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6 As discussed below, models adopting sample selection adjustment procedures to take account of zero or low (less than $1,000) earnings are also estimated, and the findings are not significantly affected.

7 Respondents who were employed during the reference period (e.g., anytime between the 2014 and 2016 survey periods) answered the workplace activity measures, even if they were not employed at the time of completing the 2016 survey. Respondents unemployed in 2016 referred to their last job when answering the workplace activity questions. However, for the question related to workplace training, only respondents employed at the time of completing the 2016 survey provided information on their current employment and therefore the sample size is smaller for this model.

2.3. OUTCOME MEASURES

We analyze three sets of outcome variables, all measured as of 2016, two years after respondents completed the BFI.

The first outcome is employment status, which captures whether an individual self-reports being employed or self-employed in the 2016 LISA survey reference week. Those not employed include both the unemployed (i.e., actively looking for work) and those not in the labour force.

The second outcome is annual earnings, which captures before-tax employment income taken from the 2016 T1FF data.[8]

The third set of outcomes represent workplace activities, comprising eleven separate outcome variables (see Appendix A for further details on each measure):

1. Job-related training;
2. Cooperation;
3. Sharing information;
4. Training others;
5. Planning own activities;
6. Planning activities of others;
7. Organizing own time;
8. Influencing others;
9. Negotiating with others;
10. Simple problem solving; and
11. Complex problem solving.

[8] This includes wages, salaries, and commissions; net positive income from self-employment (e.g., business, professional, commissions, farming, and fishing); Indian exempt employment income; and other taxable employment income (e.g., tips and gratuities).

2.4. EXPLANATORY VARIABLES

The Big Five Inventory

Non-cognitive skills, as represented by the five BFI domains (i.e., openness, conscientiousness, extraversion, agreeableness, and emotional stability), are the explanatory measures of primary interest. We construct each variable from a 15-item short version of the BFI assessment (Lang et al., 2011), which LISA participants completed in the 2014 survey. Appendix B provides details on the BFI assessment.

Survey questions that measure each of the five BFI domains are short and simple and, to prevent acquiescent responding, include both positive and negative keyed items (Primi et al., 2020). The short version of the BFI assessment generally produces results comparable to the full 60-item assessment at the domain level;[9] however, prior validation research on a comparable version of the BFI suggests that it cannot be used to assess non-cognitive skills at the underlying facet level (Soto & John, 2017).

In response to each item, participants choose a number from 1 to 7 that best describes how they see themselves, where 1 means "does not apply to me at all" and 7 means "applies to me perfectly." There are three separate survey items for each of the five domains. Three steps are involved in constructing the final scores that measure each non-cognitive skill: 1) negatively-keyed items are reverse scored;[10] 2) responses to all three items are averaged to construct a scale that ranges from 1 (low) to high (7); and 3) final domain scores are standardized.[11] As based on prior research, all domain scores are included as standardized continuous variables in the analysis (Soto & John, 2017).

Other explanatory variables

All models include a measure of the highest level of educational attainment as of 2016: less than a high school diploma, high school diploma, trades or college diploma/certificate, bachelor's degree, or professional or graduate degree.

9 As validation research shows, the 15-item BFI retains approximately 80% reliability, self-peer agreement, and external validity when compared with the full 60-item version (Soto & John, 2017, p. 77).

10 See Appendix B for a list of negatively-keyed items.

11 Standardization is a process that re-codes each score as based on the overall standard deviation. As a result, the overall mean for each domain becomes zero and each data point represents the number of standard deviations it is away from the mean. Standardization eases interpretation by allowing the results to be interpreted as a standard deviation increase in a given domain score.

Models based on the smaller PIAAC-LISA sample also include a measure of cognitive skill level in 2012 (i.e., low – level 0/1, medium – level 2/3, or high – level 4/5). Three measures of cognitive skills are available for the PIAAC-LISA sample: numeracy, literacy, and problem solving in technology-rich environments. Due to the high level of correlation among them and following most standard practice, we use the numeracy domain as a measure of cognitive skills.

The numeracy assessment consists of 56 items that test "the ability to access, use, interpret, and communicate mathematical information and ideas in order to engage in and manage the mathematical demands of a range of situations in adult life" (OECD, 2013, p. 59). According to the updated Cattell-Horn-Carroll theory of intelligence (Schneider & McGrew, 2018), quantitative/math ability has the highest correlation with general cognitive ability.

Sensitivity analysis, not shown in this report, indicates that the results of interest do not change significantly when the other cognitive skill domains are included either individually or all together in the models.

The inclusion of these education and skill variables controls for any related effects that, if omitted, would be captured by the BFI variables due to any related correlation. In addition, they provide insight into how the strength of the relationship between employment outcomes and cognitive and non-cognitive skills differ.

Additional variables measure other individual characteristics, including: gender (male, female); age in 2016 (25-34, 35-44, 45-54, 55-64); immigration background (Canadian or foreign-born); Indigenous identity; province of residence in 2016; self-reported health in 2016 (excellent or good, fair or poor); years of full-time work experience by 2016; children (age 17 or under) living in a respondent's household in 2016 (children, no children); and partnership status in 2016 (does or does not live with spouse/common-law partner).

2.5. ANALYTICAL APPROACH

As discussed above, when examining employment and earnings as the outcome variables, the analysis employs two samples: the LISA and PIAAC-LISA samples (which includes only those who completed the cognitive skill assessment for numeracy). The general analytical approach involves running a series of regression models with four different specifications that correspond to the variables included:

1. the BFI domains only (the "baseline" model);
2. the BFI domains and individual characteristics;

3. the BFI domains, individual characteristics, and education level (the "full specification LISA model"); and

4. the BFI domains, individual characteristics, education level, and cognitive skill level (the "full specification PIAAC-LISA model").

Models 1 to 3 are also estimated separately by gender, age group, and immigration background to compare the BFI estimates across these sub-groups. It is important to interpret these results in the context of the smaller samples employed, including the expected effects on standard errors (higher) and the related statistical significance (lower) of the estimates due to the smaller sample sizes.

To further explore any differences in BFI estimates by gender, age group, and immigration background, we also provide supplementary results from interaction models using the entire LISA sample. These models include separate coefficients that allow for the BFI variables to vary by gender, age group, and immigration background.[12]

Due to the binary nature of the outcome measure, the analysis of employment status is based on a linear probability model (LPM). It takes the value of 1 if the person is employed and 0 if they are not employed.[13] This approach is used for the series of models listed above which include different sets of explanatory variables.

For earnings, we use two regression approaches: ordinary least squares (OLS) and quantile regression analysis. The OLS modelling approach provides the returns to non-cognitive skills both with and without controlling for other explanatory variables across all individuals included in the estimation sample.[14]

12 These results are not relied upon more heavily because likelihood ratio tests indicate that the groups should generally not be aggregated in this way as other parameters differ by gender, age, and immigration background. These results should, therefore, be regarded as potentially indicative rather than econometrically sound estimates.

13 Logit models were also estimated to test for the robustness of the findings across models and the results were not appreciably different.

14 The earnings models for the full LISA sample including those with zero or low earnings (less than $1,000) were also estimated using Heckman sample selection correction procedures. The identifying variables used in the sample selection models included 1) number of children age 0 to 5, 2) household size, 3) age, and 4) health status, all taken from the 2016 LISA; and 5) total amount of government transfers (i.e., social assistance, EI benefits, GST credits, worker compensation credits, and child and family tax benefits) and 6) total investment income, taken from the 2016 T1FF. Overall, these sample selection LISA models did not significantly change the results of Models 1 to 3. This is likely due to the relatively small number of LISA respondents who have low (i.e., under $1,000) or no observed earnings in 2016, who comprise approximately 10% of the sample.

To understand if there is heterogeneity in returns to non-cognitive skills across the earnings distribution, we also estimate a series of unconditional quantile regression models (Firpo, Fortin, & Lemieux, 2009). The specific quantiles include the 5th, 10th, 25th, 50th, 75th, 90th, and 95th points in the earnings distribution. The unconditional quantile regression approach used here defines each earnings quantile without adjusting (or controlling) for the independent variables included in the model using a "recentered influence function" (RIF). This initial step estimates a new dependent variable based on the probability that each individual in the sample earns less than the amount at a selected quantile.[15] The effects of the explanatory variables are then estimated at these points in the earnings distribution.

Finally, we also use LPM models again to analyze the relationship between the various dimensions of the BFI and each workplace activity, again first without controlling for the other explanatory variables (Model 1) and then including them in the form of Models 2 and 3. The models are estimated using the full LISA sample and, unlike the earnings models, are not estimated separately by gender, age, or immigration background.

[15] Because this first estimation step is not affected by the independent variables in the model, it addresses the critique of conditional quantile regression as based on the conditional distribution that changes with what variables are included in the model.

3. EMPIRICAL FINDINGS

3.1. EMPLOYMENT STATUS

This section presents the estimated relationships between each BFI domain and employment status. Table 2 shows the main statistically significant results found across various models and samples and is followed by a more detailed description of the findings.

Summary of main findings

Table 2 Overview of LPM employment status model estimation results

Model #	Full LISA sample	PIAAC sample	LISA – by gender	LISA – by age	LISA – by immigration background
1	Positively related to conscientiousness and emotional stability.	Positively related to conscientiousness and emotional stability.	Men: Positively related to emotional stability. Women: Positively related to conscientiousness.	Age 25-34: Positively related to emotional stability. Age 45-54: Positively related to conscientiousness and emotional stability. Age 55-64: Positively related to conscientiousness and emotional stability.	Canadian born: Positively related to conscientiousness and emotional stability. Foreign born: Positively related to emotional stability and agreeableness.
2	Positively related to conscientiousness.	Positively related to conscientiousness.	Men: Positively related to emotional stability. Women: Positively related to conscientiousness.	Age 55-64: Positively related to conscientiousness and emotional stability.	Canadian born: Positively related to conscientiousness.

Model #	Full LISA sample	PIAAC sample	LISA – by gender	LISA – by age	LISA – by immigration background
3	Positively related to conscientiousness.	Positively related to conscientiousness.	Men: Positively related to emotional stability. Women: Positively related to conscientiousness.	Age 45-55: Negatively related to openness. Age 55-64: Positively related to conscientiousness and emotional stability.	Canadian born: Positively related to conscientiousness and agreeableness.
4	*NA*	Positively related to conscientiousness.	*NA*	*NA*	*NA*

Sample characteristics

Table 7 and Table 8 present an overview of the LISA and PIAAC-LISA samples. They each provide information on the sample composition and average BFI domain scores for each categorical variable. The overall employment rate is 86% for the LISA sample and 85% for the PIAAC-LISA sample. The demographic composition is similar across the two samples, with only small differences in terms of the percentage of survey participants who are living with a spouse/partner or children and by education level.

In terms of average BFI domain scores (which are mean-centred and standardized), in both samples respondents who are employed have higher conscientiousness and emotional stability scores compared to those who are not employed.[16] There are also differences in BFI domain scores by demographic characteristics. For example, women have higher scores for most BFI domains (other than emotional stability) compared to men and older respondents have higher conscientiousness and emotional stability scores compared to younger respondents.

The descriptive statistics also show differences in BFI domain scores by education level. For both the LISA and PIAAC-LISA samples, respondents with higher levels of education have higher openness and lower agreeableness scores compared to those with lower levels of education.

[16] The BFI scores are mean centre based on the entire LISA sample and not the samples used in the analysis and therefore do not necessarily average around zero.

Full sample results

For the full LISA sample, the detailed regression findings shown in full in Table 9 and summarized in Table 2 indicate that there is a statistically significant positive association between conscientiousness and employment. In Model 1 (which includes only the BFI domains), a one standard deviation higher conscientiousness score increases the likelihood of employment by 2.2 percentage points. This effect is reduced to 1.1 percentage points (with a lower level of statistical significance) in Model 2 (which adds the individual characteristics) and to 1.3 percentage points in Model 3 (which adds level of education).[17] [18]

Without controlling for other factors (Model 1), emotional stability is also positively related to employment status among all LISA respondents. That is, for each standard deviation increase in emotional stability scores, the likelihood of being employed increases by 2.2 percentage points. However, once the model includes other explanatory variables (Models 2 and 3), this effect is much smaller and is no longer statistically significant.

For the PIAAC-LISA sample, the regression results in Table 10 are similar to those for the full LISA sample across Models 1 to 3. Furthermore, including the numeracy measure of cognitive skills (Model 4) does not change the relationships between non-cognitive skills and employment status compared to the model that controls only for education level along with the other explanatory variables (Model 3).[19]

Results by gender, age, and immigration background

The models estimated separately by gender based on the LISA sample, shown in Table 11, indicate that conscientiousness is positively associated with employment for women (Models 1 and 3), but there is no statistically significant relationship for men.[20] For each standard deviation increase in conscientiousness scores among women, the likelihood of employment increases by 3.7 percentage points in Model 1 and 2.0 percentage points in Model 3. In contrast, emotional stability is positively associated with employment among men but not for women (Models 1

17 As mentioned earlier, these relationships may not necessarily be entirely causal. For example, the BFI scores may be correlated with other omitted attributes which have their own effect on the outcomes of interest, and in some cases there may be reverse causality.

