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Authors:
William C. Smith and Frank Fernandez

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AIR-PIAAC Contact:

Jaleh Soroui (AIR-PIAAC Director)
Saida Mamedova (Senior Research Analyst)
PIAACgateway.com
piaac@air.org

Authors Contact:

Pennsylvania State University. State College, PA.
William C. Smith at wcs152@psu.edu; and Frank Fernandez at fyf5033@psu.edu.

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William C. Smith and Frank Fernandez

Pennsylvania State University

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William C. Smith
Email: wcs152@psu.edu
Frank Fernandez
Email:fyf5033@psu.edu

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Abstract

The United States and Canada are destination countries for immigrants, attracting more than half of all Organization for Economic Cooperation and Development (OECD) immigrants and two-thirds of the OECD immigrants who have received tertiary education. Initial comparisons of immigrant wages to their native peers using data the Program for the International Assessment of Adult Competencies (PIAAC) reveal within country immigrant wage gaps in these two countries with immigrants making, on average, over $200 less per month than their native peers. This study uses PIAAC to examine potential explanations for these immigrant wage gaps using an additive path analysis approach that allows us to match populations by occupational field and segment out the direct effect of immigrant status on wage from the indirect effect of immigrant status on wage through education and literacy and numeracy skills. Results suggest that factors attributing to the immigrant wage gap differ by country. In the U.S. immigrants are disproportionately concentrated in low wage jobs. Wage gaps disappear, however, once immigrants and natives in the U.S. are matched by occupational field. The strong link between education and wage in the U.S., combined with the immigrant educational attainment gap present in the country, suggests that to reduce the within country wage gap policies should be adopted that (a) aid persistence in education by supporting the transition of immigrants into the American education system, and (b) train educators to properly support learners that are culturally and linguistically diverse. The initial wage gap in Canada remains present in nearly all occupational fields suggesting that immigrants in Canada that work in the same field and have equivalent education and literacy and numeracy skills as their native peers earn significantly less money, controlling for key demographic variables. We conclude that in Canada, the wage gap results from underemployment, marginal returns on education and discriminatory wage practices.. These findings suggest that the point-based immigrant policy in Canada is successful in attracting highly educated immigrants but may fail to properly support them once they arrive in-country.

Immigrants in both the U.S. and Canada earn less, on average, than their native-born peers[1] (Aydemir & Sweetman, 2006; Borjas, 1994; Coulombe, Grenier, & Nadeau, 2012; Nadeau & Seckin, 2010; Oreopoulos, 2011; Papademetriou & Sumption, 2011). Past work on the immigrant wage gap has often focused on single country studies (e.g., Nadeau and Seckin, 2010), with few focused on comparative analysis (Antecol, Cobb-Clark, & Trejo, 2003; Barone and Van de Werfhorst, 2011; Chiswick & Miller, 1990). Many of these studies include measures of workers' education, but a lesser number include measures of workers' skills. However, immigrants' skills and education levels are at the heart of recent immigration debates in the U.S. Congress. At the time of this writing, the U.S. Senate has passed a bipartisan immigration reform bill, but the House of Representatives has yet to vote on a similar bill. Interest groups, such as the business community and labor unions, that lobbied the Senate were concerned with immigrants' skill levels and employment (see e.g., Kim, 2013; Parker & Martin, 2013). Ultimately, the Senate bill contained provisions for "a new visa program for lesser-skilled workers . . . and it shifts the country's immigration policies away from a family-based system to one that is focused on (sic) more on work skills" (Kim, 2013). As the U.S. continues to consider immigration policy reforms, it is important to understand the effects of skill-based and family reunification-based policies as well as the relationships between immigration, education, skills, and employment outcomes across a range of occupational fields.

This study speaks to current policy issues and equity concerns around immigration, education and skills, and occupational outcomes. Immigration policy is often discussed as a false dichotomy—that is, people often assume that policies can either be more immigrant-friendly *or* they can benefit a nation's economy by providing relatively inexpensive labor. In this paper, we break away from this binary. Through rigorous quantitative analysis we are able to shed light on the factors that contribute to within country immigrant wage gaps and how policy may contribute to, or perpetuate, such factors. Using data from the Program for the International Assessment of Adult Competencies (PIAAC), we test for wage differences between native citizens and immigrants, controlling for literacy and numeracy skills and education levels. PIAAC is the most recent international survey of adult education and skills, and it includes several variables that allow us to test for relationships in novel ways (e.g., occupation categories, assessments of workers' skills). Our empirical findings inform claims about the different outcomes resulting from U.S. and Canadian immigration policies with respect to education and employment. This topic has timely implications for U.S. researchers and policymakers as evidenced by the ongoing immigration policy debates.

This paper is composed of four sections. The first section presents a review of the literature and sets forth several hypotheses. The following section provides an overview of the data and methodology used in this study. The results section examines the potential mechanisms that play into the immigrant wage gap, including disproportionate concentrations of immigrants in low wage fields, differential wage premiums for education and literacy and numeracy skills, and wage differences by occupational field. Finally, the paper concludes with a discussion of the findings, future research directions, and implications for education and immigration policies.

[1] The term "native" is used to refer to non-immigrant workers. Immigrants in this study were those defined as first-generation immigrants according to the *IMGEN* variable in the PIAAC codebook. Second-generation immigrants were excluded from the study. We define "native" workers as those with all other responses on the *IMGEN* variable (i.e., "non 1st or 2nd generation immigrants," "non-immigrant and one foreign-born parent," and "non stated or inferred"). The term "native" is commonly used in immigrant research, including recent publications by the World Bank. See, e.g., Őzden and Wagner (2014) "Immigrant versus Natives?: Displacement and Job Creation."

Literature Review

Published research on this topic has relied on datasets that are now antiquated. In addition, there is a great need for studies that consider immigrants' skills in addition to their levels of education. PIAAC presents an opportunity to both use current data and consider a variety of workers' skills. Comparative work that focuses on the U.S. and Canada often relies on data from the United States' 1980 census and Canada's 1981 census (Chiswick & Miller, 1990) and 1990/1991 censuses (Antecol, Cobb-Clark, & Trejo, 2003; Borjas, 1994). Even more recently published studies continue to use data that are several decades old. For example, Nadeau and Seckin (2010) use data from 1980, 1990, and 2000, while Barone and Van de Werfhorst (2011) use data from the 1994 International Adult Literacy Survey (IALS). We argue that these studies are inadequate for current immigration policy discussions because immigration reforms were passed by the U.S. Congress in the 1980s and 1990s and signed by Presidents Reagan and Clinton, respectively. Moreover, education has changed in Canada and the U.S. since the 1980s and 1990s, with more emphasis placed on universal access and the development of skills for use in the "knowledge economy" (Davies & Hammack, 2005, p. 89).

Why Examine Canada and the United States?

As members of the Organization for Economic Cooperation and Development (OECD), the U.S. and Canada receive more than half of all OECD immigrants and two-thirds of the OECD immigrants who have attended tertiary institutions (Grogger & Hanson, 2011). Although Canada and the U.S. are some of the most attractive destination countries in the developed world, they achieve this status with vastly different immigration policies. Canada's point system prioritizes skills while the US prioritizes family reunification, and these policies attract distinct groups of immigrants with different needs and abilities (Aydemir & Sweetman, 2006; Bloemraad & Provine, 2013, Oreopoulos, 2011).

Since the 1960s, changes to Canadian immigration policy can been characterized by a single overarching goal: to supply educated and skilled immigrant workers who can satisfy unmet demands in Canadian labor markets. Canada first adopted a point system based on immigrants' skills and potential business contributions in 1967 with significant reforms following in 1976 and 2002 (Czaika & de Haas, 2011; Government of Canada, 2010). The point system gives preferences based on factors such as immigrants' educational credentials, language skills, age, work experience, employment offers, capital, and previous Canadian residency. While the skill-based point system is the most distinguishing aspect of Canadian immigration policy, the 2002 Immigration and Refugee Protection Act also included provisions for family reunification and refugees. Still, more than half of all immigrants who enter Canada are screened by the point system (Oreopoulos, 2011). In 2010, the Federal Skilled Workers Program—the official name of Canada's point system—admitted approximately 49,000 workers, accompanied by an estimated 55,000 children and spouses (Papademetriou & Sumption, 2011). Oreopoulos (2011) notes that "virtually every immigrant who enters Canada under the point system now has at least an undergraduate degree," (p. 149) whereas only about 20% of native-born Canadians earn the baccalaureate. In addition, Canada's immigration policy is characterized by a certain amount of devolution. For example, provinces and territories may, after negotiating agreements

with the national government, offer residency to immigrants who can fill local employment needs (Government of Canada, 2010).

Although immigration policies ensure that those who enter the country are more skilled or more educated, Canada can only benefit from an influx of human capital if immigrants are able to use their skills in their new jobs. In other words, Canada's policy of leveraging immigrant education and skills for economic growth is not achieving its stated goals if immigrants are "undermatched," relative to occupational fields. Despite the premiums placed on immigrants' skills and the goal of using immigration to fulfill labor market needs, many studies have found that foreign-born workers earn less than similarly qualified natives (Coulombe, Grenier, & Nadeau, 2012; Nadeau & Seckin, 2010; Papademetriou & Sumption, 2011; Oreopoulos, 2011). Not only do these findings suggest that Canadian immigration policy is achieving suboptimal results, these findings present an equity concern for immigrant workers. In March of 2006, the Canadian Minister of Citizenship and Immigration recognized these concerns stating:

> Many newcomers have trouble finding work that allows them to fully use their skills and experience. Their unemployment and underemployment represent more than just a drag on Canada's productivity. It is a human tragedy, and basic decency dictates that it not be allowed to continue (as cited in Wald & Fang, 2008, p. 458).

Additionally, this should cause concern for immigrants' offspring who are the native workers of the future. As Zhou (1997) writes in a review of literature on immigration research, "the implications for the new second generation are profound, since the current state and future prospects of immigrant children are related to the advantages or disadvantages that accrue to the socioeconomic status of their parent" (p. 66).

At various points in history, the U.S. has given preference to different types of immigrants. Without recounting the long history of racial preferences and exclusion, we might consider modern U.S. immigration policy starting with the Bracero Program that lasted from 1942-1964 (Massey, 1987). Hanson (2009) argues that the Bracero Program marked the last time the U.S. adopted immigration policies that prioritized low-skilled workers and allocated visas in a manner that was responsive to the demand for labor by U.S. businesses. Critiquing current policies, especially those for temporary workers, Hanson argues that "because of policy constraints on the number of visas, some types of legal immigration are largely unresponsive to market forces . . . US visa programs are simply not designed to accommodate the changing demands of US industry" (2009, p. 8). The Immigration Act of 1990 set upper limits on the number of legal immigrants that could be admitted under a series of categories: 480,000 family-sponsored; 140,000 skilled employees; and 55,000 in a lottery category. In addition to these categories, an unlimited number of immediate family members may gain legal residency, while asylees and refugees fall under other provisions of immigration law (Hanson, 2009).

Perhaps one of the biggest reasons that immigration policy continues to be politically salient in the U.S. is that the estimated number of undocumented immigrants has continued to increase from the 1980 estimate of 2-4 million. Estimates of undocumented immigrants increased to 8.5 million people in 2000, and presently approximately 11.6 million undocumented immigrants live in the U.S. in addition to 29.2 million legal residents (Nwosu, Batalova & Auclair, 2014). During President George W. Bush's second term, three congressional bills were voted on. The Republican controlled House of Representatives passed the "Border Protection, Anti-Terrorism, and Illegal Immigration Control Act of 2005" (H.R. 4437), which focused on enforcement. The Senate passed two bills, one under a Republican majority (S.2611) and the

second a year later under Democratic control (S.1639). Although neither Senate bill was adopted by the House of Representatives, the earlier bill would have created a larger guest worker program for less-skilled immigrants, and the latter bill would have "reduced family reunification as the basis for admitting immigrants and replaced it with a 'merit system' in which points would be allocated for a range of skills plus family connections" (Holzner, 2011).

Past cross-national studies that have attempted to include the U.S. and/or Canada have lacked a natural comparative sample. When the countries that are studied are more different than similar, it can be difficult to reach useful implications about wages, skill gaps, and education policies. For example, Barone and Van de Werfhorst (2011) looked at the U.S., Germany, the Netherlands, and the United Kingdom. In part, their findings revealed more about what was dissimilar than what was similar among the countries' education systems. When Barone and Van de Werfhorst compared the U.S. and Germany, they noted that years of education in one country were not the same as years of education in the other country. The German education system uses tracking to prepare students with skills that are more clearly aligned with specific career fields, whereas the U.S. system is less focused and prepares students with broader curricula. A comparative study between two systems that are so fundamentally different in the ways they promote education and skills makes it more difficult to draw implications for policy. However, Davies and Hammack (2005) compare the higher education systems of the U.S. and Canada, noting that the "two countries offer a strategic contrast" and that the relative similarities of their secondary schools "make it possible to isolate those factors responsible for any observed differences" in higher education outcomes (p. 91). By choosing two countries that are geographically adjacent, comparably developed, and similar in terms of education systems, we are able to reach more valid conclusions about differences in wages between immigrant populations. In comparing the U.S. to Canada, we learn about current U.S. policy as well as what might occur should the U.S. transition to a predominately skills-based policy similar to that seen in Canada.

Factors Affecting Wages

Educational Credentials and Literacy and Numeracy Skills

There are multiple schools of thought about what determines an employee's wages. Even though wages or income levels are often used as variables in studies about labor market and educational outcomes, there is no consensus about what determines wage levels. A prominent sociological position is that educational credentials are poor proxies of a graduate's skills, arguing instead that labor markets value the way schools socialize students for the workplace (Bowles & Gintis, 2002; Gintis, 1971). Barone and Van de Werhorst (2011) counter that skills, such as literacy, that are associated with educational credentials are more responsible for differences in wages than had been previously indicated by Bowles and Gintis—although they admit that there is still variation across countries.

Past research on the immigrant achievement gap indicates that there is a strong correlation between years of education completed (i.e. credential) and a student's score on an achievement test (i.e. literacy and numeracy skills). However, this correlation may be smaller for immigrant groups. Research using cross national data on 15 year olds from the 2000, 2003, and 2009 Programme for International Student Assessment (PISA) identifies an immigrant achievement gap in literacy and numeracy between 30 and 80 points (Azzolini, Schnell &

Palmer 2012; Levels & Dronkers 2008; Levels, Dronkers & Kraaykamp 2008; Marks 2005; Sori, Susteric & Gaber 2011), relative to an OECD average of 500 points. The achievement gap with native students is more sizable for first generation immigrants (Azzolini et al. 2012; Portes & Fernandez-Kelly 2008), and first generation immigrants who arrive later in their school career (i.e., arriving at secondary school age compared to arriving at elementary school age) are at a disadvantage (Smith, Brezicha, & Persson, 2014). The primary determinants of the immigrant achievement gap are family background variables, including: socio-economic status, home language, parental education, and family structure. In his investigation of 20 countries using the 2000 PISA, Marks (2005) finds that socio-economic, socio-cultural, and school factors account for the bulk of the immigrant achievement gap.

In the majority of countries, there is a strong association between the amount of education you complete and your earnings. Psacharopoulos and Patrinos (2004) in their overview of the literature on returns to educational investments conclude that at the individual level "it is established beyond any reasonable doubt that there are tangible and measurable returns to investment in education" (p. 118). While Psacharopoulos and Patrinos argue that there is less evidence that education has broader effects on economic development, others have found that education also benefits firms and national economies (Blundell, Dearden, Meghir, & Sianesi, 1999). With regard to higher education, there is evidence that returns to schooling can vary by the selectivity of institution a student attends and the academic major a student pursues (e.g., Thomas & Zhang, 2004; Zhang, 2008). With the direct relationship between schooling, skills, and employment outcome, closing the immigrant achievement gap may be one avenue to addressing the immigrant wage gap.

Additionally, understanding educational and occupational outcomes for immigrant populations is important because the occupational successes or failure of immigrants are often perpetuated through future generations. The idea that immigrants can earn fair wages and contribute to economic growth appeals to democratic notions of equal opportunity and economic mobility. However, as Borjas (1994) argues, "there exists a strong correlation between the skills of immigrants and the skills of second-generation Americans, so that the huge skill differentials observed among today's foreign-born groups become tomorrow's differences among American-born ethnic groups" (p. 1713).

Work-Related Conditions

The number of hours worked are related to monthly wages for both immigrant and native employees, however, studies have also shown that experience and time spent working at a specific job may be related to immigrants' earnings. In a Canadian context, studies have shown that work experience and job-tenure are related to immigrants' employment and earnings (Bloom & Gunderson, 1987; Wald & Fang, 2008). Research on the U.S. has found similar relationships between work-related conditions and wages. For example, Gentsch and Massey (2011) found that immigrants from Mexico often accumulate work experience over several trips to the U.S. Furthermore, exposure and adeptness with information and communications technology (ICT) may influence an individual's wage. Language of the ICT medium is important, as immigrants whose home language differs from the dominant language are less likely to access and use ICT (Ono & Zavodny, 2008) and may, therefore, be at a disadvantage in regards to earnings.

The Potential of Adult Education

Increasingly, more individuals are delaying their post-secondary education or returning to school following experience in the labor force. This opportunity for continuing education into adulthood may be used by immigrants as a vehicle to improve their earnings. Banerjee and Verma (2011) find that immigrants are more likely to pursue education after migration to Canada if they are younger, fluent in English or French, and were already well educated or had professional work experience in their country of origin. Furthermore, they find that shorter-term professional development programs lead to quicker wage returns than post-secondary degree programs, which may take more years to lead to higher wages. Teranishi, Suárez-Orozco, and Suárez-Orozco (2011) argue that immigrants to the U.S. may use open-access, affordable community colleges to increase English-language skills and do better in the labor market.

Discrimination

While education is related to higher wages, generally speaking, there is also significant evidence that immigrant wages are often lower than their similarly qualified native peers, with the possibility that this wage gap is due in part to employment discrimination (Coulombe, Grenier, & Nadeau, 2012; Nadeau & Seckin, 2010). Oreopoulos (2009) used a randomized field experiment to find evidence that Canadian employers in Toronto discriminated against equally qualified immigrants with names that suggested Chinese, Indian, or Pakistani origins. Other studies find employment discrimination against minority or "foreign" sounding names in the U.S., but they do not test for effects on immigrants, per se (Bertrand & Mullainathan, 2003; Jacquemet & Yannelis, 2012). The existence of wage differences between equally qualified and skilled immigrants and natives in the same occupation suggests that immigrant status is the dominate factor contributing to the wage gap and may indicate the presence of discriminatory practices.

Hypotheses

Drawing on previous research and situating our analysis in the unique policy environments of the U.S. and Canada this study tests four hypotheses.

H1: First generation immigrants in Canada will have relatively more education and higher skills than their peers in the U.S.

H2: The more educated and higher skilled immigrant population in Canada will hold positions in higher wage fields, relative to the immigrant population in the U.S.

H3: After controlling for education levels as well as literacy and numeracy skills, the immigrant wage gap will be less pronounced in Canada, relative to the U.S.

H4: After controlling for education levels as well as literacy and numeracy skills, the immigrant wage gap within the U.S. and Canada will differ by occupational field.

Methodology

Data and Variables

Data[2] from the 2012 Program for the International Assessment of Adult Competencies (PIAAC) were used in this study. PIAAC is a large-scale, cross-national assessment of individuals' literacy, numeracy, and technology based problem solving skills. In addition to literacy, numeracy, and problem solving scores, rich demographic and occupational information is collected through background questionnaires. Nationally representative samples of individuals age 16-65 were drawn from 24 OECD or OECD partner countries. The emphasis in PIAAC on skills and participation in the 21st century global economy make it a rich source capable of addressing inquiries on education, immigrant background, literacy and numeracy skills, and various measures of occupational success. Data from the U.S. and Canada[3] samples were used for this study. Analysis was conducted separately, by country, with regression coefficients compared to examine between country differences.

To explore differences by immigrant status first-generation immigrants (hereafter immigrants)—those born outside the country of interest—were compared to individuals native to the country[4] (first generation immigrant = 1, native = 0). Cases missing information on immigrant status and wage, the dependent variable, were omitted from this study. Additionally, wage outliers, which we defined as individuals whose monthly wage is greater than three standard deviations above the mean wage for their occupational field, were deleted. To address problems with missing data from the remaining control variables, a statistical process called multiple imputation was used (Wayman, 2003). This process does not change any of the original data, but it substitutes likely values for missing responses of PIAAC survey participants. Given these conditions our final sample for the U.S. study was approximately 2,700 of which 12.8% were first generation immigrants. The final sample for Canada included approximately 15,660 participants of which 17.9% were first generation immigrants[5].

To calculate the wage gap between first generation immigrants and their native peers, we used self-reported monthly *wage* plus bonuses in U.S. dollars and adjusted for inflation as the dependent variable[6]. Specific individual wage information available from the restricted 2012 PIAAC data was obtained through a Thomas J. Alexander Fellowship with the Organization for

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[2] Non-weighted data were used in this analysis. The use of final full sample weights did not change the conclusion of the complete model for the U.S. and Canadian full sample. Specifically, the inclusion of sample weights confirmed that after controlling for literacy skills, numeracy skills, education, and control variables the mean wage of immigrants in the U.S. is greater than that of their native peers while the mean wage of immigrants in Canada is below that of their native peers.

[3] Although PIAAC data can be disaggregated into English Canadian and French Canadian populations this study used the overall Canadian sample as our interest is focused on comparing national immigration policy and both subpopulations are subject to national policy.

[4] Second generation immigrants – individuals born in the country whose parents were born outside the country – are omitted from this study due to small sample size. Additionally, to avoid misinterpretation they are not included in the native category.

[5] The large Canadian sample size is due to the large total sample size. Canada oversampled (a) their national language minority; (b) individuals age 16-24; (c) immigrants; (d) aboriginals.

[6] All analyses were also completed using a log transformation of wage. No substantive difference in results was found. To ease interpretation the untransformed wage dependent variable is reported in this study. The log transformed results are available from the author upon request.