18 Estimates are shown for all variables included in the models, but only the BFI results are discussed since the other variables are included mainly as controls and are not of particular interest to this analysis. In general, these other findings all conform to what might be expected.

19 As mentioned earlier, adding the other measures of cognitive skills available in the data does not appreciably change the estimates in any way except to reduce the estimated coefficient and statistical significance of the numeracy variable itself.

20 The smaller samples used in these and other models separated by sub-groups (gender, age, immigration background) will tend to drive down the statistical significance of the estimates.

and 3). For each standard deviation increase in emotional stability scores among men, the likelihood of employment increases by 3.6 percentage points in Model 1 and 1.8 percentage points in Model 3.

The supplementary interaction models shown in Table 12 support these findings as there is a positive interaction for women and conscientiousness, although it is statistically significant in Model 1 but not Model 3. There is also a negative interaction for women and emotional stability (Models 1 and 3).[21] The baseline interaction model (Model 1) also indicates there is a negative interaction for women and agreeableness, although the coefficient becomes non-significant once other explanatory variables are included in the model (Model 3).

As the results in Table 13 illustrate, the relationships between non-cognitive skills and employment status also vary by age, with the effects of non-cognitive skills on employment status mattering most for older respondents. Among those age 55-64, conscientiousness is positively related to employment (Models 1 and 3). In Model 3, each standard deviation increase in conscientiousness scores is associated with a 2.6 percentage point increase in the likelihood of being employed. Emotional stability also has a significant effect, but only in the baseline model (Model 1) where the point estimate is .033 (or 3.3 percentage points).

Among those age 45-54, openness is negatively related to employment in the full specification model (Model 3); each standard deviation increase in this domain score is associated with a 2.1 percentage point decrease in the likelihood of being employed. The interaction models in Table 14 support this finding as they show a negative interaction for respondents age 45-54 and openness (Model 3) compared to the reference group of respondents age 25-34. Higher levels of conscientiousness and emotional stability are also associated with higher employment, but only in Model 1 (estimated effects of 3.6 and 3.1 percentage points, respectively).

For the younger age groups, the only significant effect found in these separate models is a positive effect of emotional stability (2.4 percentage points) on employment in Model 1 for those age 25-34.

The associations between non-cognitive skills and employment status also differ by immigration background, as seen in Table 15. Canadian-born LISA respondents with higher conscientiousness scores are more likely to be employed (estimates of .033 and .019 in Models 1 and 3), while this effect is estimated to be smaller and is not statistically significant for foreign-born respondents.

In the baseline model (Model 1), emotional stability is positively related to employment for both Canadian and foreign-born respondents (estimated effects of .021 and .031, respectively);

[21] See the cautions regarding these interactive specifications discussed above.

however, in both cases, the results become statistically non-significant once other explanatory variables are included (Model 3).

For the agreeableness domain, there is a statistically significant negative association with employment in the foreign-born baseline model (Model 1) and a positive effect on employment for the Canadian-born sample in the full specification model (Model 3).

The interaction models in Table 16 show a positive interaction for foreign-born respondents and openness (Model 1 only) and negative interactions for foreign-born respondents and conscientiousness (Models 1 and 3) and agreeableness (Model 1 only), the latter findings supporting the differences in effects seen in the separate models.

3.2. EARNINGS

This section presents the empirical findings for the OLS and quantile (log) earnings models.[22] The OLS models are again estimated over the full LISA and LISA-PIAAC samples along with separate models estimated by gender, age, and immigration background (with further references to the supplementary interaction models associated with those characteristics). The quantile models are estimated over the full LISA sample only.

[22] The log specification is standard for earnings models and allows the coefficients to be interpreted as (approximations of) the percentage difference in earnings associated with a one unit change in the relevant explanatory variable.

Summary of main findings

Table 3 Overview of OLS earnings model estimation results

Model #	Full LISA sample	PIAAC sample	LISA – by gender	LISA – by age	LISA – by immigration background
1	Positively related to conscientiousness and emotional stability. Negatively related to openness and agreeableness.	Positively related to conscientiousness and emotional stability. Negatively related to agreeableness.	Women: Positively related to conscientiousness, negatively related to openness and agreeableness. Men: Positively related to conscientiousness in Model 1 only, and to emotional stability, negatively related to agreeableness.	Age 25-34: Positively related to conscientiousness and emotional stability, negatively related to openness and agreeableness. Age 35-44: Positively related to emotional stability, negatively related to agreeableness. Age 45-54: Positively related to conscientiousness and emotional stability, negatively related to agreeableness. Age 55-64: Positively related to emotional stability, negatively related to agreeableness.	Canadian born: Positively related to conscientiousness and emotional stability, negatively related to openness and agreeableness. Foreign born: Negatively related to agreeableness.
2	Positively related to conscientiousness and emotional stability. Negatively related to openness and agreeableness.	Positively related to conscientiousness. Negatively related to agreeableness.	Women: Positively related to conscientiousness, negatively related to openness and agreeableness. Men: Positively related to emotional stability, negatively related to agreeableness.	Age 25-34: Positively related to conscientiousness, emotional stability, and extraversion, negatively related to openness and agreeableness. Age 35-44: Negatively related to agreeableness.	Canadian born: Positively related to conscientiousness and emotional stability, negatively related to openness and agreeableness. Foreign born: Negatively related to agreeableness.

Model #	Full LISA sample	PIAAC sample	LISA – by gender	LISA – by age	LISA – by immigration background
				Age 45-54: Positively related to conscientiousness and emotional stability, negatively related to agreeableness. Age 55-64: Positively related to emotional stability.	
3	Positively related to conscientiousness and emotional stability. Negatively related to openness and agreeableness.	Positively related to conscientiousness Negatively related to agreeableness.	Women: Positively related to conscientiousness, negatively related to openness and agreeableness. Men: Positively related to emotional stability, negatively related to openness and agreeableness.	Age 25-34: Positively related to conscientiousness and extraversion, negatively related to openness and agreeableness. Age 45-54: Positively related to conscientiousness, negatively related to openness.	Canadian born: Positively related to conscientiousness and emotional stability, negatively related to openness and agreeableness.
4	*NA*	Positively related to conscientiousness. Negatively related to openness and agreeableness.	*NA*	*NA*	*NA*

Sample characteristics

Table 17 and Table 18 provide information on the sample composition and average BFI domain scores for the LISA and PIAAC-LISA samples used for the earnings models. As with the employment analysis, the demographic composition is similar across the two samples. The samples do differ, however, from those used in the previous section, as this part of the analysis only includes survey participants with employment earnings above $1,000.

In terms of average BFI domain scores, there are some differences across the demographic characteristics. As before, LISA and PIAAC-LISA respondents with higher levels of education have higher openness and lower agreeableness scores than those with lower levels of education. In addition, PIAAC-LISA respondents with higher cognitive skill levels (levels 4 and 5) have lower scores on conscientiousness, extraversion, and agreeableness and higher scores on emotional stability compared to survey participants at cognitive skill level 3 or below.

Full sample results

Across the different model specifications for the full LISA sample, the detailed regression findings presented in Table 19 and summarized in Table 3 show that conscientiousness and emotional stability have positive returns to earnings (Models 1 to 3). In the full specification model, each standard deviation increase in conscientiousness scores is associated with 3.8% higher earnings and each standard deviation increase in emotional stability scores is associated with 3.1% higher earnings.[23]

In contrast, negative returns are found for openness and agreeableness. In the full specification model, each standard deviation increase in openness is associated with 6.8% lower earnings and each standard deviation increase in agreeableness is associated with 4.0% lower earnings.

The results for the PIAAC-LISA sample differ somewhat from the full LISA sample estimates. In particular, in the baseline model (Model 1) in Table 20, the statistically significant negative effect of openness on earnings found in the full LISA sample does not hold in the PIAAC-LISA sample, although it does become statistically significant in the full model specification (Model 4), where each standard deviation in openness scores is associated with 4.8% lower earnings.

Similarly, the positive effect of emotional stability found for the full LISA sample is lost in Models 2 and 3 for the PIAAC-LISA sample. The positive effects of consciousness and negative effects of agreeableness found in the LISA sample repeat in the PIAAC-LISA sample.

These differences are likely due at least in part to the smaller PIAAC-LISA sample size (2,907 observations in comparison to 7,963), which reduces the statistical power of the model. In particular, post-hoc power tests indicate that a sample size larger than the PIAAC-LISA sample would be necessary for the estimated effect of openness found in the LISA sample to be statistically significant. In all cases the direction of the estimated effects is the same in both samples and for the most part the sample estimates are of approximately the same magnitude.

[23] As discussed above, the estimation of models which adjust for sample selection using a two-stage Heckman approach indicate the results in Models 1 to 3 are robust to any potential bias resulting from the censored nature of earnings (i.e., the exclusion of respondents with very low or zero earnings).

Most importantly, adding the numeracy measure included in Model 4 does not appreciably change the estimates for the BFI variables. In fact, the findings are slightly stronger, in that the negative effect of openness becomes statistically significant and the positive effect of conscientiousness becomes significant at a higher level and both point estimates increase slightly in the final model in both cases.

Results by gender, age, and immigration background

The results estimated by gender shown in Table 21 indicate that both openness and agreeableness are negatively related to earnings for both men and women (Models 1 and 3). In Model 3, each standard deviation increase in openness scores is associated with 5.0% lower earnings for men and 9.6% lower earnings for women. The corresponding estimated effects for agreeableness are 3.9% and 4.6% for women and men, respectively.

Like the results for employment status, only women have positive returns to conscientiousness and only men have positive returns to emotional stability in the full specification LISA model (Model 3), with corresponding estimated effects of 4.1% and 3.9 percent.[24] That said, there are no statistically significant interactions by gender in the interaction models in Table 22 and the signs of the estimated effects are the same for men and women, which suggests the differences are a matter of degree rather than kind.

Returns to non-cognitive skills also vary by age (Table 23). For the youngest participants (i.e., age 25 to 34), conscientiousness and extraversion are positively related to earnings in both Models 1 and 3 (estimated effects of 10.9 and 6.9%, respectively, in the latter model), while openness and agreeableness are negatively related to earnings (11.2 and 8.5%).

Although the separate models do not generate as many significant effects for other age groups, those that are significant largely align with the full sample results. That is, when statistically significant, openness and agreeableness are negatively related to earnings and conscientiousness and emotional stability are positively related to earnings. Once again, the smaller sample sizes and associated reduced statistical power associated with the estimation of separate models by age group should be kept in mind.

The age-based interaction models in Table 24 also point to differences in the effects by age. In particular, compared to the reference group of respondents age 25 to 34, there is a significant negative interaction between participants age 35 to 44 and conscientiousness (Models 1 and 3) and a significant negative interaction between participants age 55 to 64 and conscientiousness

[24] The coefficient on consciousness is marginally significant in Model 1 for men, with an (.040) estimated effect half that found for women (.093).

(Models 1 and 3). There is also a significant negative interaction between those age 55 to 64 and extraversion (Models 1 and 3).

By immigration status, the estimates for the Canadian-born respondents in Table 25 generally reflect the full sample findings, which is not surprising since they dominate the sample (75% versus 25%). The only significant effect for foreign-born respondents is a negative effect of agreeableness on earnings in Model 1, which becomes non-significant once education is added as a control variable (Model 3). These differences do not, however, appear to be solely a matter of sample sizes, as the interaction models in Table 26 indicate a statistically significant negative interaction between foreign-born respondents and emotional stability for Model 1 (i.e., the effect is estimated to be smaller). Reflecting the results of the models separated by immigration background, this interaction is not statistically significant once the model controls for education (Model 3).

Full sample quantile results

Table 4 Overview of quantile regression earnings model estimation results

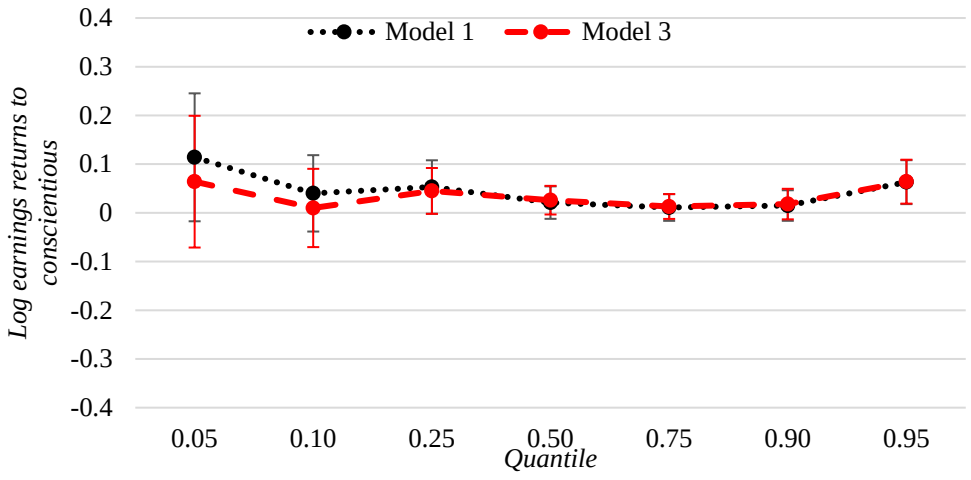
Model #	5th percentile	10th percentile	25th percentile	50th percentile	75th percentile	90th percentile	95th percentile
1	Positively related to emotional stability. Negatively related to agreeableness.	Positively related to emotional stability. Negatively related to openness and agreeableness.	Positively related to emotional stability. Negatively related to openness and agreeableness.	Positively related to emotional stability. Negatively related to agreeableness.	Positively related to emotional stability. Negatively related to agreeableness.	Positively related to emotional stability. Negatively related to agreeableness.	Positively related to conscientiousness and emotional stability. Negatively related to agreeableness.
2		Negatively related to openness and agreeableness.	Negatively related to openness and agreeableness.	Negatively related to agreeableness.	Positively related to emotional stability. Negatively related to agreeableness.	Negatively related to agreeableness.	Positively related to conscientiousness. Negatively related to agreeableness.