Economic Co-Operation and Development (OECD). Primary explanatory or independent variables included years of education and literacy and numeracy skills. *Years of education* was derived from PIAAC data identifying the highest educational credential an individual has completed, using the International Standard Classification of Education (ISCED) scale. Similar to Byun and Kim (2010), years of education was recoded from ISCED categories using country specific mapping information from Appendix 5 of the PIAAC technical report (e.g. in the U.S. completion of ISCED 1 = 6 years of education and completion of ISCED 6 = 21 years of education)[7]. Literacy skills and numeracy skills were identified through PIAAC's *literacy* and *numeracy* assessment. The third cognitive assessment, problem solving, was not used in this analysis due to the disproportionate number of missing cases from immigrant participants[8]. Literacy and numeracy scores are similarly scaled and range from 0 to 500. The inclusion of literacy and numeracy skills in the analysis allows us to parse out differences between returns on individual skill or ability and returns to educational credentials, with years of education acting as a proxy.

Beyond education and literacy and numeracy skills, factors that may affect an individual's wage include the experience they have in the position, how many hours per week they work, their area of study, and their adeptness with ICT. To address the confounding nature of these factors we treated each factor as a control variable in this study. *Hours worked per week* and years in the position are continuous variables. *Years in the position* was derived by subtracting an individual's age from the age they started their present position. Identifying an individual's area of study is important as individual's focused on engineering, for example, might have higher numeracy scores that may lead to higher wages. To control for *area of study*, we created dummy coded variables from eight broad educational categories: services or general education, education focused, humanities, social sciences, science or math, engineering, agriculture or veterinary medicine, and health. *ICT* adeptness is a context specific measure that asks the individual whether they have the ICT skills necessary to be successful in their occupation (1 = yes, 0 = no). Finally, *gender* (female = 1, male = 0) and *age* (continuous variable) were included in the analysis to control for discrepancies in wage by gender and experience. Noticeably absent from the included variables are immigrant's country of origin. Given the small sample size of the U.S. the disaggregation of immigrants by country of origin would significantly reduce the power necessary to complete our analysis. Thus this omission is unfortunate but necessary to retain the comparative structure of this study. Descriptive statistics for each national sample by immigrant status can be found on Tables 1 and 2.

Table 1: Comparing Immigrant and Native Samples in the U.S.

	Overall Sample	**First Generation Immigrant**	**Native**
Percent of Sample	100%	12.84%	87.16%
Monthly Earnings (USD PPP)	3964.64 (3511.57)	3718.56 (3432.19)	4000.89 (3522.37)

[7] Years of education was chosen over maintaining ISCED levels due to: the similar structure of the U.S. and Canadian education systems, the minimal numbers in the lower ISCED levels and in vocational categories, and to ease interpretation of results (i.e. one year of education versus differences relative to a reference ISCED level).
[8] Relative to the 12.8% and 17.9% of immigrants in the national samples, 36.8% and 21.3% of participants missing problem solving scores are immigrants.

Literacy	277.46 (45.11)	244.91 (53.88)	282.26 (41.58)
Numeracy	262.62 (51.79)	233.99 (64.04)	266.84 (48.34)
Years of Schooling	13.72 (2.79)	13.11 (3.95)	13.81 (2.56)
ICT Skills	93.90% (0.24)	91.07% (0.29)	94.31% (0.23)
Age	40.02 (13.07)	39.46 (11.77)	40.10 (13.25)
Female	52.68% (0.50)	47.84% (0.50)	53.40% (0.50)
Hours Worked Per Week	39.70 (13.28)	40.16 (12.44)	39.63 (13.41)
Years in Position	7.42 (8.35)	6.10 (6.78)	7.61 (8.54)
Arrived in Country before Age 20	NA	47.69% (0.50)	NA
N	2700	350	2350

Note: Standard Deviations in Parentheses

Table 2: Comparing Immigrant and Native Samples in Canada

	Overall Sample	**First Generation Immigrant**	**Native**
Percent of Sample	100%	17.88%	82.12%
Monthly Earnings (USD PPP)	3398.77 (2511.77)	3207.44 (2557.59)	3440.44 (2499.84)
Literacy	274.45 (45.41)	263.57 (49.72)	276.82 (44.05)
Numeracy	265.80 (49.63)	258.29 (55.62)	267.44 (48.08)
Years of Schooling	13.34 (2.50)	14.66 (1.75)	13.05 (2.54)
ICT Skills	92.98% (0.26)	94.29% (0.23)	92.86% (0.26)
Age	40.42 (13.02)	39.86 (11.68)	40.54 (13.29)
Female	52.22% (0.50)	50.70% (0.50)	52.55% (0.50)
Hours Worked Per Week	37.38 (13.02)	36.94 (11.99)	37.47 (13.23)
Years in Position	7.99 (9.12)	5.16 (6.85)	8.60 (9.43)
Arrived in Country before Age 20	NA	31.82% (0.47)	NA
N	15660	2800	12860

Note: Standard Deviations in Parentheses

Extending past research, which tends to calculate wage gaps across entire populations, we matched immigrants and natives on occupation[9] allowing us to move beyond wage gaps that arise from an overconcentration of immigrants in low wage occupational fields to identify whether discriminatory practices are present within particular fields. To maintain our cross-national comparison, matching was limited to the first level of the International Classification of Occupations (ISCO-08). We then ran separate analyses by occupational field within each country. The following section describes the analytic approach used to examine the immigrant wage gap in the total population and by occupational field for the U.S. and Canada.

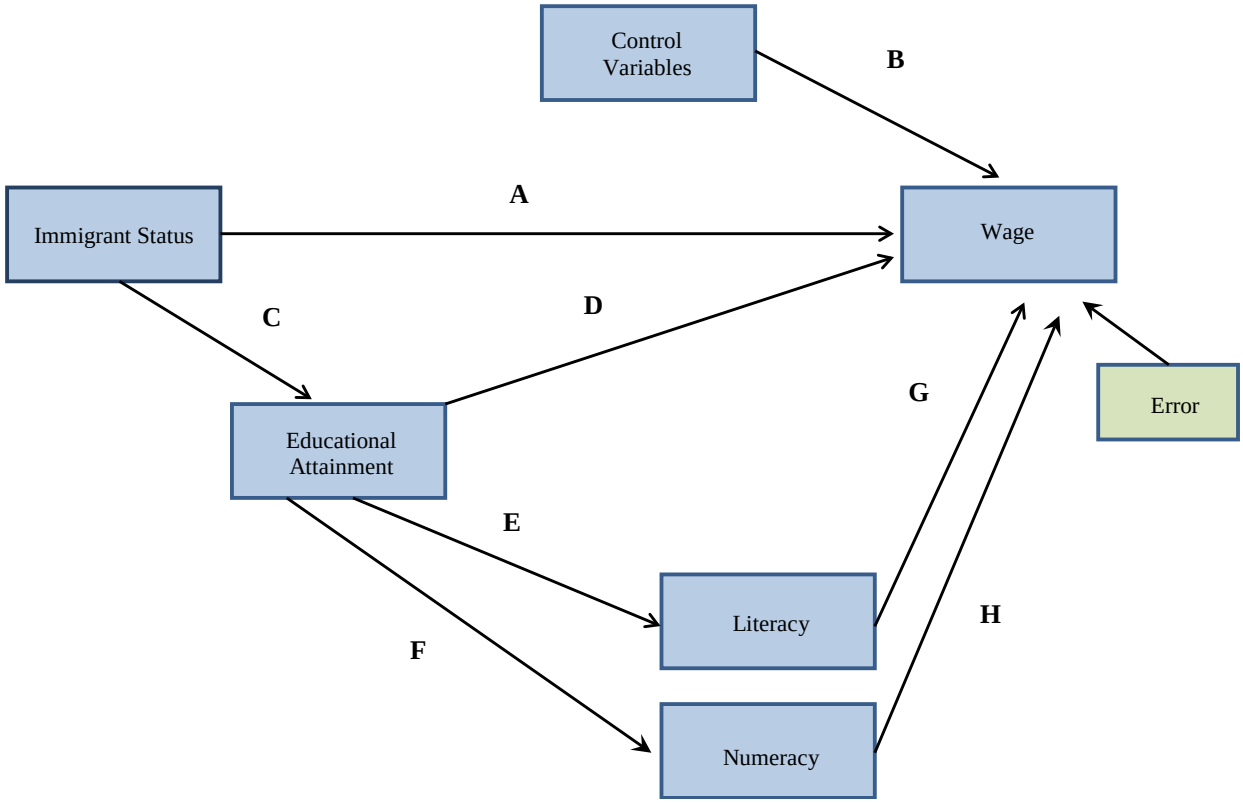
Methods

Path analysis or simultaneous regression, using Stata statistical software, was the primary method of analysis used in this study (Lleras, 2005). Path analysis allowed us to distinguish between the direct effect of immigrant status on individual wage and the indirect effects of immigrant status on wage through differences in years of education and literacy and numeracy skills. Analyses were conducted independently by country, allowing us to compare path coefficients between countries and evaluate the relative strength of explanatory variables. Additionally, to ensure that the immigrant-native wage differential is not merely an indicator of occupational difference, separate within country path analyses were conducted for each occupational field.

Figure 1 displays the path used in the complete model. The complete path was finished through four additive steps. The baseline model (path A) predicts the direct effect of immigrant status on individual wage for each occupational field, by country. The second model (paths A & B) adds the control variable identified in the preceding section—years in the position, hours worked per week, area of study, ICT adeptness, gender, and age—to the baseline model. The third model (paths A, B, C, & D) adds years of education to the second model, capturing the indirect effect of immigrant status through years of education. The final model (all paths) adds literacy and numeracy skills as an outcome of years of education, allowing us to distinguish between credential effects (path D) and skill premiums on wage (paths G & H). Path A in the final model can be interpreted as the standardized difference in wage between an immigrant and native employee working in the same occupational field with equivalent years of education and literacy and numeracy skills, controlling for years in the position, hours worked weekly, area of study, ICT skill, gender and age. Negative coefficients for path A in the final model indicate an immigrant wage gap, suggesting discriminatory practices may be present within the given occupational field.

[9] Occupational fields are defined in PIAAC using the International Standard Classification of Occupations (ISCO-08) prepared by the International Labour Office (see Appendix C; International Labour Organization, 2012). Two major groups, "Skilled Agricultural, Forestry, and Fishery Workers" and "Armed Forces Occupations" have been omitted from the sub-analysis due to small sample size.

Figure 1: Complete Path Predicting Wage[10]



Akaike Information Criteria (AIC) and Bayesian Information Criteria (BIC) were used to assess which model best fit the available data. AIC and BIC measure the overall model fit for both nested and non-nested models, identifying how likely the model is to generate the original data given the specified parameters. For AIC smaller numbers indicate desirable model fit; for BIC the larger negative number indicates the preferred model (Long & Freese, 2001). Finally, given the complex sample design and the use of plausible values in the measurement of literacy and numeracy skills, all analyses that include literacy and numeracy skills were ran ten times, once for each plausible value, and combined using the rules of Rubin (1987) to provide appropriate standard errors.

Results

Tables 1 and 2 (see above) suggest that immigrant populations in the U.S. and Canada differ relative to their native peers. T-tests indicate that an initial wage gap is present in Canada, with immigrants making $233.00 less per month than native workers ($p<.001$). A similar pattern

[10] Error terms for the other endogenous variables (educational attainment, literacy skills, and numeracy skills) are not shown in the model as wage is the dependent variable of interest.

is present in the U.S. (wage gap = $282.33); however, a t-test indicates that immigrant wages are not significantly different than the wage of native workers in the country (p=.162). Caution, however, should be taken in interpreting the lack of an initial significant wage gap in the U.S. as small sample size of the U.S. makes it more challenging to identify significant results. Additionally, although PIAAC makes a considerable effort to capture undocumented immigrants in the sample by not asking about citizenship status, ensuring anonymity, and sampling based on geographic location, past research indicates that undocumented immigrants are less likely to be included in a national sample (Smith, 2012). As undocumented immigrants in the U.S. are more likely to have jobs in lower wage fields (Passel, 2006), their potential omission from the sample artificially compresses the differences in wage between immigrants and native. Given the relatively small p-value, the potential undersampling of undocumented immigrants, and the overall small sample size we are confident that an initial wage gap is present in the U.S.

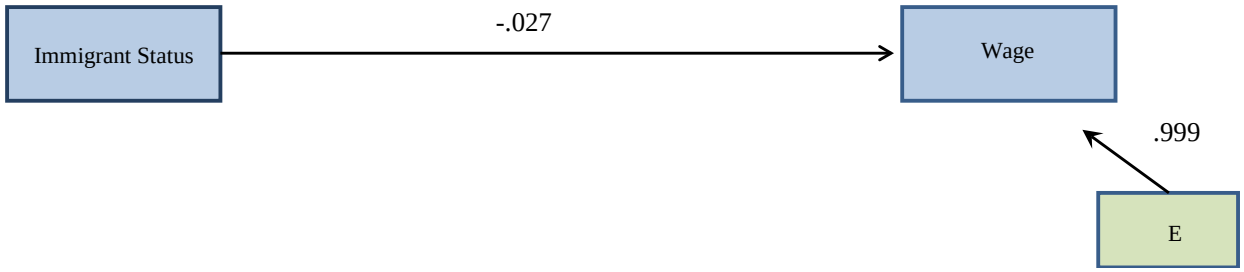
Although the magnitude of the initial immigrant wage gap is similar across the U.S. and Canada, immigrants in Canada complete more years of education and have higher literacy and numeracy test scores. Test scores indicate a significant gap in literacy ($p<.001$ for both) and numeracy skills ($p<.001$ for both) between immigrants and native peers in both countries. However, the magnitude of the gap is roughly three times larger in the U.S. (Literacy, 37.347; Numeracy, 32.850) than in Canada (Literacy, 13.254; Numeracy, 9.151). The larger skill gap in the U.S. may be partially attributed to the language of the assessment. In the U.S. the literacy and numeracy assessment was administered in English. In Canada participants were given the option of having the test administered in either English or French. According to the OECD, the language options offered in Canada captured the native language of 98.4% of the sampling frame while the monolingual requirement in the U.S. only covered 91.5% of the sampling frame (OECD, 2013), suggesting that a larger percentage of participants in the U.S. were likely to complete the literacy and numeracy assessment in a language other than their native language.

Regarding years of education completed, immigrants in Canada have an advantage over their native peers, completing over one and a half more years of education on average (1.611, $p<.001$). In the U.S. a significant education gap is present with immigrants completing a half year less than their native peers (-.706, $p<.001$). The presence of an education advantage in Canada, coupled the more minimal skill gap, suggests that national immigrant policies are, as expected, leading to differential immigrant compositions in each country.

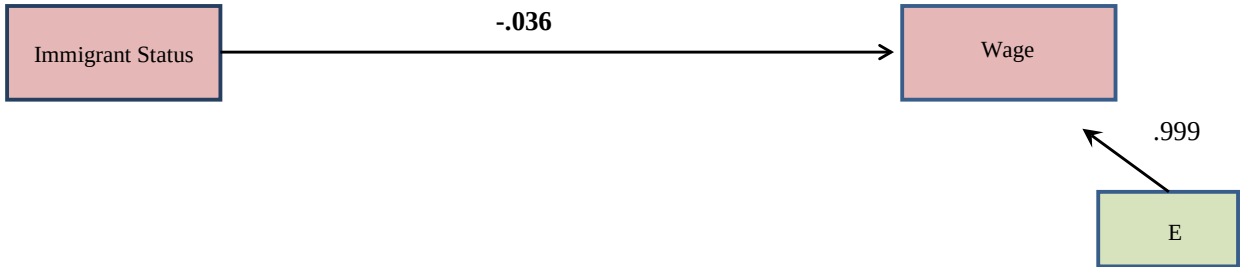
Does this initial difference in education and literacy and numeracy skills explain the presence of an immigrant wage gap in the U.S. and Canada? To address this question the additive path analysis outlined in the methods section was conducted by country for each national sample. Figure 2 illustrates the baseline model for each country with standardized coefficients akin to the initial wage gap found during bivariate analysis.

Figure 2: Baseline Models Predicting Wage from Immigrant Status

United States



Canada



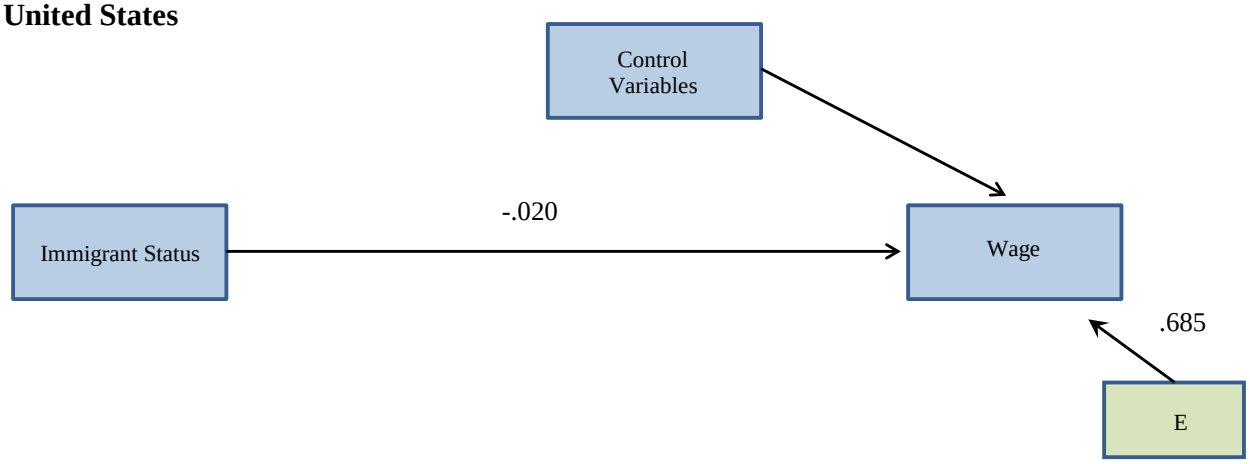
Note: Standardized Coefficients Provided. Italics indicates p<.10. Bold indicates p<.05.

Figure 3 adds control variables to the baseline model. Upon adjusting for age, gender, years in the position, hours worked per week, area of study, and ICT adeptness[11], the magnitude of the immigrant wage gap in both countries decreases slightly; from a standardized coefficient of -0.027 to -0.020 in the U.S. and from -0.036 to -0.033 in Canada.

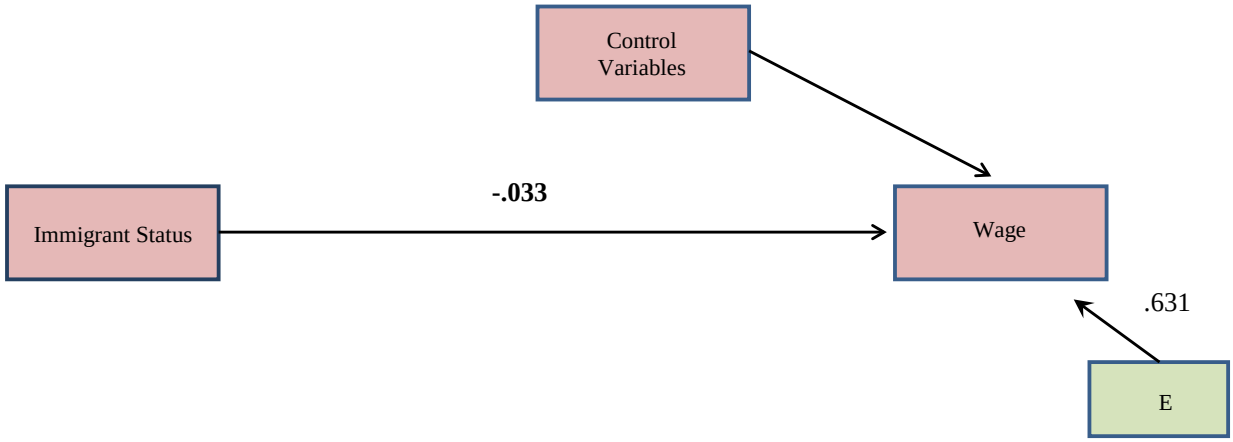
Figure 3: Predicting Wage from Immigrant Status– Controlling for Age, Gender, Years in Position, Hours Worked per Week, Area of Study, and ICT Adeptness

[11] ICT adeptness was largely non-significant in this study due to a lack of variance in participant response. Over 90% of participants in both the U.S. and Canada, regardless of immigrant status, responded that they have the necessary ICT skills to be successful at their job.

United States



Canada

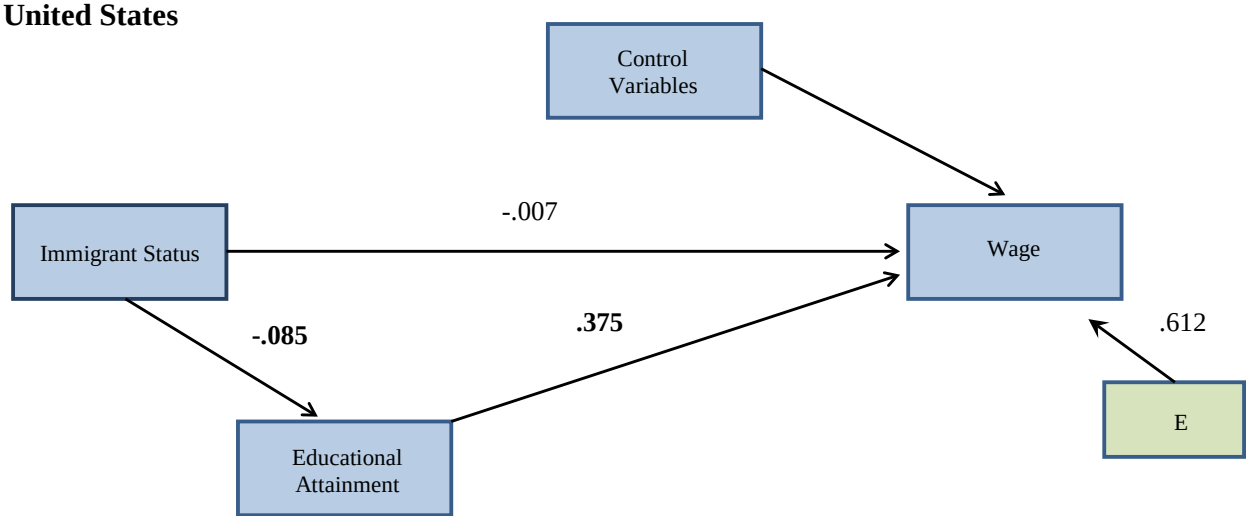


Note: Standardized Coefficients Provided. Italics indicates p<.10. Bold indicates p<.05.