Model #	5th percentile	10th percentile	25th percentile	50th percentile	75th percentile	90th percentile	95th percentile
3	Positively related to emotional stability.	Negatively related to openness.	Negatively related to openness.	Negatively related to openness and agreeableness.	Positively related to emotional stability. Negatively related to openness and agreeableness.	Negatively related to openness and agreeableness.	Positively related to conscientiousness. Negatively related to agreeableness.

The quantile regression results are summarized in Table 4, while the graphs show the point estimates and 95 percent confidence intervals around these for models 1 and 3. These indicate that returns to non-cognitive skills differ across the earnings distribution. Parallel to the majority of the results above, there are statistically significant results for all BFI domains other than extraversion. In this section, we present the results for those four domains graphically.

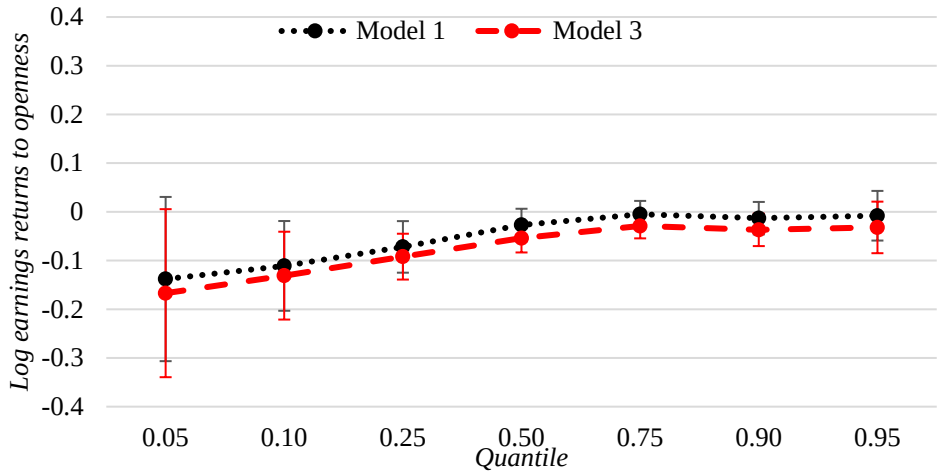
Across all model specifications, the estimated effects on earnings of conscientiousness are clearest for those at the 95th percentile (the point estimates are larger for some of the other quantiles, but are mostly not statistically significant). As shown in Figure 1, for each standard deviation increase in conscientiousness scores, earners in the top 95th percentile earn approximately 6% more in both the baseline and full specification models. As a sensitivity test, we estimated a separate OLS model for the entire sample except with the top 5% of earners removed. In this model, the coefficient for conscientiousness is statistically significant only in Model 1.

Figure 1 Returns to conscientious across earning quantiles



For openness (Figure 2), the returns (in this case negative) are again stronger at the lower percentiles than at the higher points in the earnings distribution; once the model controls for education (Model 3), for each standard deviation increase in openness, those in the bottom 5th earnings percentile earn approximately 17% less and earners at the 90th percentile earn 4% less than others (although neither of these is statistically significant at the level shown).

Figure 2 Returns to openness across earning quantiles



In both the baseline (Model 1) and full specification (Model 3) models, the positive returns to emotional stability are once more estimated to be greater for lower earnings individuals (Figure 3). For example, earners in the bottom .05 percentile earn 19% more for each standard deviation increase in the emotional stability score in Model 1, although the return is estimated to be only about half that in magnitude and is no longer statistically significant in Model 3. For the .50 (50%) quantiles and above, the estimated effects are approximately half as strong as for the bottom quantile in Model 1 and generally close to zero in Model 3.

Figure 3 Returns to emotional stability across earning quantiles

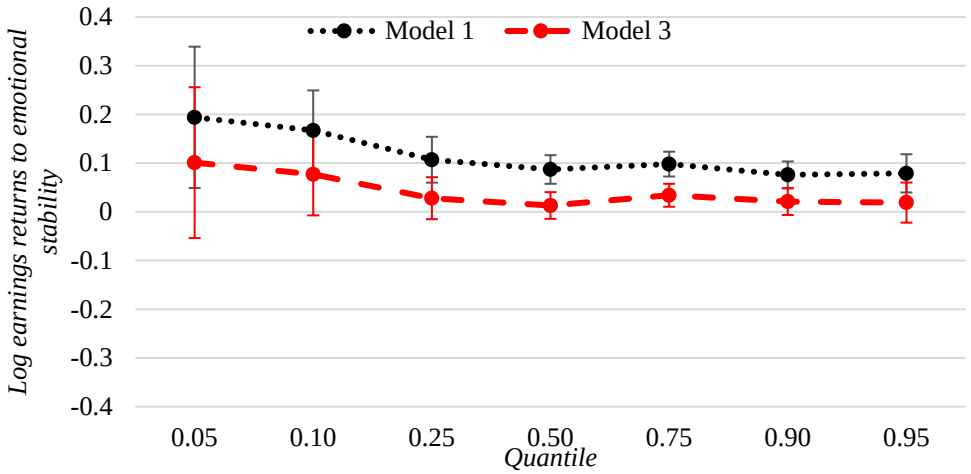
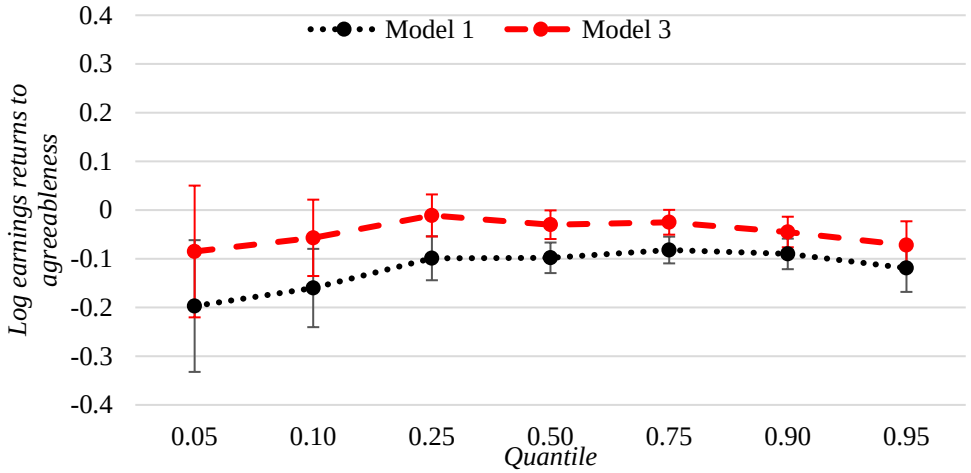


Figure 4 shows that earners at all percentiles have negative returns to agreeableness in Model 1, but the effects are again generally stronger (more negative) for those at lower earnings levels. In particular, earners in the bottom .05 percentile earn 20% less for each standard deviation increase in the agreeableness score in Model 1. The estimated effects are, however, all greatly reduced and mostly not significant (the top two categories excepted) in the full model (Model 3).

Figure 4 Returns to agreeableness across earning quantiles



3.3. WORKPLACE ACTIVITIES

This section presents the empirical findings for the workplace activity models. Models 1 (baseline) and 3 (full specification) are estimated for each workplace activity over the relevant LISA samples described above. Table 5 presents the main statistically significant results pertaining to each BFI domain, which are discussed in further detail below.

Summary of main findings

Table 5 Overview of workplace activity model estimation results

	Job-related training	Cooperation	Sharing information	Training others
Openness				Positive relationship in the baseline and full models.
Conscientiousness				Positive relationship in the full model.
Extraversion	Positive relationship in the baseline and full models.	Positive relationship in the baseline and full models.		
Agreeableness	Negative relationship in the baseline model.			
Emotional stability	Positive relationship in the baseline model.	Positive relationship in the baseline and full models.		
	Planning act. (own)	**Planning act. (others)**	**Organizing own time**	**Influencing others**
Openness	Positive relationship in the baseline and full models.	Positive relationship in the baseline and full models.	Positive relationship in the baseline and full models.	Positive relationship in the baseline and full models.
Conscientiousness		Positive relationship in the full model.		
Extraversion		Positive relationship in the baseline and full models.		Positive relationship in the baseline and full models.
Agreeableness	Negative relationship in the baseline model.	Negative relationship in the baseline model.	Negative relationship in the baseline and full models.	Negative relationship in the baseline model.
Emotional stability	Positive relationship in the baseline model.	Positive relationship in the baseline and full models.		

	Negotiating with others	Simple problem solving	Complex problem solving
Openness	Positive relationship in the baseline and full models.	Positive relationship in the baseline and full models.	Positive relationship in the baseline and full models.
Conscientiousness		Negative relationship in the baseline model.	Negative relationship in the baseline model.
Extraversion	Positive relationship in the baseline and full models.		Positive relationship in the full model.
Agreeableness	Negative relationship in the baseline model.	Negative relationship in the baseline and full models.	Negative relationship in the baseline model.
Emotional stability	Positive relationship in the baseline model.		Positive relationship in the baseline model.

Sample characteristics

Table 27 provides the descriptive statistics for the samples used in the models estimated for workplace activities. The first column shows the percentage of LISA survey respondents included in the analysis sample who describe engaging in low or high levels of each activity ("No", "Yes"). While more than 80% of people frequently engage in workplace activities that involve sharing information, organizing one's own time, or engaging in simple problem solving, less than 50% report frequently training, planning the activities, or negotiating with others.

The descriptive statistics suggest there are both differences and similarities in BFI domain scores by level of workplace activity engagement. The highest average openness and extraversion scores are among those who frequently negotiate with others. Respondents who do not often engage in simple problem solving have the highest conscientiousness and agreeableness scores. Emotional stability scores are highest for those who regularly plan the activities of others. As the descriptive statistics from the previous two sections show, the correlation between average BFI domain scores also relates to demographic characteristics that may partially explain why BFI scores differ by these workplace activities. Therefore, regression results that control for these factors provide greater insight into how BFI scores relate to workplace activities.

Full sample results

Although openness is negatively associated with earnings, it has a positive relationship with many workplace activities in both the baseline (Table 28) and full specification models (Table 29), including more frequently training others, planning and organizing one's own

activities and time, planning and organizing the activities and time of others, influencing others, negotiating with others, and simple and complex problem solving. For example, for each standard deviation increase in openness, there is a 3.0-percentage point increase in the likelihood of engaging in high levels of complex problem solving after including all other explanatory variables.

Whereas conscientiousness figures importantly in the employment and earnings models, the only significant relationships between conscientiousness and workplace activities are positive effects on training others and planning the activities of others in the full specification model (Model 3), as well as negative effects on simple and complex problem solving in the baseline model (Model 1). In the full specification model, each standard deviation increase in conscientiousness scores is associated with a 2.4 and 2.0-percentage point increase in the likelihood of training and planning the activities of others at work, respectively.

Conversely, while extraversion has little-to-no relationship to employment status and earnings, it is positively related to job training, more frequently cooperating with others, planning the activities of others, influencing others, negotiating with others, and complex problem solving in the baseline and full specification models (Models 1 and 3). For example, each standard deviation increase in extraversion scores is associated with a 4.5-percentage point increase in the likelihood of engaging in higher levels of negotiation with others at work in the full specification model.

In the baseline model specification (Model 1), agreeableness is negatively related to job-related training, planning, and organizing one's own time and others', influencing and negotiating with others, and both simple and complex problem solving. However, these relationships largely become non-significant in the full specification model (Model 3), where only the effects on organizing one's own time and simple problem solving are still statistically significant. In the final model, each standard deviation increase in agreeableness scores is associated with a 1.3 to 1.5-percentage point decrease in the likelihood of engaging in high levels of both activities.

In the baseline model (Model 1), emotional stability is positively related to job-related training, cooperation, planning one's own and other's activities, negotiating with others, and complex problem solving. In the full specification model (Model 3), however, the effects remain statistically significant only for cooperating with others and planning the activities of others. Each standard deviation increase in this domain score results in a 1.6-percentage point increase in the likelihood of engaging in high levels of both activities.

4. CONCLUSION

4.1. SUMMARY AND DISCUSSION OF MAIN RESULTS

Aligning with prior research that demonstrates each BFI domain differs in its relationship to various labour market outcomes (e.g., Duckworth et al., 2012), the findings from our study demonstrate how each non-cognitive skill domain varies in the effects found on employment, earnings, and workplace activities, as summarized at a high level in Table 6.