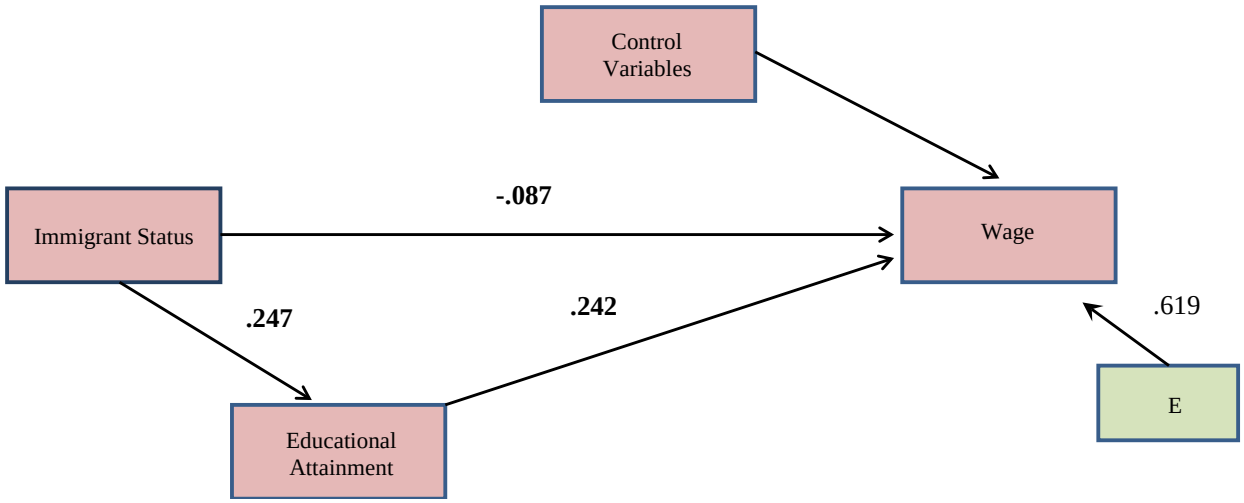
The educational advantage for immigrants in Canada suggests that, once we control for years of education completed, the immigrant wage gap in the country is likely to increase. Figure 4 finds this to be true as the standardized coefficient doubles in magnitude; immigrant workers in Canada make approximately 0.09 standard deviations less in monthly wage than native peers with an equivalent amount of education. In the U.S. the immigrant education gap leads to education moderating the effect of immigrant status on wage, reducing the immigrant wage gap to nearly zero.

Figure 4: Predicting Wage from Immigrant Status and Years of Education

United States



Canada



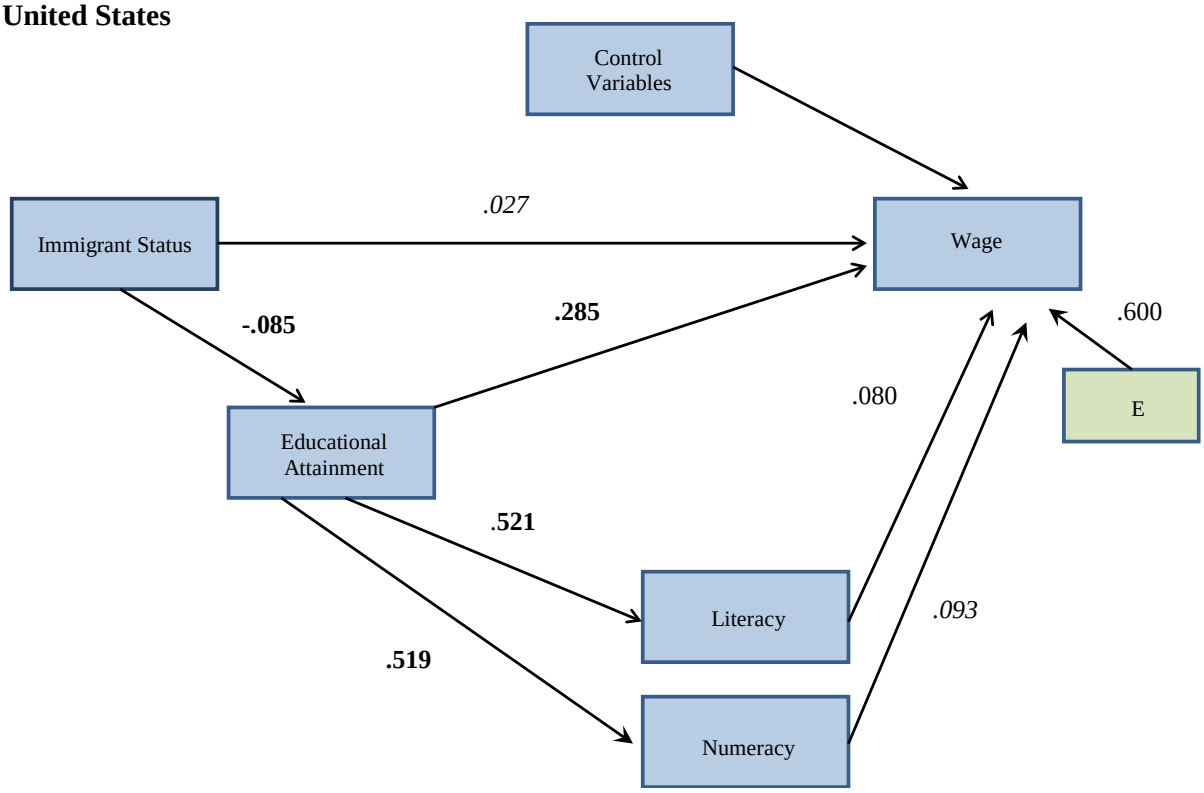
Note: Standardized Coefficients Provided. Italics indicates p<.10. Bold indicates p<.05.

In the final model, the immigrant wage gap in Canada remains robust with the inclusion of literacy and numeracy skills. However, once literacy and numeracy skills are included in the analysis, immigrants in the U.S. are at a wage advantage (see Figure 5). When immigrants and natives with equivalent education and skills are compared in the U.S., immigrants make a significantly higher monthly wage (p<.10)[12]. To see the unstandardized coefficients for the direct effect on wage for both countries see Appendix A.

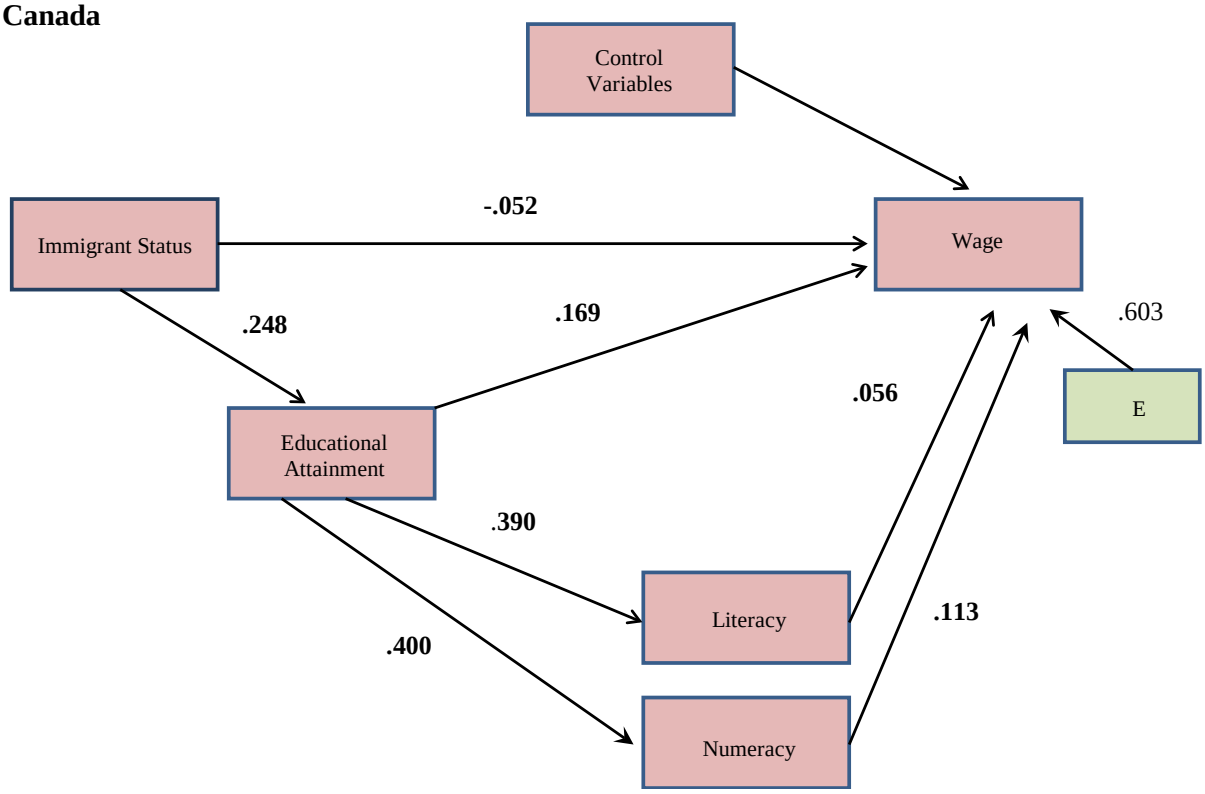
[12] Using the log transformation of wage as the dependent variable the significance level shifts from p<.10 to p<.05.