Table 6 Overview of main findings by each BFI domain

Openness	Conscientiousness	Extraversion	Agreeableness	Emotional stability
▪ Negatively related to earnings. ▪ Positively related to many workplace activities.	▪ Positively related to employment for women but not men. ▪ Positively related to earnings for women but not men except with no controls, differences across age groups.	▪ Positively related to earnings for young adults, but no relationship for other age groups. ▪ Positively related to many workplace activities.	▪ Negatively related to earnings among all respondents.	▪ Positively related to employment without controlling for other factors (Model 1), non-significant in Models 2 and 3. ▪ Positive in all models for men but not women. ▪ Also positively related to earnings for men but not women.

Openness

We find that openness is negatively related to earnings across our entire sample, as well as separately among men and women. The relationship between openness and earnings is inconsistent in prior research, showing a positive (Heineck, 2011; Mueller & Plug, 2006), a negative (Heineck & Anger, 2010), or no association (McLean et al., 2019). Along with possible discrepancies across the type of BFI assessment used, openness correlates with occupation (Barrick, Mount, & Gupta, 2003) and cognitive skills, both with and without controlling for education level (Rammstedt, Danner, & Martin, 2016), while openness has also been linked to

unconventionality and a greater likelihood of employment in artistic jobs (Judge et al., 1999) that may pay less, any of which may also be contributing to the effects found (Heineck, 2011).

Conversely, openness is positively related to many workplace activities. Individuals who have high openness scores are more likely to train, negotiate, and influence others, engage in time management, and undertake simple and complex problem solving. Openness is a domain that is often positively associated with a willingness to engage with others in the workplace, such as participating in teams (Homan et al., 2008). Openness is also associated with higher performance on tests of inductive reasoning (Hogan et al., 2012) and engaging in literacy activities (Soubelet & Salthouse, 2010).

Conscientiousness

Confirming the results of prior studies (Duckworth et al., 2012; Fletcher, 2013), across the entire sample we find that conscientiousness is positively associated with the likelihood of being employed. Uysal and Pohlmeier (2011) describe conscientiousness as a domain "that guarantees job stability" (p. 986) as it refers to the tendency to be organized, responsible, and hardworking. The longer version of the BFI also includes a sub-domain that captures the extent to which individuals are achievement striving, which aligns with "generating positive outcomes in work" (Cox et al., 2010, p. 1190) and intrinsic work motivation (Bipp, 2010). For this reason, conscientiousness is often a key domain that emerges in studies of work performance (Barrick & Mount, 1991; Störmer & Fahr, 2013), which would be expected to be related to employment opportunities. When broken down by gender, however, conscientiousness is found to be significant only for women and not for men.

Among the entire sample, there is also a positive relationship between conscientiousness and earnings; but again, when separated by gender we find the relationship is statistically significant among women across all models, but only in the baseline model (with no controls) for men. The effects also vary across age groups. These findings align with prior research that indicates there are gender differences in the association between each BFI domain and earnings (Gensowski, 2018; McLean et al., 2019; Nyhus & Pons, 2005), including Mueller and Plug's (2006) study that also shows women with higher conscientiousness scores earn more on average. For women, conscientiousness is even shown to increase the earnings of spouses (Averett et al., 2020). Like the openness domain, there is a relationship between conscientiousness and cognitive skills (Rammstedt et al., 2016). Gensowski (2018) argues that, because individuals with high conscientiousness scores are more likely to acquire higher levels of education, the relationship between conscientiousness and earnings is mediated through educational attainment, which is controlled for in our models.

Extraversion

Extraversion is not related to employment, and across the majority of model specifications we find no relationship between extraversion and earnings, a similar result to prior BFI research (Averett et al., 2020; Fletcher, 2013). When examining results separated by age, there is a positive relationship between extraversion and earnings for the youngest age group (i.e., respondents age 25 to 34). McLean et al. (2019) show that the relationship between extraversion and earnings varies in its statistical significance depending on whether a model accounts for occupation. One reason for their finding may come from research that suggests extraversion is associated with occupational preferences, with outgoing people more likely to select occupations based on their level of sociability (Barrick & Mount, 1991; Nandi & Nicoletti, 2014). It is possible that positive earnings returns to sociable occupations, if they exist, are most prominent at an early career stage.

Although respondents' level of extraversion has little relationship to employment and earnings in our models, it is positively associated with a range of workplace activities, including a greater likelihood of engaging in job-related training and cooperating, training, negotiating, and influencing others. Prior research typically finds a positive relationship between extraversion and various measures of workplace performance, such as employee engagement and job performance (Wilmot et al., 2019). In particular, extraversion is characterized by the drive to influence and engage with others, as well as have new experiences.

Agreeableness

Confirming the results from a large number of prior studies (Gensowski, 2018; Heineck & Anger, 2010; McLean et al., 2019; Nyhus & Pons, 2005), we find that agreeableness, which is not related to employment, is negatively related to earnings, with the effects somewhat stronger for women than men. Heineck (2011) argues that the "agreeableness penalty" likely connects to a lower likelihood of those with high scores in this domain to engage in wage negotiations. High levels of agreeableness are also associated with lower levels of psychopathy, narcissism, and Machiavellianism — a trait that describes people striving for personal success, power, and influence that is also associated with higher earnings (Lindley, 2018). The negative relationship between agreeableness and earnings may, in addition, relate to work-life balance. For example, Averett et al. (2020) find that women with high agreeableness scores engage in more hours of housework, which may adversely affect earnings.

Not only is agreeableness negatively related to earnings in the OLS models, the analysis using quantile regression demonstrates that agreeableness is more strongly related to earnings for those at lower earnings levels. This contrasts with the findings of Collischon (2020) using data

from Germany, the United Kingdom, and Australia, where the negative returns to agreeableness increase in magnitude at higher-earning percentiles.

Emotional stability

Without controlling for other explanatory variables, we find a positive relationship between emotional stability and employment across the entire LISA sample, a finding that also exists in prior BFI research (Fletcher, 2013). Although this result becomes non-significant in subsequent models, it is found to be significant across all models for men but not women. While emotional stability may affect employment, causality may also run in the other direction, with prior research indicating that emotional stability decreases among adults who experience adverse employment events (Cobb-Clark & Schurer, 2012).

Aligning with prior BFI research (Judge et al., 1999; Semeijn et al., 2018), emotional stability is also positively associated with earnings, but again this is found to be the case only for men and not for women (Mueller & Plug, 2006; Nyhus & Pons, 2005). Emotional stability is argued to result in greater potential for productivity (Nyhus & Pons, 2005), a theory that is supported by an experimental study that assessed the relationship between noncognitive skills and task performance (Cubel et al., 2016). Emotional stability is also positively associated with both educational attainment (van Eijck & de Graaf, 2004) and cognitive skills (Rammstedt et al., 2016). Nevertheless, once controlling for education level in the full LISA sample, we still find a positive relationship between emotional stability and earnings.

4.2. FUTURE RESEARCH IN SUPPORT OF SKILLS POLICY

Although skill-based policy often focuses on promoting cognitive skills — including essential skills such as literacy and numeracy — to support schooling and employment outcomes, our research is consistent with the broad findings in the literature in finding that non-cognitive skills are related to labour market success at both the individual level, as seen in employment and earnings, and at the broader level as captured by their relationship to constructive workplace activities.

Further research is, however, needed to more completely assess the potential benefits of non-cognitive skills and to develop, implement, and evaluate related policy initiatives in Canada. Given its richness in terms of the information available, including the availability of both direct cognitive skill assessments along with the BFI measures of non-cognitive skills, the LISA data used in this analysis could provide further insight into how non-cognitive skills are associated with not only employment status, earnings, and workplace activities, but also other outcomes such as adult education and training, the ability to cope with adverse life course events,

additional employment outcomes such as job tenure, and a range of other schooling and work outcomes.

The LISA data and methods employed in this research could also shed light on how different combinations of cognitive skills, as well as combinations of non-cognitive and cognitive skills, work together to affect outcomes.

The OECD's Study on Social and Emotional Skills, which uses a measurement framework based on the BFI domains (Kankaraš & Suarez-Alvarez, 2019), aims to not only understand how non-cognitive skills relate to academic achievement among 10- and 15-year-old students, but also the policies and practices that best support the development of these skills. With evidence that curriculum and program interventions among children and youth can promote non-cognitive skill development (Durlak et al., 2011; McCormick et al., 2020), there is potential to design and assess education and training programs that aim to develop non-cognitive skills throughout the life course.

More generally, non-cognitive skills are now understood to be attributes that may change with age, policy interventions, or life events (Costa & McCrae, 2017; Cunha & Heckman, 2008; Cunha, Heckman, & Schennach, 2010), and a range of strategies may promote the development of non-cognitive skills from early childhood through adulthood (Kautz et al., 2015).

To establish the evidence necessary to develop policy options, further understanding of how non-cognitive skills develop, change, and lead to improved outcomes is necessary, and only new lines of research will provide this. These could include controlled trials as well as otherwise building evaluation strategies into any new initiatives to advance the knowledge base required to develop and put in place strategies at a general level in the longer term.

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APPENDIX A: MEASURES OF WORKPLACE ACTIVITIES

Area	2016 LISA Survey question	Original outcome measure	Derived outcome measure
Job-related training	Over the last two years, have you taken any workshops, tutorials or seminars made available by your employer? Over the last two years, have you taken any computer assisted, correspondence or online training made available by your employer?	Binary 1=Yes 0=No	Binary 1=Yes to either question 0=No to both questions
Cooperation	In your [current job/last job] what proportion of your time [do/did] you usually spend... cooperating or collaborating with co-workers?	Continuous 1 (None of the time) to 5 (All of the time)	0= Low (up to half of the time) 1= High (more than half the time)
Sharing information	How often [does/did] your [current job/last job] usually involve sharing work-related information with co-workers?	Continuous 1 (Never) to 5 (Every day)	0= Low (up to half of the time) 1= High (more than half the time)
Training others	How often [does/did] your [current job/last job] usually involve instructing, training or teaching people, individually or in groups?	Continuous 1 (Never) to 5 (Every day)	0= Low (Less than once a week) 1= High (Once a week or more)
Planning own activities	How often [does/did] your [current job/last job] usually involve planning your own activities?	Continuous 1 (Never) to 5 (Every day)	0= Low (Less than once a week) 1= High (Once a week or more)
Planning activities of others	How often [does/did] your [current job/last job] usually involve planning the activities of others?	Continuous 1 (Never) to 5 (Every day)	0= Low (Less than once a week) 1= High (Once a week or more)
Organizing own time	How often [does/did] your [current job/last job] usually involve organising your own time?	Continuous 1 (Never) to 5 (Every day)	0= Low (Less than once a week) 1= High (Once a week or more)

Area	2016 LISA Survey question	Original outcome measure	Derived outcome measure
Influencing others	How often [does/did] your [current job/last job] usually involve persuading or influencing people?	Continuous 1 (Never) to 5 (Every day)	0= Low (Less than once a week) 1= High (Once a week or more)
Negotiating with others	How often [does/did] your [current job/last job] usually involve negotiating with people either inside or outside your firm or organization?	Continuous 1 (Never) to 5 (Every day)	0= Low (Less than once a week) 1= High (Once a week or more)
Simple problem solving	How often [are/were] you usually faced with relatively simple problems that [take/took] no more than 5 minutes to find a good solution?	Continuous 1 (Never) to 5 (Every day)	0= Low (Less than once a week) 1= High (Once a week or more)
Complex problem solving	How often [are/were] you usually confronted with more complex problems that [take/took] at least 30 minutes to find a good solution?	Continuous 1 (Never) to 5 (Every day)	0= Low (Less than once a week) 1= High (Once a week or more)

APPENDIX B: DESCRIPTION OF BFI QUESTIONS

Respondents are asked to choose the number which best describes how they see themselves using a scale from 1 to 7, where 1 means "does not apply to me at all" and 7 means "applies to me perfectly."

#	Domain	Question
1*	Agreeableness	I see myself as someone who is sometimes rude to others
2	Conscientiousness	I see myself as someone who does a thorough job.
3	Extraversion	I see myself as someone who is talkative.
4*	Emotional Stability	I see myself as someone who worries a lot.
5	Open-Mindedness	I see myself as someone who is original, comes up with new ideas.
6	Agreeableness	I see myself as someone who has a forgiving nature.
7*	Conscientiousness	I see myself as someone who tends to be lazy.
8	Extraversion	I see myself as someone who is outgoing and sociable.
9*	Emotional Stability	I see myself as someone who gets nervous easily.
10	Open-Mindedness	I see myself as someone who values artistic, aesthetic experiences.
11	Agreeableness	I see myself as someone who is considerate and kind to almost everyone.
12	Conscientiousness	I see myself as someone who does things efficiently.
13*	Extraversion	I see myself as someone who is reserved.
14	Emotional Stability	I see myself as someone who is relaxed, who handles stress well.
15	Open-Mindedness	I see myself as someone who has an active imagination.

Note: Negatively keyed items that are reverse scores are denoted by an asterisk.

Of note, there is more than one version of the extra short BFI, each of which has different ideas. The LISA survey used the version developed by Lang et al. (2011) rather than the updated version — termed the BFI 2 — developed by Soto and John (2017).

APPENDIX C: TABLES OF EMPIRICAL FINDINGS

Table 7 Descriptive statistics for employment analysis, LISA sample

	Proportion	Average score				
Weighted obs. = 13,601,400 *Sample size = 7,963*	*%*	*Openness*	*Conscien-tiousness*	*Extra-version*	*Agreea-bleness*	*Emotional stability*
All						
Employed	0.86	0.07	-0.01	-0.01	-0.03	0.02
Not employed	0.14	0.04	-0.21	-0.02	-0.08	-0.19
Gender						
Male	0.51	0.06	-0.15	-0.11	-0.19	0.21
Female	0.49	0.07	0.07	0.10	0.12	-0.24
Age						
25-34	0.20	0.12	-0.30	0.07	-0.13	-0.07
35-44	0.27	0.07	-0.05	0.03	-0.06	-0.04
45-54	0.29	0.01	0.01	-0.06	-0.01	-0.01
55-64	0.24	0.07	0.11	-0.07	0.03	0.06
Immigration background						
Canadian born	0.75	0.06	-0.05	0.02	-0.07	-0.07
Foreign born	0.25	0.07	-0.02	-0.10	0.04	0.16
Indigenous identity						
Indigenous	0.02	0.08	-0.07	-0.16	-0.28	-0.12
Non-Indigenous	0.98	0.06	-0.04	-0.01	-0.03	-0.01
Health status						
Good or excellent	0.92	0.07	-0.01	0.00	-0.03	0.02
Fair or poor	0.08	-0.06	-0.44	-0.19	-0.20	-0.43
Children in household						
Yes	0.41	-0.01	-0.06	0.02	-0.05	-0.02
No	0.59	0.11	-0.03	-0.04	-0.03	-0.01
Living with spouse/partner						
Yes	0.72	0.01	0.00	-0.01	-0.03	0.01
No	0.28	0.21	-0.14	-0.02	-0.05	-0.08
Education level						
Less than high school	0.05	-0.22	0.13	-0.09	0.14	-0.06
High school diploma	0.18	-0.02	-0.08	-0.04	0.00	-0.06
Diploma or certificate	0.39	0.05	-0.01	0.02	0.00	-0.01
Bachelor's degree	0.22	0.11	-0.14	-0.04	-0.09	0.03
Professional or grad. degree	0.16	0.20	0.02	0.00	-0.15	-0.01

Note: Due to Statistics Canada disclosure rules, sample size and averages are based on weighted and rounded calculations.

Table 8 Descriptive Statistics for Employment Analysis, PIAAC-LISA Sample

	Proportion	Average score				
Weighted obs. =15,582,250 *Sample size = 3,247*	*%*	*Openness*	*Conscien-tiousness*	*Extra-version*	*Agreea-bleness*	*Emotional Stability*
All						
Employed	0.85	0.08	-0.01	-0.02	-0.02	0.03
Not employed	0.15	0.07	-0.26	-0.04	-0.07	-0.17
Gender						
Male	0.51	0.05	-0.11	-0.11	-0.18	0.25
Female	0.49	0.11	0.02	0.08	0.14	-0.26
Age						
25-34	0.21	0.17	-0.29	0.05	-0.12	-0.07
35-44	0.26	0.10	-0.04	0.00	-0.03	0.02
45-54	0.30	0.04	-0.01	-0.05	0.01	-0.02
55-64	0.23	0.02	0.10	-0.05	0.02	0.06
Immigration background						
Canadian born	0.77	0.05	-0.07	0.00	-0.05	-0.07
Foreign born	0.23	0.16	0.00	-0.09	0.07	0.22
Indigenous identity						
Indigenous	0.97	0.24	-0.07	-0.14	-0.11	-0.10
Non-Indigenous	0.03	0.07	-0.05	-0.02	-0.02	0.00
Health status						
Good or excellent	0.92	0.09	-0.02	0.00	-0.01	0.03
Fair or poor	0.08	-0.12	-0.42	-0.23	-0.17	-0.32
Children in household						
Yes	0.36	0.04	-0.03	0.06	0.01	-0.01
No	0.64	0.10	-0.06	-0.07	-0.04	0.00
Living with spouse/partner						
Yes	0.69	0.02	0.00	0.00	-0.01	0.01
No	0.31	0.20	-0.16	-0.07	-0.06	-0.04
Education level						
Less than high school	0.07	-0.07	0.18	0.00	0.23	-0.08
High school diploma	0.20	0.01	-0.07	-0.06	-0.05	-0.04
Diploma or certificate	0.42	0.06	-0.05	0.01	0.02	0.01
Bachelor's degree	0.18	0.10	-0.15	-0.05	-0.11	0.03
Professional or grad. degree	0.13	0.27	0.01	-0.01	-0.14	0.00
Cognitive skill level						
Low: Level 0/1	0.18	-0.03	0.09	-0.03	0.17	-0.02
Medium: Level 2/3	0.65	0.11	-0.05	0.02	-0.02	-0.03
High: Level 4/5	0.17	0.05	-0.22	-0.17	-0.24	0.11

Note: Due to Statistics Canada disclosure rules, sample size and averages are based on weighted and rounded calculations.

Table 9 Regression results for employment status, LISA sample

BFI domain	Model 1	Model 2	Model 3
Openness	0.001	0.002	-0.004
	(0.005)	(0.005)	(0.005)
Conscientiousness	0.022***	0.011*	0.013*
	(0.006)	(0.005)	(0.006)
Extraversion	-0.004	-0.007	-0.006
	(0.006)	(0.005)	(0.005)
Agreeableness	-0.004	0.003	0.009
	(0.006)	(0.006)	(0.006)
Emotional stability	0.022***	0.008	0.007
	(0.006)	(0.006)	(0.006)
Gender (Male)			
Female		0.013	0.005
		(0.011)	(0.011)
Age (25-34)			
35-44		-0.092***	-0.095***
		(0.017)	(0.016)
45-54		-0.168***	-0.167***
		(0.019)	(0.019)
55-64		-0.289***	-0.281***
		(0.024)	(0.024)
Immigration background (Canadian born)			
Foreign born		-0.003	-0.013
		(0.012)	(0.012)
Indigenous identity (Non-Indigenous)			
Indigenous		-0.004	0.015
		(0.030)	(0.030)
Health status (Good or excellent)			
Fair or poor		-0.270***	-0.245***
		(0.025)	(0.026)
Years of full-time work experience		0.009***	0.009***
		(0.001)	(0.001)
Children in household (No children)			
Children in household		-0.009	-0.011
		(0.011)	(0.011)
Living with spouse/partner (No)			
Living with spouse/partner		0.068***	0.061***
		(0.014)	(0.014)

BFI domain	Model 1	Model 2	Model 3
Education level (High school)			
Less than high school			-0.143***
			(0.028)
Diploma or certificate			0.037*
			(0.015)
Bachelor's degree			0.087***
			(0.016)
Professional or grad. degree			0.109***
			(0.016)
Province of residence		*included*	*included*
Intercept	0.861***	0.802***	0.759***
	(0.005)	(0.021)	(0.024)
R^2	0.009	0.120	0.146
Weighted Observations	13,601,400	13,601,400	13,601,400
Sample size	7,963	7,963	7,963

Notes: Outcome (1=employed); Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 10 Regression results for employment status, PIAAC-LISA sample

	Model 1	Model 2	Model 3	Model 4
BFI domain				
Openness	-0.002	-0.004	-0.009	-0.011
	(0.010)	(0.008)	(0.008)	(0.008)
Conscientiousness	0.031**	0.020*	0.020*	0.022*
	(0.010)	(0.009)	(0.009)	(0.009)
Extraversion	-0.002	-0.008	-0.007	-0.006
	(0.008)	(0.007)	(0.007)	(0.007)
Agreeableness	-0.004	0.005	0.012	0.013
	(0.010)	(0.009)	(0.009)	(0.009)
Emotional stability	0.021*	0.012	0.010	0.010
	(0.010)	(0.010)	(0.010)	(0.010)
Gender (Male)				
Female		0.013	0.007	0.013
		(0.017)	(0.016)	(0.017)
Age (25-34)				
35-44		-0.098***	-0.099***	-0.098***
		(0.025)	(0.024)	(0.024)
45-54		-0.186***	-0.183***	-0.177***
		(0.029)	(0.029)	(0.029)
55-64		-0.328***	-0.313***	-0.302***
		(0.036)	(0.036)	(0.036)
Immigration background (Canadian born)				
Foreign born		-0.031	-0.037	-0.016
		(0.023)	(0.023)	(0.024)
Indigenous identity (Non-Indigenous)				
Indigenous		-0.050	-0.032	-0.025
		(0.047)	(0.049)	(0.048)
Health status (Good or excellent)				
Fair or poor		-0.263***	-0.244***	-0.239***
		(0.040)	(0.040)	(0.039)
Years of full-time work experience		0.010***	0.010***	0.009***
		(0.001)	(0.001)	(0.001)
Children in household (No children)				
Children in household		-0.027	-0.030	-0.028
		(0.018)	(0.017)	(0.017)
Living with spouse/partner (No)				
Living with spouse/partner		0.078***	0.077***	0.072***
		(0.019)	(0.019)	(0.019)

	Model 1	Model 2	Model 3	Model 4
Education level (High school)				
Less than high school			-0.135***	-0.108**
			(0.039)	(0.040)
Diploma or certificate			0.020	0.008
			(0.022)	(0.022)
Bachelor's degree			0.050*	0.025
			(0.025)	(0.026)
Professional or grad. degree			0.100***	0.067*
			(0.025)	(0.026)
Cognitive skill level (Low)				
Medium: Level 2/3				0.089*
				(0.035)
High: Level 4/5				0.121**
				(0.038)
Province of residence		*included*	*included*	*included*
Intercept	0.854***	0.798***	0.770***	0.701***
	(0.008)	(0.034)	(0.038)	(0.048)
R^2	0.007	0.119	0.148	0.151
Weighted Observations	15,582,250	15,582,250	15,582,250	15,582,250
Sample size	3,247	3,247	3,247	3,247

Notes: Outcome (1=employed); Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 11 Regression results for employment status by gender, LISA sample

	Male		Female	
	Model 1	Model 3	Model 1	Model 3
BFI domain				
Openness	-0.004	-0.003	0.005	-0.008
	(0.008)	(0.007)	(0.007)	(0.007)
Conscientiousness	0.011	0.005	0.037***	0.020*
	(0.008)	(0.008)	(0.009)	(0.008)
Extraversion	-0.008	-0.011	0.003	-0.002
	(0.008)	(0.007)	(0.008)	(0.007)
Agreeableness	0.008	0.015	-0.016	-0.000
	(0.008)	(0.008)	(0.009)	(0.009)
Emotional stability	0.036***	0.018*	0.006	-0.004
	(0.010)	(0.009)	(0.008)	(0.007)
Age (25-34)				
35-44		-0.100***		-0.080***
		(0.023)		(0.023)
45-54		-0.180***		-0.137***
		(0.030)		(0.025)
55-64		-0.276***		-0.246***
		(0.040)		(0.030)
Immigration background (Canadian born)				
Foreign born		0.024		-0.047**
		(0.016)		(0.017)
Indigenous identity (Non-Indigenous)				
Indigenous		0.008		0.013
		(0.040)		(0.042)
Health status (Good or excellent)				
Fair or poor		-0.251***		-0.234***
		(0.035)		(0.035)
Years of full-time work experience		0.007***		0.010***
		(0.001)		(0.001)
Children in household (No children)				
Children in household		0.015		-0.039**
		(0.016)		(0.014)
Living with spouse/partner (No spouse)				
Living with spouse/partner		0.115***		0.012
		(0.023)		(0.017)

	Male		Female	
	Model 1	Model 3	Model 1	Model 3
Education level (High school)				
Less than high school		-0.123***		-0.147***
		(0.035)		(0.043)
Diploma or certificate		0.009		
		(0.019)		0.074**
Bachelor's degree		0.051*		(0.023)
		(0.021)		
Professional or grad. degree		0.071**		0.122***
		(0.023)		(0.023)
Province of residence		included		included
Intercept	0.868***	0.768***	0.847***	0.759***
	(0.009)	(0.031)	(0.007)	(0.030)
R^2	0.014	0.162	0.010	0.164
Weighted Observations	6,961,570	6,961,570	6,639,830	6,639,830
Sample size	3,816	3,816	4,147	4,147

Notes: Outcome (1=employed); Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 12 Interaction results for employment status by gender, LISA sample

	Model 1	Model 3
BFI domain		
Openness	-0.004	-0.005
	(0.008)	(0.007)
Conscientiousness	0.011	0.003
	(0.008)	(0.008)
Extraversion	-0.008	-0.009
	(0.008)	(0.007)
Agreeableness	0.008	0.016*
	(0.008)	(0.008)
Emotional stability	0.036***	0.020*
	(0.010)	(0.009)
Gender (Male)		
Female	-0.020	0.006
	(0.011)	(0.011)
Interactions		
Openness*Female	0.009	0.001
	(0.011)	(0.010)
Conscientiousness*Female	0.026*	0.021
	(0.012)	(0.011)
Extraversion*Female	0.010	0.006
	(0.011)	(0.010)
Agreeableness*Female	-0.025*	-0.017
	(0.012)	(0.011)
Emotional stability*Female	-0.031*	-0.024*
	(0.013)	(0.012)
Other explanatory variables		*included*
Intercept	0.868***	0.754***
	(0.009)	(0.024)
R^2	0.014	0.148
Weighted Observations	13,601,400	13,601,400
Sample size	7,963	7,963