Figure 5: Predicting Wage from Immigrant Status, Years of Education and Literacy and Numeracy Skills

United States



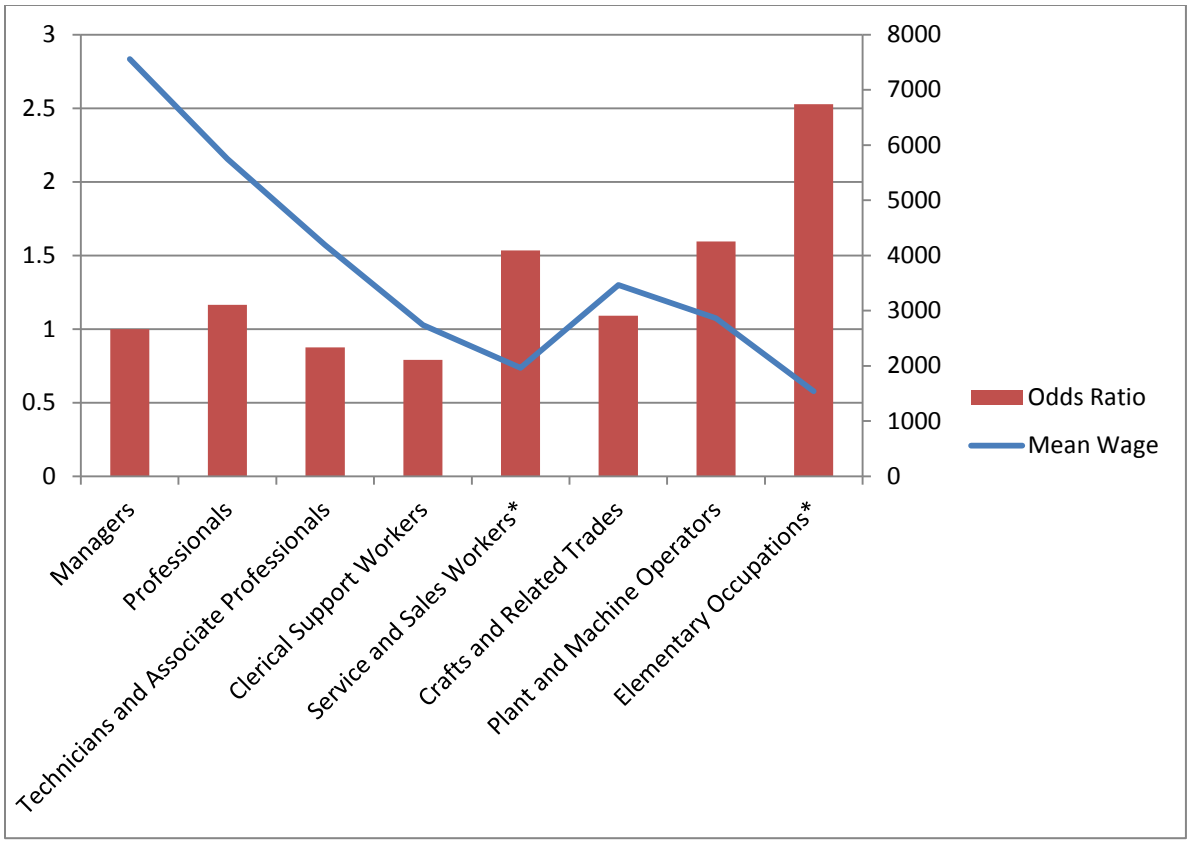
Canada



Note: Standardized Coefficients Provided. Italics indicates p<.10. Bold indicates p<.05.

The initial wage gap in each country could be a product of a disproportionate concentration of immigrants in lower wage occupations. This may especially be the case in the U.S., given the education and skill gaps between immigrants and natives. To examine the likelihood that immigrants will end up in a lower wage occupational field a multinomial logistic regression was conducted, predicting occupation from immigrant status. Figure 6 indicates that in the U.S. immigrants are more likely to be in a low wage occupation. Specifically, immigrants in the U.S. are more likely to be in the two lowest wage occupational fields, service and sales workers and elementary occupations, than the highest wage field, managers (see Appendix C for definitions and examples of all occupational fields). Figure 6 illustrates that in the U.S. the odds of an immigrant holding a position in the elementary occupation field is over 2.5 times greater than that of a native. In other words, relative to their native peers, immigrants in the U.S. are over two and a half times more likely to hold positions in the lowest wage elementary occupations field. The greater concentration of immigrants in the two lowest wage fields helps explain the initial immigrant wage gap present in the U.S.

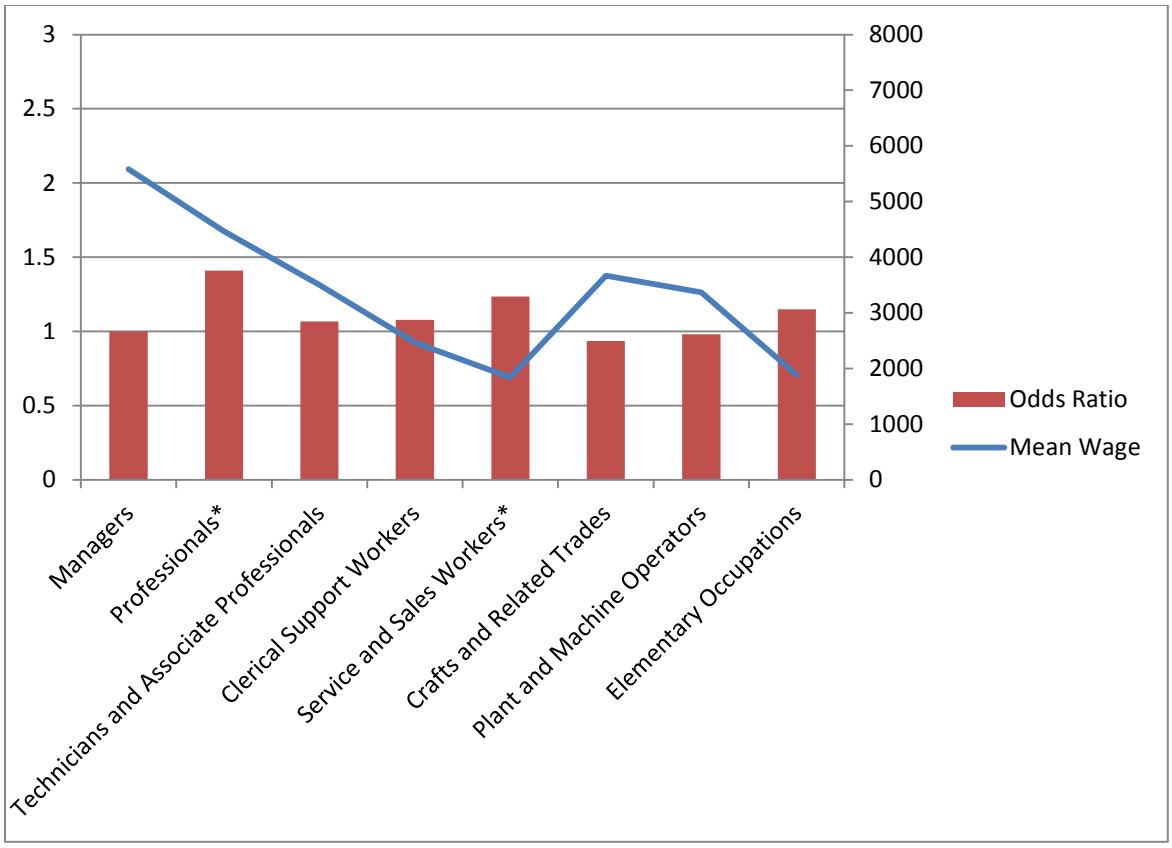
Figure 6: Odds of Immigrant Being in a Given Occupation: U.S.



Note: Managers were used as the reference group (OR=1.0). * p<.05

In Canada, immigrants are not concentrated in lower wage fields. Overall odds ratios hover around the 1.0 of the reference group, managers (see Figure 7). Immigrants are significantly more likely to hold a position in the lower wage service and sales field as well as the higher wage professional field. Therefore, unlike the U.S., a concentration of immigrants in lower wage occupations cannot explain the immigrant wage gap in Canada.

Figure 7: Odds of Immigrant Being in a Given Occupation: Canada



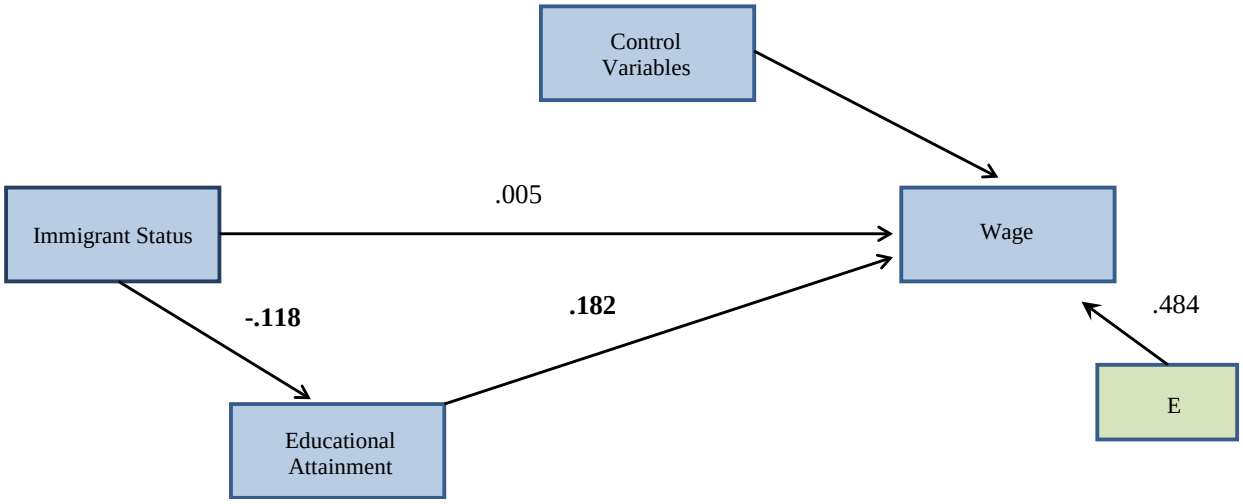
Note: Managers were used as the reference group (OR=1.0). * p<.05

Because the immigrant wage gap in Canada cannot be explained by a greater concentration of immigrants in lower wage occupations, it is important to examine whether the wage gap is a by-product of large wage differences within occupational fields. To address the question—does the immigrant wage gap differ by occupational fields in the given countries?—additive path analyses, similar to Figures 2 through 5, were completed for each occupational field, by country. Complete paths for all occupational fields can be found in Appendix B.

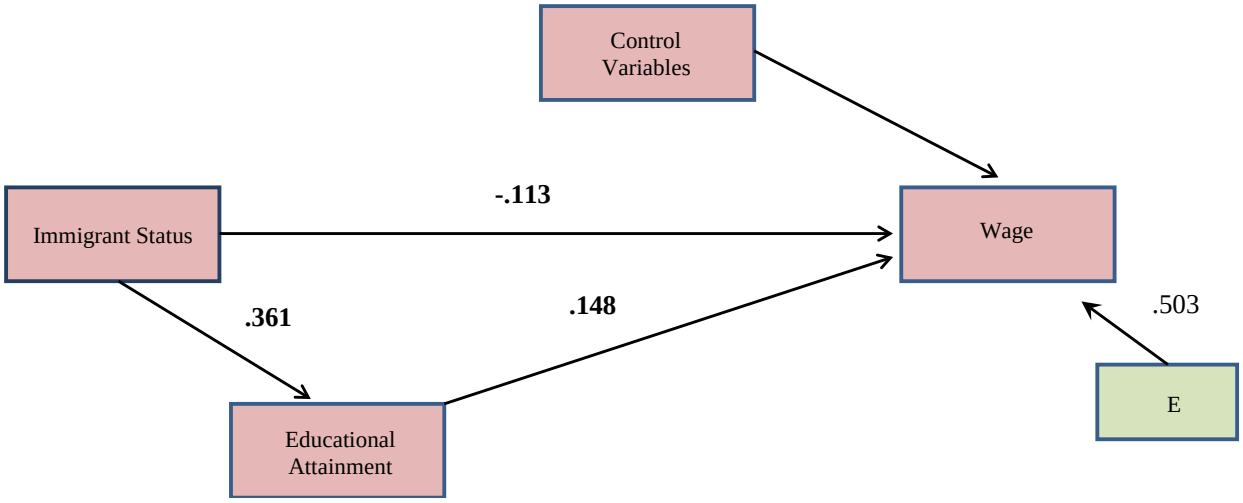
To illustrate the trends in each country a representative occupation was chosen. In both the U.S. and Canada, immigrants were more likely to hold a position in the lower wage service and sales field. The baseline model with immigrant status predicting wage for workers in the service and sales field reveals a significant wage gap in Canada (standardized $\beta = -0.061$, $p<.05$) with a positive, but not significant, wage advantage for immigrants in the U.S. (standardized $\beta = 0.024$, ns). Figure 8 displays an inflated wage gap in Canada once years of education and control variables are included in the model; for the U.S. there is no wage differential between immigrants and natives when these variables are included. Finally, the magnitude of the wage gap in Canada shrinks slightly once literacy and numeracy skills are included in the model while the wage differential in the U.S. remains non-significant and positive (see Figure 9). The total effect of immigrant status on wage in Canada (-0.042) for the complete model is found by adding the direct effect (-0.092) to the indirect effect of immigrant status through years of education (0.361*0.121) and the indirect effect of immigrant status through literacy (0.361*0.233*0.064) and numeracy skills (0.361*0.218*0.010). This suggests that the entirety of the immigrant wage gap in Canada can be attributed to immigrant status and that the educational and skill benefits of immigrants in Canada reduce, but do not completely eliminate, the country's wage gap.

Figure 8: Predicting Wage in Service and Sales Field from Immigrant Status and Years of Education

United States



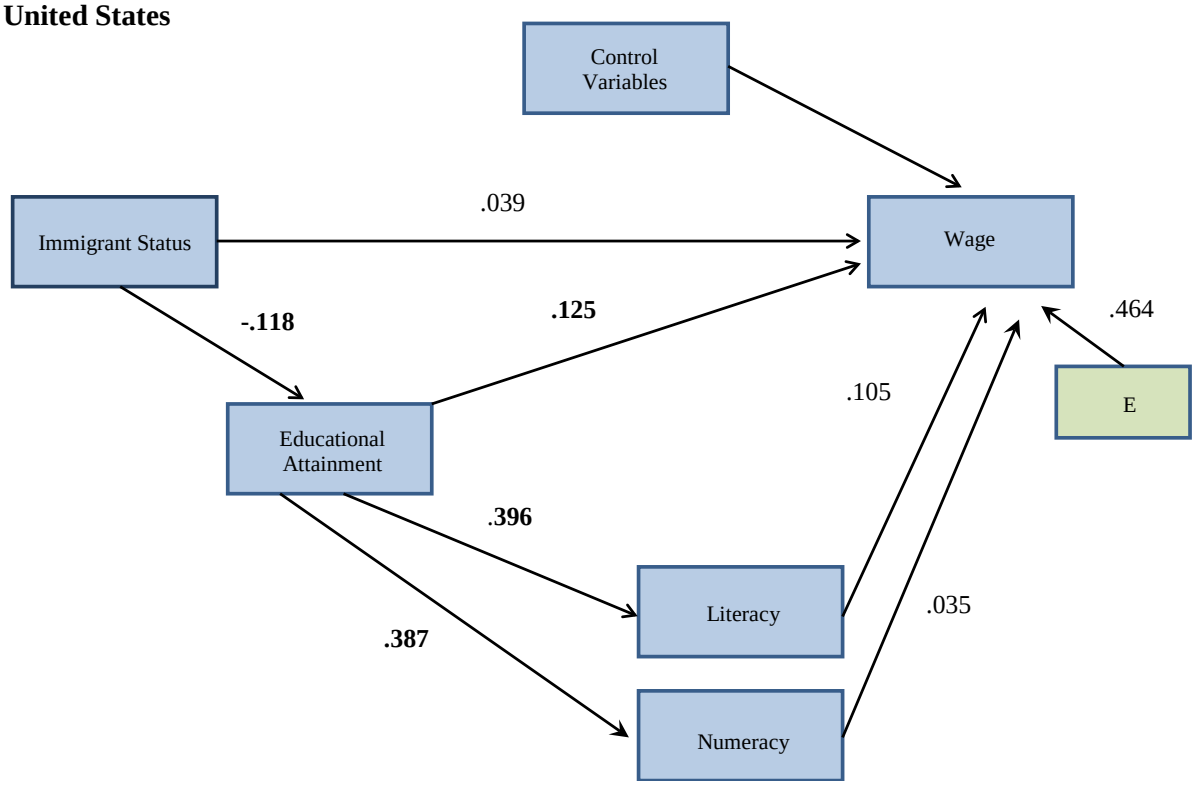
Canada



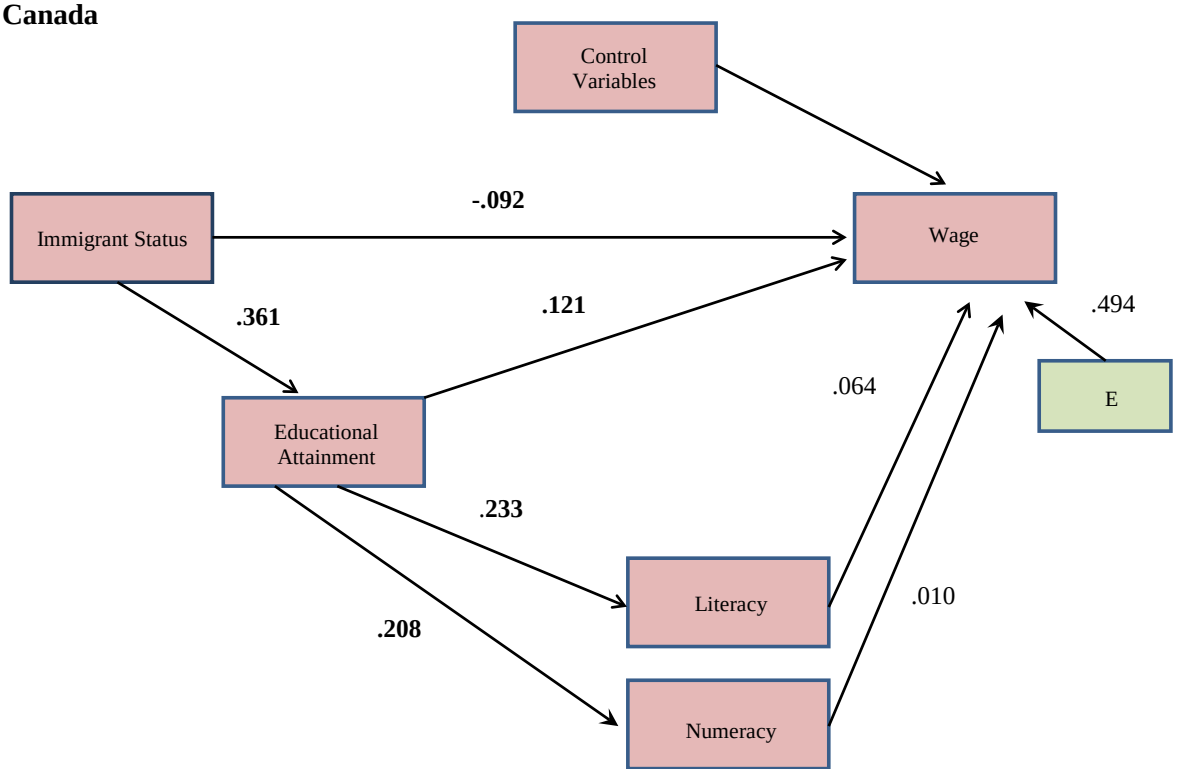
Note: Standardized Coefficients Provided. Italics indicates p<.10. Bold indicates p<.05. N: (U.S. = 580; Canada = 2820)

Figure 9: Predicting Wage in Service and Sales Field from Immigrant Status, Years of Education and Literacy and Numeracy Skills

United States



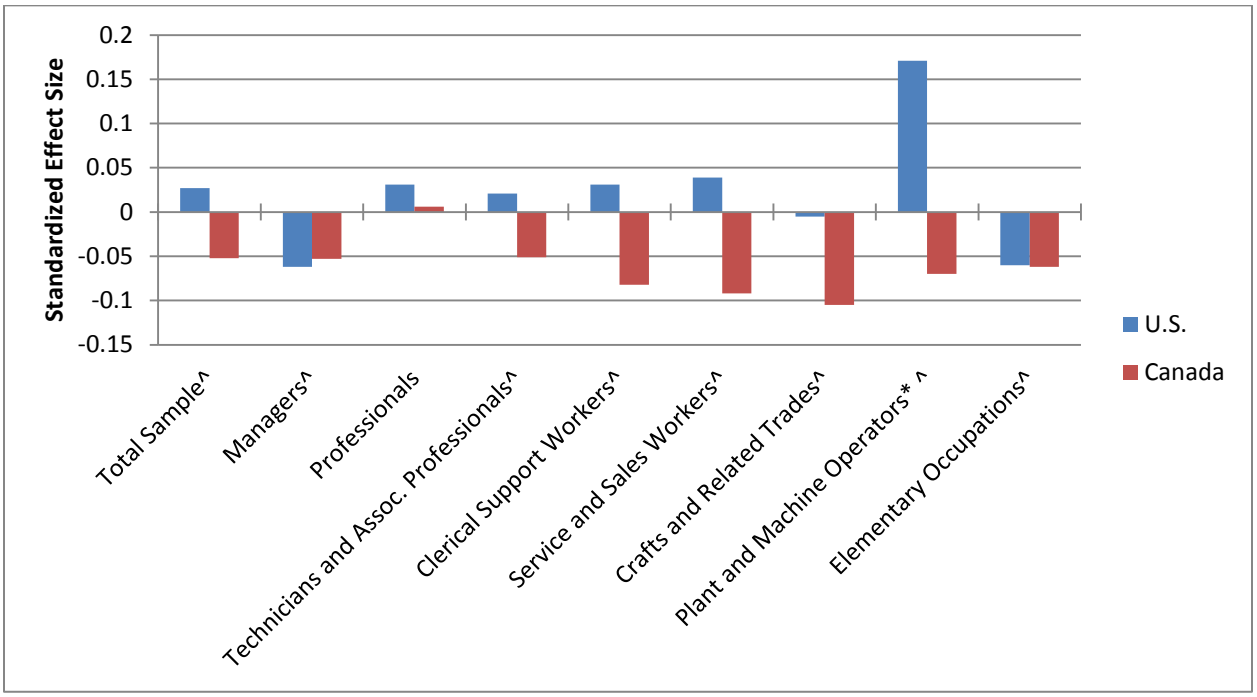
Canada



Note: Standardized Coefficients Provided. Italics indicates p<.10. Bold indicates p<.05. N: (U.S. = 580; Canada = 2820)

Immigrant wage gaps (i.e., the direct effect of immigrant status on wage) are found in every occupational field in Canada, sans professionals. These gaps increase in magnitude once education and literacy and numeracy skills are included in the model. As illustrated in standardized results from the complete model (see Figure 10), this contrasts sharply with the U.S. Once demographic control variables are included in the model, most wage gaps in the U.S. are eliminated. Gaps that persist to the complete model are not significant. The largest initial wage gap in the U.S. is found in the crafts and related trades field. Once education is included in the model the standardized difference in wage among craft and related trade workers is reduced from a significant -0.166 to a non-significant -0.071. The addition of literacy and numeracy skills further reduces the coefficient to nearly zero.