Notes: Outcome (1=employed); Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 13 Regression results for employment status by age, LISA sample

	25-34		35-44		45-54		55-64	
	M 1	*M 3*	*M 1*	*M 3*	*M 1*	*M 3*	*M 1*	*M 3*
BFI domain								
Openness	0.002	0.005	0.004	0.001	-0.016	-0.021*	0.016	0.003
	(0.012)	(0.011)	(0.011)	(0.010)	(0.010)	(0.009)	(0.012)	(0.010)
Conscientiousness	0.009	-0.005	0.022	0.015	0.036**	0.010	0.031**	0.026*
	(0.013)	(0.013)	(0.012)	(0.012)	(0.012)	(0.009)	(0.012)	(0.011)
Extraversion	0.006	-0.001	-0.008	-0.009	0.002	0.004	-0.023	-0.022
	(0.010)	(0.010)	(0.010)	(0.009)	(0.010)	(0.009)	(0.012)	(0.011)
Agreeableness	0.005	0.012	0.006	0.020	-0.004	0.009	-0.019	-0.005
	(0.014)	(0.013)	(0.012)	(0.011)	(0.010)	(0.010)	(0.013)	(0.011)
Emotional stability	0.024*	0.019	0.006	-0.010	0.031**	0.014	0.033**	0.007
	(0.010)	(0.011)	(0.012)	(0.010)	(0.011)	(0.010)	(0.011)	(0.011)
Gender (Male)								
Female		-0.006		-0.040*		0.047*		0.045*
		(0.022)		(0.020)		(0.019)		(0.023)
Immigration background (Can. born)								
Foreign born		-0.039		-0.026		0.003		-0.000
		(0.031)		(0.022)		(0.020)		(0.025)
Indigenous identity (None)								
Indigenous		0.065		0.027		0.024		0.021
		(0.071)		(0.069)		(0.059)		(0.046)
Health status (Good or excel.)								
Fair or poor		-0.152*		-0.253***		-0.204***		-0.296***
		(0.063)		(0.059)		(0.047)		(0.044)
Years of FT work experience		0.019***		0.010***		0.013***		0.007***
		(0.003)		(0.002)		(0.001)		(0.001)
Children in household (None)								
Children in household		-0.088***		-0.021		0.036*		0.067*
		(0.023)		(0.026)		(0.016)		(0.031)
Living with spouse/partner (No)								
Living with spouse/partner		0.050*		0.074		0.079**		0.054*
		(0.021)		(0.039)		(0.024)		(0.026)

	25-34		35-44		45-54		55-64	
	M 1	*M 3*	*M 1*	*M 3*	*M 1*	*M 3*	*M 1*	*M 3*
Education level (High school)								
Less than high school		-0.189*		-0.109		-0.074		-0.173***
		(0.080)		(0.062)		(0.049)		(0.042)
Diploma or certificate		0.038		0.048		0.041		0.032
		(0.032)		(0.033)		(0.027)		(0.027)
Bachelor's degree		0.119***		0.093**		0.093**		0.053
		(0.034)		(0.035)		(0.029)		(0.033)
Professional or grad. degree		0.138***		0.138***		0.102***		0.096***
		(0.037)		(0.034)		(0.030)		(0.028)
Province of residence		*incl.*		*incl.*		*incl.*		*incl.*
Intercept	0.887***	0.707***	0.873***	0.655***	0.867***	0.441***	0.813***	0.546***
	(0.012)	(0.052)	(0.010)	(0.059)	(0.009)	(0.057)	(0.011)	(0.057)
R^2	0.009	0.138	0.006	0.128	0.022	0.196	0.018	0.170
Weighted Observations	2,672,100	2,672,100	3,635,720	3,635,720	3,981,950	3,981,950	3,311,630	3,311,630
Sample size	1,273	1,273	1,758	1,758	2,548	2,548	2,384	2,384

Notes: Outcome (1=employed); Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 14 Interaction results for employment status by age, LISA sample

	Model 1	Model 3
BFI domain		
Openness	0.002	0.009
	(0.012)	(0.011)
Conscientiousness	0.009	-0.007
	(0.013)	(0.013)
Extraversion	0.006	-0.001
	(0.010)	(0.010)
Agreeableness	0.005	0.005
	(0.014)	(0.013)
Emotional stability	0.024*	0.021
	(0.010)	(0.011)
Age (25-34)		
35-44	-0.014	-0.089***
	(0.015)	(0.016)
45-54	-0.020	-0.159***
	(0.015)	(0.019)
55-64	-0.074***	-0.276***
	(0.016)	(0.023)
Interactions		
Openness*35-44	0.002	-0.008
	(0.017)	(0.016)
Openness*45-54	-0.018	-0.034*
	(0.015)	(0.014)
Openness*55-64	0.013	-0.005
	(0.017)	(0.015)
Conscientiousness*35-44	0.013	0.021
	(0.017)	(0.016)
Conscientiousness*45-54	0.027	0.022
	(0.018)	(0.016)
Conscientiousness*55-64	0.022	0.032
	(0.017)	(0.017)
Extraversion*35-34	-0.014	-0.010
	(0.014)	(0.013)
Extraversion*45-54	-0.004	0.006
	(0.015)	(0.014)
Extraversion*55-64	-0.029	-0.020
	(0.015)	(0.014)

	Model 1	Model 3
Agreeableness*35-44	0.001	0.010
	(0.019)	(0.018)
Agreeableness*45-54	-0.009	0.006
	(0.017)	(0.016)
Agreeableness*55-64	-0.024	-0.003
	(0.019)	(0.017)
Emotional stability*35-44	-0.018	-0.024
	(0.016)	(0.015)
Emotional stability*45-54	0.007	-0.008
	(0.015)	(0.014)
Emotional stability*55-64	0.010	-0.019
	(0.015)	(0.015)
Other explanatory variables		*included*
Intercept	0.887***	0.750***
	(0.012)	(0.024)
R^2	0.019	0.149
Weighted Observations	13,601,400	13,601,400
Sample size	7,963	7,963

Notes: Outcome (1=employed); Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 15 Regression results for employment status by immigration background, LISA sample

	Canadian born		Foreign born	
	Model 1	Model 3	Model 1	Model 3
BFI domain				
Openness	-0.004	-0.006	0.023	0.009
	(0.006)	(0.005)	(0.012)	(0.011)
Conscientiousness	0.033***	0.019**	-0.010	-0.009
	(0.007)	(0.006)	(0.011)	(0.011)
Extraversion	0.001	-0.004	-0.024	-0.021
	(0.006)	(0.006)	(0.012)	(0.012)
Agreeableness	0.005	0.014*	-0.026*	-0.003
	(0.007)	(0.007)	(0.011)	(0.011)
Emotional stability	0.021***	0.005	0.031*	0.015
	(0.006)	(0.006)	(0.013)	(0.013)
Gender (Male)				
Female		0.024*		-0.064**
		(0.012)		(0.021)
Age (25-34)				
35-44		-0.093***		-0.066
		(0.017)		(0.038)
45-54		-0.178***		-0.105*
		(0.021)		(0.043)
55-64		-0.295***		-0.206***
		(0.026)		(0.050)
Health status (Good or excellent)				
Fair or poor		-0.268***		-0.167***
		(0.031)		(0.045)
Years of full-time work experience		0.009***		0.008***
		(0.001)		(0.001)
Children in household (No children)				
Children in household		-0.017		0.006
		(0.013)		(0.020)
Living with spouse/partner (No)				
Living with spouse/partner		0.068***		0.016
		(0.015)		(0.033)

	Canadian born		Foreign born	
	Model 1	Model 3	Model 1	Model 3
Education level (High school)				
Less than high school		-0.144***		-0.111
		(0.032)		(0.063)
Diploma or certificate		0.036*		0.045
		(0.016)		(0.036)
Bachelor's degree		0.094***		0.066*
		(0.017)		(0.032)
Professional or grad. degree		0.111***		0.093**
		(0.018)		(0.034)
Province of residence		*included*		*included*
Intercept	0.865***	0.747***	0.847***	0.797***
	(0.006)	(0.026)	(0.011)	(0.047)
R^2	0.015	0.169	0.016	0.118
Weighted Observations	10,162,920	10,162,920	3,438,480	3,438,480
Sample size	6,305	6,305	1,658	1,658

Notes: Outcome (1=employed); Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 16 Interaction results for employment status by immigration background, LISA sample

	Model 1	Model 3
BFI domain		
Openness	-0.004	-0.004
	(0.006)	(0.006)
Conscientiousness	0.033***	0.033***
	(0.007)	(0.007)
Extraversion	0.001	0.001
	(0.006)	(0.006)
Agreeableness	0.005	0.005
	(0.007)	(0.007)
Emotional stability	0.021***	0.021***
	(0.006)	(0.006)
Immigration background (Canadian born)		
Foreign born	-0.018	-0.019
	(0.012)	(0.012)
Interactions		
Openness*Foreign born	0.028*	0.015
	(0.014)	(0.013)
Conscientiousness*Foreign born	-0.043***	-0.032**
	(0.013)	(0.012)
Extraversion*Foreign born	-0.025	-0.020
	(0.013)	(0.013)
Agreeableness*Foreign born	-0.030*	-0.020
	(0.013)	(0.012)
Emotional stability*Foreign born	0.010	0.018
	(0.014)	(0.013)
Other explanatory variables		*included*
Intercept	0.865***	0.760***
	(0.006)	(0.023)
R^2	0.016	0.149
Weighted Observations	13,601,400	13,601,400
Sample size	7,963	7,963

Notes: Outcome (1=employed); Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 17 Descriptive statistics for earnings analysis, LISA sample

	Proportion	Average score				
Weighted obs. = 12,146,150 *Sample size = 7,151*	*%*	*Openness*	*Conscien-tiousness*	*Extra-version*	*Agreea-bleness*	*Emotional stability*
All		0.06	-0.02	-0.02	-0.04	0.01
Gender						
Male	0.53	0.05	-0.13	-0.12	-0.18	0.22
Female	0.47	0.07	0.10	0.10	0.12	-0.23
Age						
25-34	0.20	0.13	-0.28	0.09	-0.11	-0.05
35-44	0.27	0.08	-0.03	0.02	-0.06	-0.03
45-54	0.29	0.00	0.05	-0.06	-0.01	0.03
55-64	0.24	0.06	0.13	-0.09	0.00	0.08
Immigration background						
Canadian born	0.75	0.05	-0.02	0.01	-0.06	-0.05
Foreign born	0.25	0.10	-0.03	-0.11	0.03	0.18
Indigenous identity						
Indigenous	0.98	0.11	0.03	-0.17	-0.28	-0.02
Non-Indigenous	0.02	0.06	-0.02	-0.01	-0.04	0.01
Health status						
Good or excellent	0.95	0.06	-0.01	-0.01	-0.04	0.03
Fair or poor	0.05	-0.01	-0.28	-0.21	-0.07	-0.33
Children in household						
Yes	0.41	-0.01	-0.04	0.02	-0.06	0.00
No	0.59	0.11	-0.01	-0.04	-0.03	0.02
Living with spouse/partner						
Yes	0.73	0.00	0.00	-0.02	-0.05	0.02
No	0.27	0.23	-0.08	-0.01	-0.03	-0.02
Education level						
Less than high school	0.04	-0.26	0.17	-0.13	0.08	-0.02
High school diploma	0.17	0.00	-0.03	-0.01	0.03	0.00
Diploma or certificate	0.39	0.05	0.00	0.01	-0.01	0.01
Bachelor's degree	0.23	0.10	-0.14	-0.04	-0.09	0.03
Professional or grad. degree	0.17	0.19	0.04	-0.02	-0.15	0.00

Note: Due to Statistics Canada disclosure rules, proportion and averages are based on weighted and rounded calculations.

Table 18 Descriptive statistics for earnings analysis, PIAAC-LISA sample

Weighted obs. = 13,921,510 *Sample size = 2,907*	Proportion	Average score				
	%	*Openness*	*Conscien-tiousness*	*Extra-version*	*Agreea-bleness*	*Emotional stability*
All		0.08	-0.03	-0.02	-0.03	0.02
Gender						
Male	0.54	0.04	-0.09	-0.12	-0.18	0.26
Female	0.46	0.12	0.06	0.09	0.13	-0.27
Age						
25-34	0.19	0.19	-0.34	0.05	-0.14	-0.06
35-44	0.28	0.09	-0.02	-0.01	-0.04	0.04
45-54	0.30	0.03	0.04	-0.05	0.02	0.02
55-64	0.23	0.03	0.13	-0.06	-0.01	0.06
Immigration background						
Canadian born	0.75	0.04	-0.04	-0.01	-0.06	-0.05
Foreign born	0.25	0.18	0.02	-0.07	0.05	0.22
Indigenous identity						
Indigenous	0.02	0.32	0.12	-0.02	-0.08	-0.01
Non-Indigenous	0.98	0.07	-0.03	-0.02	-0.03	0.02
Health status						
Good or excellent	0.94	0.08	-0.01	-0.01	-0.03	0.04
Fair or poor	0.06	-0.03	-0.22	-0.20	-0.03	-0.29
Children in household						
Yes	0.37	0.01	0.00	0.06	-0.02	0.01
No	0.63	0.11	-0.04	-0.07	-0.04	0.02
Living with spouse/partner						
Yes	0.70	0.01	0.01	-0.01	-0.04	0.02
No	0.30	0.24	-0.10	-0.05	-0.03	0.01
Education level						
Less than high school	0.06	-0.01	0.30	0.05	0.19	-0.12
High school diploma	0.19	0.02	-0.01	-0.02	-0.02	0.02
Diploma or certificate	0.43	0.05	-0.04	-0.02	-0.01	0.03
Bachelor's degree	0.18	0.09	-0.15	-0.03	-0.11	0.05
Professional or grad. degree	0.14	0.25	0.04	-0.04	-0.13	0.02
Cognitive skill level						
Low: Level 0/1	0.16	0.03	0.17	0.02	0.17	0.00
Medium: Level 2/3	0.66	0.10	-0.02	0.01	-0.04	0.00
High: Level 4/5	0.17	0.04	-0.23	-0.16	-0.24	0.15

Note: Due to Statistics Canada disclosure rules, proportion and averages are based on weighted and rounded calculations.

Table 19 OLS Regression Results for Earnings, LISA Sample

	Model 1	Model 2	Model 3
BFI domain			
Openness	-0.044**	-0.038*	-0.068***
	(0.017)	(0.017)	(0.016)
Conscientiousness	0.043**	0.038**	0.038**
	(0.015)	(0.015)	(0.014)
Extraversion	-0.007	0.009	0.016
	(0.016)	(0.015)	(0.015)
Agreeableness	-0.110***	-0.072***	-0.040**
	(0.015)	(0.015)	(0.015)
Emotional stability	0.102***	0.038**	0.031*
	(0.014)	(0.014)	(0.014)
Gender (Male)			
Female		-0.300***	-0.343***
		(0.029)	(0.027)
Age (25-34)			
35-44		0.049	0.006
		(0.048)	(0.046)
45-54		-0.064	-0.116*
		(0.057)	(0.053)
55-64		-0.444***	-0.506***
		(0.067)	(0.062)
Immigration background (Canadian born)			
Foreign born		-0.064	-0.131***
		(0.034)	(0.033)
Indigenous identity (Non-Indigenous)			
Indigenous		-0.178*	-0.075
		(0.087)	(0.089)
Health status (Good or excellent)			
Fair or poor		-0.332***	-0.245***
		(0.060)	(0.058)
Years of full-time work experience		0.022***	0.027***
		(0.002)	(0.002)
Children in household (No children)			
Children in household		-0.021	-0.038
		(0.037)	(0.034)
Living with spouse/partner (No)			
Living with spouse/partner		0.147***	0.106**
		(0.037)	(0.035)

	Model 1	Model 2	Model 3
Education level (High school)			
Less than high school			-0.243***
			(0.055)
Diploma or certificate			0.184***
			(0.035)
Bachelor's degree			0.522***
			(0.043)
Professional or grad. degree			0.773***
			(0.045)
Province of residence		*included*	*included*
Intercept	10.678***	10.429***	10.109***
	(0.015)	(0.055)	(0.063)
R^2	0.027	0.126	0.213
Weighted Observations	12,146,150	12,146,150	12,146,150
Sample size	7,963	7,963	7,963

Notes: Outcome=log earnings; Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 20 OLS regression results for earnings, PIAAC-LISA sample

	Model 1	Model 2	Model 3	Model 4
BFI domain				
Openness	-0.036	-0.023	-0.045	-0.048*
	(0.026)	(0.025)	(0.024)	(0.024)
Conscientiousness	0.051*	0.045*	0.049*	0.058**
	(0.024)	(0.023)	(0.022)	(0.022)
Extraversion	-0.038	-0.022	-0.013	-0.010
	(0.024)	(0.023)	(0.022)	(0.022)
Agreeableness	-0.116***	-0.079**	-0.052*	-0.046*
	(0.024)	(0.025)	(0.024)	(0.023)
Emotional stability	0.096***	0.028	0.016	0.012
	(0.023)	(0.025)	(0.024)	(0.023)
Gender (Male)				
Female		-0.274***	-0.322***	-0.295***
		(0.049)	(0.048)	(0.049)
Age (25-34)				
35-44		0.019	-0.026	-0.029
		(0.068)	(0.067)	(0.066)
45-54		-0.142	-0.185*	-0.179*
		(0.083)	(0.081)	(0.081)
55-64		-0.534***	-0.559***	-0.541***
		(0.100)	(0.098)	(0.099)
Immigration background (Canadian born)				
Foreign born		-0.032	-0.087	-0.032
		(0.057)	(0.056)	(0.060)
Indigenous identity (Non-Indigenous)				
Indigenous		-0.219*	-0.100	-0.086
		(0.102)	(0.102)	(0.104)
Health status (Good or excellent)				
Fair or poor		-0.301***	-0.234**	-0.224*
		(0.089)	(0.088)	(0.088)
Years of full-time work experience		0.025***	0.029***	0.028***
		(0.003)	(0.003)	(0.003)
Children in household (No children)				
Children in household		-0.043	-0.050	-0.049
		(0.055)	(0.053)	(0.052)
Living with spouse/partner (No)				
Living with spouse/partner		0.121*	0.092	0.080
		(0.055)	(0.054)	(0.054)

	Model 1	Model 2	Model 3	Model 4
Education level (High school)				
Less than high school			-0.164	-0.097
			(0.088)	(0.090)
Diploma or certificate			0.214***	0.180**
			(0.055)	(0.056)
Bachelor's degree			0.511***	0.434***
			(0.073)	(0.077)
Professional or grad. degree			0.716***	0.606***
			(0.074)	(0.082)
Cognitive skill level (Low)				
Medium: Level 2/3				*0.201**
				(0.085)
High: Level 4/5				*0.388****
				(0.103)
Province of residence		*included*	*included*	*included*
Intercept	10.628***	10.375***	10.082***	9.904***
	(0.023)	(0.095)	(0.105)	(0.123)
R^2	0.022	0.122	0.204	0.214
Weighted Observations	13,921,510	13,921,510	13,921,510	13,921,510
Sample size	2,907	2,907	2,907	2,907

Notes: Outcome=log earnings; Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 21 OLS regression results for earnings by gender, LISA sample

	Male		Female	
	Model 1	Model 3	Model 1	Model 3
BFI domain				
Openness	-0.037	-0.050*	-0.070**	-0.096***
	(0.022)	(0.022)	(0.024)	(0.022)
Conscientiousness	0.040*	0.032	0.093***	0.041*
	(0.020)	(0.019)	(0.023)	(0.021)
Extraversion	0.010	0.016	0.014	0.021
	(0.023)	(0.021)	(0.021)	(0.019)
Agreeableness	-0.073***	-0.039*	-0.099***	-0.046*
	(0.019)	(0.018)	(0.024)	(0.022)
Emotional stability	0.066**	0.044*	0.039	0.013
	(0.022)	(0.020)	(0.022)	(0.019)
Age (25-34)				
35-44		-0.017		0.041
		(0.065)		(0.065)
45-54		-0.092		-0.134
		(0.077)		(0.074)
55-64		-0.472***		-0.487***
		(0.106)		(0.076)
Immigration background (Canadian born)				
Foreign born		-0.176***		-0.085
		(0.043)		(0.048)
Indigenous identity (Non-Indigenous)				
Indigenous		0.005		-0.149
		(0.107)		(0.126)
Health status (Good or excellent)				
Fair or poor		-0.281***		-0.210*
		(0.078)		(0.093)
Years of full-time work experience		0.022***		0.031***
		(0.003)		(0.002)
Children in household (No children)				
Children in household		0.077		-0.175***
		(0.043)		(0.048)
Living with spouse/partner (No)				
Living with spouse/partner		0.179***		0.031
		(0.053)		(0.048)

	Male		Female	
	Model 1	Model 3	Model 1	Model 3
Education level (High school)				
Less than high school		-0.298***		-0.112
		(0.068)		(0.091)
Diploma or certificate		0.174***		0.201***
		(0.048)		(0.057)
Bachelor's degree		0.464***		0.585***
		(0.059)		(0.065)
Professional or grad. degree		0.699***		0.854***
		(0.061)		(0.066)
Province of residence		*included*		*included*
Intercept	10.856***	10.151***	10.478***	9.739***
	(0.022)	(0.088)	(0.022)	(0.081)
R^2	0.014	0.163	0.020	0.206
Weighted Observations	6,384,870	6,384,870	5,761,270	5,761,270
Sample size	3,534	3,534	3,617	3,617

Notes: Outcome=log earnings; Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 22 Interaction results for earnings by gender, LISA sample

	Model 1	Model 3
BFI domain		
Openness	-0.037	-0.053*
	(0.022)	(0.022)
Conscientiousness	0.040*	0.026
	(0.020)	(0.019)
Extraversion	0.010	0.021
	(0.023)	(0.021)
Agreeableness	-0.073***	-0.037*
	(0.019)	(0.018)
Emotional stability	0.066**	0.047*
	(0.022)	(0.021)
Gender (Male)		
Female	-0.378***	-0.340***
	(0.029)	(0.027)
Interactions		
Openness*Female	-0.033	-0.030
	(0.032)	(0.031)
Conscientiousness*Female	0.053	0.027
	(0.031)	(0.028)
Extraversion*Female	0.005	-0.009
	(0.031)	(0.028)
Agreeableness*Female	-0.026	-0.010
	(0.030)	(0.027)
Emotional stability*Female	-0.027	-0.030
	(0.033)	(0.030)
Other explanatory variables		*included*
Intercept	10.856***	10.102***
	(0.022)	(0.064)
R^2	0.065	0.213
Weighted Observations	12,146,150	12,146,150
Sample size	7,151	7,151

Notes: Outcome=log earnings; Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 23 OLS regression results for earnings by age, LISA sample

	25-34		35-44		45-54		55-64	
	M 1	*M 3*	*M 1*	*M 3*	*M 1*	*M 3*	*M 1*	*M 3*
BFI domain								
Openness	-0.125***	-0.112***	-0.041	-0.054	-0.029	-0.086**	0.029	-0.029
	(0.036)	(0.032)	(0.037)	(0.033)	(0.032)	(0.027)	(0.027)	(0.026)
Conscientiousness	0.122***	0.109***	-0.031	-0.010	0.071*	0.068*	-0.035	-0.023
	(0.033)	(0.032)	(0.028)	(0.028)	(0.030)	(0.027)	(0.028)	(0.027)
Extraversion	0.055	0.069*	0.002	0.012	-0.014	0.015	-0.056	-0.030
	(0.034)	(0.033)	(0.030)	(0.026)	(0.028)	(0.023)	(0.028)	(0.026)
Agreeableness	-0.119***	-0.085**	-0.095***	-0.020	-0.153***	-0.050	-0.068*	0.005
	(0.033)	(0.028)	(0.027)	(0.025)	(0.030)	(0.028)	(0.031)	(0.030)
Emotional stability	0.081*	0.012	0.075**	0.026	0.126***	0.039	0.131***	0.047
	(0.032)	(0.031)	(0.028)	(0.028)	(0.028)	(0.024)	(0.028)	(0.026)
Gender (Male)								
Female		-0.371***		-0.350***		-0.357***		-0.236***
		(0.060)		(0.055)		(0.051)		(0.058)
Immigration (Can. born)								
Foreign born		-0.091		-0.161*		-0.188***		-0.020
		(0.085)		(0.068)		(0.055)		(0.057)
Indigenous identity (None)								
Indigenous		-0.203		0.132		-0.315		0.064
		(0.177)		(0.148)		(0.194)		(0.109)
Health status (Good or ex.)								
Fair or poor		-0.199		-0.048		-0.326**		-0.265*
		(0.172)		(0.100)		(0.109)		(0.111)
Years of full-time work experience		0.067***		0.047***		0.026***		0.018***
		(0.008)		(0.005)		(0.003)		(0.003)
Children in household (No)								
Children in household		-0.318***		-0.081		0.005		0.057
		(0.076)		(0.057)		(0.056)		(0.115)
Living with spouse/partner (No)								
Living with spouse/partner		0.146*		0.101		0.174*		0.038
		(0.072)		(0.070)		(0.075)		(0.063)

	25-34		35-44		45-54		55-64	
	M 1	*M 3*	*M 1*	*M 3*	*M 1*	*M 3*	*M 1*	*M 3*
Ed. level (High school)								
Less than high school		0.080		-0.268*		-0.371***		-0.166
		(0.129)		(0.112)		(0.111)		(0.093)
Diploma or certificate		0.148		0.142		0.246**		0.193***
		(0.081)		(0.079)		(0.076)		(0.055)
Bachelor's degree		0.413***		0.591***		0.656***		0.450***
		(0.091)		(0.089)		(0.088)		(0.076)
Profess. or grad. degree		0.601***		0.848***		0.873***		0.788***
		(0.101)		(0.090)		(0.092)		(0.090)
Province of residence		*incl.*		*incl.*		*incl.*		*incl.*
Intercept	10.524***	9.934***	10.725***	9.784***	10.794***	9.929***	10.626***	9.885***
	(0.035)	(0.121)	(0.030)	(0.173)	(0.027)	(0.169)	(0.027)	(0.147)
R^2	0.060	0.233	0.023	0.255	0.040	0.264	0.024	0.165
Weighted Observations	2,444,550	2,444,550	3,244,760	3,244,760	3,573,000	3,573,000	2,883,840	2,883,840
Sample size	1,157	1,157	1,571	1,571	2,311	2,311	2,112	2,112

Notes: Outcome=log earnings; Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 24 Interaction results for earnings by age, LISA sample

	Model 1	Model 3
BFI domain		
Openness	-0.125***	-0.108**
	(0.036)	(0.035)
Conscientiousness	0.122***	0.119***
	(0.033)	(0.031)
Extraversion	0.055	0.064*
	(0.034)	(0.032)
Agreeableness	-0.119***	-0.095**
	(0.033)	(0.030)
Emotional stability	0.081*	0.032
	(0.032)	(0.030)
Age (25-34)		
35-44	0.201***	-0.011
	(0.045)	(0.047)
45-54	0.271***	-0.134*
	(0.043)	(0.055)
55-64	0.102*	-0.524***
	(0.043)	(0.064)
Interactions		
Openness*35-44	0.085	0.048
	(0.050)	(0.047)
Openness*45-54	0.097*	0.023
	(0.049)	(0.045)
Openness*55-64	0.154***	0.086
	(0.046)	(0.044)
Conscientiousness*35-44	-0.153***	-0.131**
	(0.043)	(0.042)
Conscientiousness*45-54	-0.051	-0.055
	(0.045)	(0.042)
Conscientiousness*55-64	-0.157***	-0.134**
	(0.043)	(0.041)
Extraversion*35-34	-0.053	-0.049
	(0.044)	(0.041)
Extraversion*45-54	-0.068	-0.048
	(0.043)	(0.040)
Extraversion*55-64	-0.110*	-0.092*
	(0.043)	(0.041)

	Model 1	Model 3
Agreeableness*35-44	0.024	0.060
	(0.043)	(0.039)
Agreeableness*45-54	-0.034	0.041
	(0.044)	(0.040)
Agreeableness*55-64	0.051	0.115**
	(0.045)	(0.042)
Emotional stability*35-44	-0.006	-0.006
	(0.042)	(0.039)
Emotional stability*45-54	0.045	0.016
	(0.042)	(0.038)
Emotional stability*55-64	0.050	-0.013
	(0.042)	(0.039)
Other explanatory variables		*included*
Intercept	10.524***	10.130***
	(0.035)	(0.064)
R^2	0.049	0.218
Weighted Observations	12,146,150	12,146,150
Sample size	7,151	7,151

Notes: Outcome=log earnings; Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 25 OLS regression results for earnings by immigration background, LISA sample

	Canadian born		Foreign born	
	Model 1	Model 3	Model 1	Model 3
BFI domain				
Openness	-0.049**	-0.080***	-0.010	-0.032
	(0.018)	(0.017)	(0.042)	(0.035)
Conscientiousness	0.049**	0.051**	0.023	0.001
	(0.017)	(0.016)	(0.034)	(0.028)
Extraversion	-0.004	0.018	-0.032	0.014
	(0.018)	(0.017)	(0.034)	(0.031)
Agreeableness	-0.098***	-0.036*	-0.136***	-0.041
	(0.017)	(0.016)	(0.033)	(0.031)
Emotional stability	0.125***	0.040**	0.028	-0.020
	(0.015)	(0.014)	(0.037)	(0.036)
Gender (Male)				
Female		-0.364***		-0.301***
		(0.032)		(0.056)
Age (25-34)				
35-44		0.005		0.042
		(0.049)		(0.114)
45-54		-0.108		-0.069
		(0.059)		(0.119)
55-64		-0.507***		-0.444***
		(0.073)		(0.129)
Health status (Good or excellent)				
Fair or poor		-0.286***		-0.136
		(0.073)		(0.104)
Years of full-time work experience		0.026***		0.028***
		(0.002)		(0.004)
Children in household (No children)				
Children in household		0.019		-0.187**
		(0.039)		(0.068)
Living with spouse/partner (No)				
Living with spouse/partner		0.102*		0.110
		(0.040)		(0.072)

	Canadian born		Foreign born	
	Model 1	Model 3	Model 1	Model 3
Education level (High school)				
Less than high school		-0.258***		-0.161
		(0.062)		(0.127)
Diploma or certificate		0.184***		0.183**
		(0.041)		(0.065)
Bachelor's degree		0.574***		0.377***
		(0.049)		(0.080)
Professional or grad. degree		0.811***		0.660***
		(0.056)		(0.074)
Province of residence		*included*		*included*
Intercept	10.695***	10.106***	10.639***	10.002***
	(0.017)	(0.074)	(0.030)	(0.096)
R^2	0.032	0.224	0.023	0.210
Weighted Observations	9,150,360	9,150,360	2,995,790	2,995,790
Sample size	5,719	5,719	1,432	1,432

Notes: Outcome=log earnings; Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 26 Interaction results for earnings by immigration background, LISA sample

	Model 1	Model 3
BFI domain		
Openness	-0.049**	-0.078***
	(0.018)	(0.017)
Conscientiousness	0.049**	0.047**
	(0.017)	(0.016)
Extraversion	-0.004	0.018
	(0.018)	(0.017)
Agreeableness	-0.098***	-0.039*
	(0.017)	(0.016)
Emotional stability	0.125***	0.043**
	(0.015)	(0.014)
Immigration background (Canadian born)		
Foreign born	-0.056	-0.128***
	(0.035)	(0.033)
Interactions		
Openness*Foreign born	0.039	0.052
	(0.045)	(0.039)
Conscientiousness*Foreign born	-0.027	-0.041
	(0.038)	(0.032)
Extraversion*Foreign born	-0.028	-0.010
	(0.039)	(0.035)
Agreeableness*Foreign born	-0.038	0.001
	(0.036)	(0.034)
Emotional stability*Foreign born	-0.097*	-0.065
	(0.039)	(0.036)
Other explanatory variables		*included*
Intercept	10.695***	10.107***
	(0.017)	(0.062)
R^2	0.031	0.214
Weighted Observations	12,146,150	12,146,150
Sample size	7,151	7,151

Notes: Outcome=log earnings; Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 27 Descriptive statistics for workplace activities analysis, LISA sample

	Proportion	Average score and standard deviation				
	%	*Openness*	*Conscien-tiousness*	*Extra-version*	*Agreea-bleness*	*Emotional stability*
Job-related training						
No	0.34	0.07	-0.03	0.01	-0.05	0.03
Yes	0.66	0.00	0.01	-0.13	0.01	-0.04
Cooperation						
Low	0.48	0.05	-0.05	-0.06	-0.07	-0.03
High	0.52	0.10	0.01	0.04	-0.02	0.05
Sharing information						
Low	0.16	0.11	-0.05	0.00	0.01	-0.04
High	0.84	0.06	-0.01	-0.01	-0.05	0.02
Training others						
Low	0.61	0.03	-0.04	-0.03	-0.04	-0.01
High	0.40	0.14	0.01	0.03	-0.05	0.04
Planning activities (own)						
Low	0.21	-0.06	-0.05	-0.09	0.02	-0.05
High	0.79	0.11	-0.01	0.02	-0.06	0.03
Planning activities (others)						
Low	0.58	0.01	-0.05	-0.06	-0.03	-0.03
High	0.42	0.15	0.02	0.06	-0.06	0.07
Organizing own time						
Low	0.13	-0.06	-0.08	-0.10	0.07	-0.05
High	0.87	0.09	-0.01	0.01	-0.06	0.02
Influencing others						
Low	0.42	-0.05	-0.03	-0.11	-0.02	-0.02
High	0.58	0.16	-0.01	0.07	-0.06	0.04
Negotiating with others						
Low	0.57	0.00	-0.03	-0.09	-0.03	-0.03
High	0.43	0.17	0.00	0.11	-0.06	0.06
Simple problem solving						
Low	0.18	-0.04	0.07	-0.07	0.08	-0.02
High	0.82	0.10	-0.04	0.01	-0.07	0.02
Complex problem solving						
Low	0.48	-0.01	0.02	-0.04	0.00	-0.02
High	0.52	0.15	-0.05	0.03	-0.08	0.04

Note: Due to Statistics Canada disclosure rules, proportion and averages are based on weighted and rounded calculations.

Table 28 Model 1 regression results for workplace activities, LISA sample

	Job-related training	Cooperation	Sharing information	Training others
BFI domain				
Openness	0.012	0.004	-0.006	0.026**
	(0.009)	(0.008)	(0.006)	(0.008)
Conscientiousness	-0.013	0.010	0.008	0.011
	(0.010)	(0.008)	(0.006)	(0.008)
Extraversion	0.031***	0.021**	-0.000	0.006
	(0.008)	(0.008)	(0.006)	(0.008)
Agreeableness	-0.019*	0.005	-0.010	-0.012
	(0.009)	(0.008)	(0.006)	(0.008)
Emotional stability	0.019*	0.016*	0.009	0.010
	(0.008)	(0.008)	(0.005)	(0.008)
Weighted Observations	9,632,820	12,542,570	12,536,550	12,537,780
Sample size	5,588	7,394	7,392	7,390
	Planning act. (own)	**Planning act. (others)**	**Organizing own time**	**Influencing others**
BFI domain				
Openness	0.028***	0.030***	0.017**	0.047***
	(0.007)	(0.008)	(0.006)	(0.008)
Conscientiousness	0.008	0.015	0.010	0.002
	(0.007)	(0.008)	(0.006)	(0.008)
Extraversion	0.012	0.019*	0.009	0.034***
	(0.007)	(0.008)	(0.005)	(0.008)
Agreeableness	-0.024***	-0.024**	-0.023***	-0.027***
	(0.006)	(0.008)	(0.005)	(0.007)
Emotional stability	0.014*	0.024**	0.009	0.013
	(0.007)	(0.007)	(0.006)	(0.007)
Weighted Observations	12,538,660	12,531,940	12,538,070	12,508,550
Sample size	7,389	7,389	7,390	7,375
	Negotiating with others	**Simple p. solving**	**Complex p. solving**	
BFI domain				
Openness	0.033***	0.024***	0.045***	
	(0.008)	(0.006)	(0.008)	
Conscientiousness	0.000	-0.015*	-0.021*	
	(0.009)	(0.006)	(0.009)	
Extraversion	0.042***	0.009	0.011	
	(0.008)	(0.006)	(0.008)	
Agreeableness	-0.023**	-0.024***	-0.029***	
	(0.008)	(0.006)	(0.008)	
Emotional stability	0.020**	0.010	0.020**	
	(0.007)	(0.006)	(0.007)	
Weighted Observations	12,532,280	12,518,380	12,513,930	
Sample size	7,387	7,381	7,375	

Notes: Outcome=high/frequent engagement in workplace activity; Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

Table 29 Model 3 regression results for workplace activities, LISA sample

	Job-related training	Cooperation	Sharing information	Training others
BFI domain				
Openness	0.006	0.007	-0.008	0.016*
	(0.009)	(0.008)	(0.006)	(0.008)
Conscientiousness	-0.011	0.015	0.010	0.024**
	(0.010)	(0.008)	(0.006)	(0.008)
Extraversion	0.031***	0.016*	-0.005	0.011
	(0.008)	(0.008)	(0.006)	(0.008)
Agreeableness	-0.007	0.005	-0.003	-0.001
	(0.009)	(0.008)	(0.006)	(0.008)
Emotional stability	0.014	0.016*	0.008	0.002
	(0.008)	(0.008)	(0.006)	(0.008)
Weighted Observations	9,632,820	12,542,570	12,536,550	12,537,780
Sample size	5,588	7,394	7,392	7,390
	Planning act. (own)	**Planning act. (others)**	**Organizing own time**	**Influencing others**
BFI domain				
Openness	0.024***	0.025**	0.014*	0.037***
	(0.007)	(0.008)	(0.006)	(0.008)
Conscientiousness	0.005	0.020*	0.009	0.012
	(0.007)	(0.008)	(0.006)	(0.008)
Extraversion	0.010	0.021**	0.008	0.036***
	(0.006)	(0.007)	(0.005)	(0.008)
Agreeableness	-0.009	-0.011	-0.015**	-0.014
	(0.006)	(0.008)	(0.006)	(0.007)
Emotional stability	0.011	0.016*	0.007	0.005
	(0.007)	(0.007)	(0.006)	(0.008)
Weighted Observations	12,538,660	12,531,940	12,538,070	12,508,550
Sample size	7,389	7,389	7,390	7,375
	Negotiating with others	**Simple p. solving**	**Complex p. solving**	
BFI domain				
Openness	0.025**	0.015*	0.030***	
	(0.008)	(0.006)	(0.008)	
Conscientiousness	0.005	-0.005	-0.007	
	(0.009)	(0.006)	(0.009)	
Extraversion	0.045***	0.009	0.016*	
	(0.008)	(0.006)	(0.007)	
Agreeableness	-0.010	-0.013*	-0.007	
	(0.008)	(0.006)	(0.008)	
Emotional stability	0.008	0.003	-0.001	
	(0.008)	(0.006)	(0.007)	
Weighted Observations	12,532,280	12,518,380	12,513,930	
Sample size	7,387	7,381	7,375	

Notes: Outcome=high/frequent engagement in workplace activity; Bootstrap standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001.

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