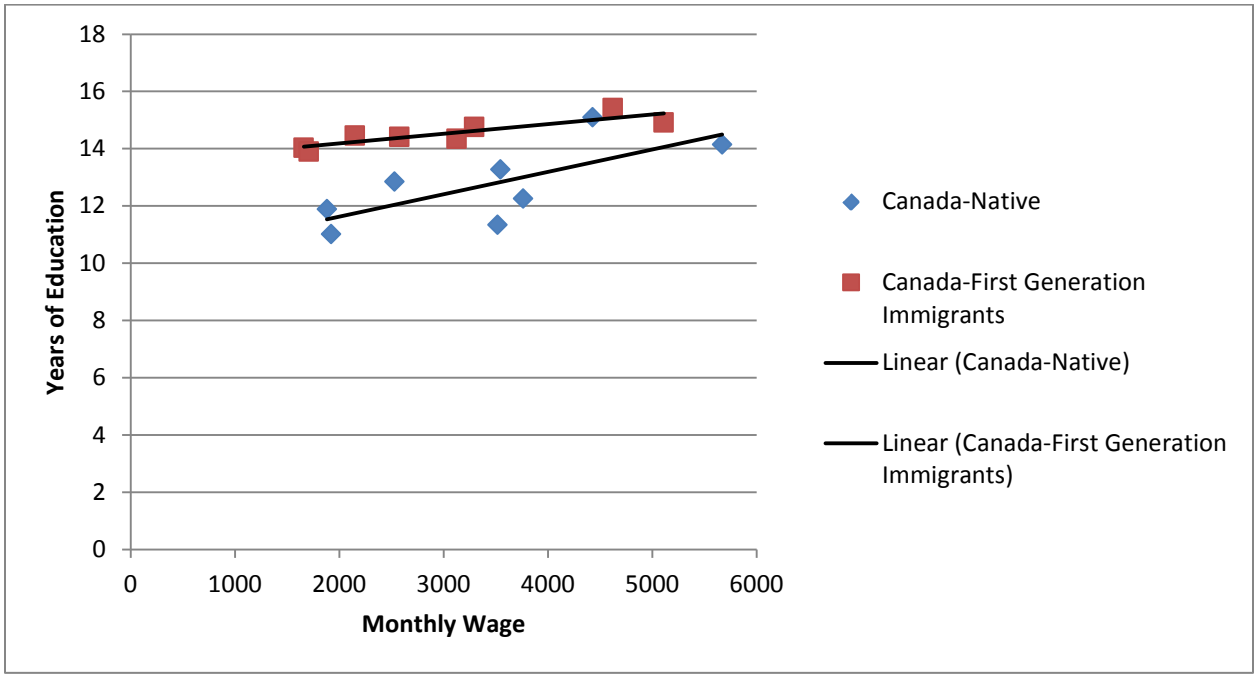
Figure 10: Immigrant Wage Differential across all Occupational Fields, by Country



Note: Standardized Coefficients Provided. Negative Numbers indicate Immigrant Wage Gap. Positive Numbers indicate Immigrant Wage Advantage ^ p<.05 (Canada) * p<.05 (U.S.)

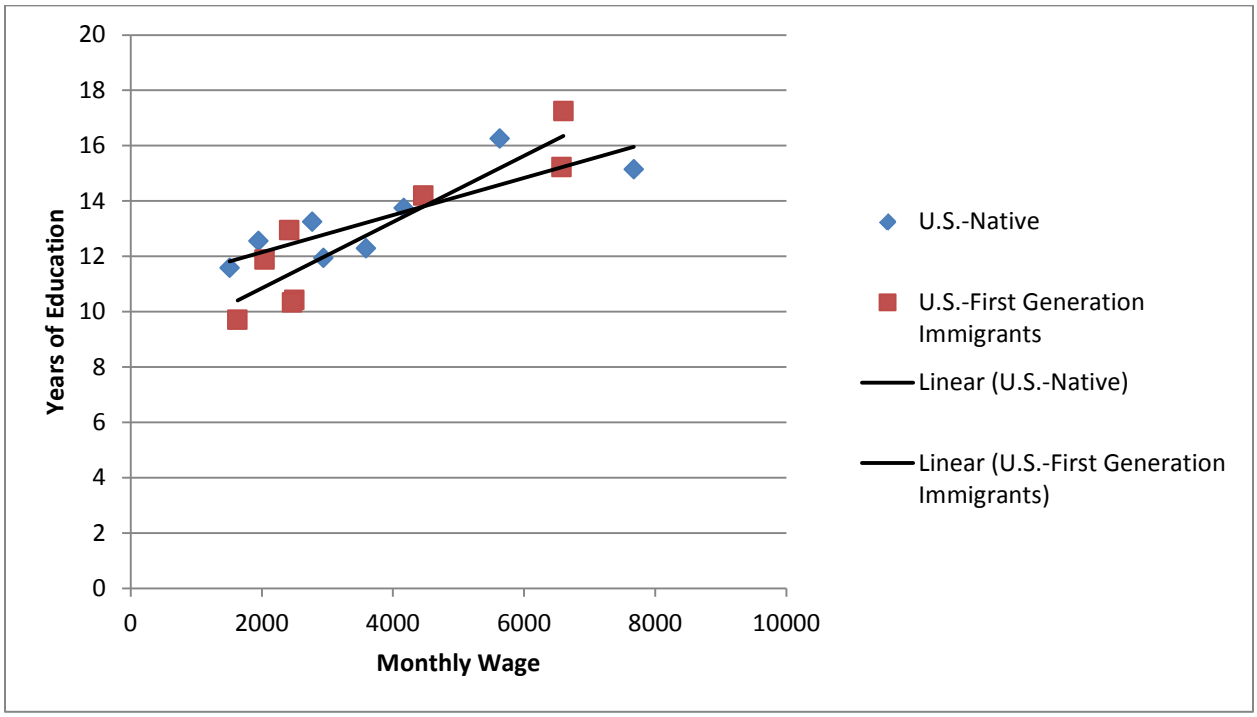
The persistence of an immigrant wage gap across nearly all occupational fields after controlling for education, literacy and numeracy skills, age, gender, years in the position, hours worked per week, area of study, and ICT adeptness is interesting and requires further study. One potential contributor to the gap is the differential return on education and skills in Canada, relative to the U.S. As immigrants in Canada have completed significantly more years of education than their peer counterparts, part of the wage gap may be due to an unequal education premium disadvantaging immigrants. Figure 11 displays the minimal correlation between education and mean wage in Canada. The nearly flat line for immigrants in Canada shows that although they have completed more education than native peers, regardless of the occupational field, the increased education is not strongly related to increased wage.

Figure 11: Relationship between Occupations Mean Years of Education and Mean Wage in Canada



This pattern differs substantially from the U.S. where education is more important for wage among immigrants, indicated by the greater positive slope relative to native peers in Figure 12. The contrast present in these two figures suggests that immigrants in Canada are unable to rapidly increase their wage by solely investing in education. The incentive for completing more education is greater for immigrants in the U.S., as immigrants who have completed more than 14 years of education (an associate's degree) are more likely to be found in the top two wage fields. The different return to education in the U.S. may be due to the earlier arrival of immigrants, with only 2% of immigrants arriving in the U.S. with a foreign education credential. In contrast, approximately 50% of Canadian immigrants arrive with a foreign credential above a secondary education. Therefore, the post-secondary investment of immigrants in the U.S. is predominately at U.S. colleges and universities. This within country credential is likely to have a greater wage return than a foreign credential.

Figure 12: Relationship between Occupations Mean Years of Education and Mean Wage in Canada



Discussion

Findings from this study reveal a similar initial immigrant wage gap in the U.S. and Canada despite their strikingly different immigrant populations. It is likely that the differences between immigrant populations in education and abilities are at least partially an effect of different national immigration policies (Aydemir & Sweetman, 2006; Bloemraad & Provine, 2013, Oreopoulos, 2011). Immigrants in Canada complete significantly more years of education than their native peers, while an educational attainment gap is present in the U.S. where immigrants complete over half a year less on average. Literacy and numeracy skills are also greater among immigrants in Canada. Although both immigrant populations have significantly lower scores on literacy and numeracy than their native peers, the magnitude of the skill gap is approximately three times greater in the U.S. However, the more educated and skilled position of immigrants in Canada, relative to immigrants in the U.S., does not reduce the within country wage gap nor lead to a disproportionate concentration of immigrants in higher wage fields. Additionally, once disaggregated by occupational field, wage gap patterns remain stable within each country. After controlling for education, numeracy and literacy skills, as well as a host of other demographic and work specific variables a significant immigrant wage gap is present in nearly all occupational fields in Canada (with the exception of managers) with the monthly wage differential ranging from $223 to $601. However, in the U.S. there is no evidence of an immigrant wage gap in any occupational field. This suggests that within a given occupation immigrants to the U.S. make roughly the same monthly wage as their native peers with equivalent education and literacy and numeracy skills.

Similar factors affect monthly wage in each country. Outside of hours worked per week, years of education completed is the strongest predictor of wage in both the U.S. and Canada. The return on education tends to be greater in the U.S., regardless of immigrant status, with the premium for a year of education 2 to 28 times higher depending on the occupational field. Differences in skills in both countries are rarely significantly related to wage. In the few cases there is an economic return on higher skill levels, the return on numeracy skills is greater than literacy skills (with the exception of professionals in the U.S.). The inclusion of skills and years of education allowed us to segment out return on education credentials compared to the return on skills. By comparing the ratio of the coefficients for years of education to literacy and numeracy skills it appears that the economy in the U.S. more highly values education credentials while in Canada there is a relatively greater emphasis on literacy and numeracy skills. This suggests that in Canada employees are rewarded for their actual skills and abilities, instead of the perceived abilities signaled through an education credential.

A more in depth look at the immigrant wage gap by country revealed different potential explanations which guide our policy recommendations. In the U.S. the initial wage gap appears to be an artifact of the disproportionate concentration of immigrants in low wage positions. This wage differential is eliminated once we match immigrants and natives by occupation and control for education and literacy and numeracy skills. The disproportionate concentration suggests that immigrants in the U.S., in general, are having difficulty accessing higher wage jobs. This is likely due in part to immigrants' significantly lower levels of education and literacy and numeracy skills. Given that nearly 50% of immigrants in the U.S. arrived before the age of 20, many immigrants complete their education in the U.S. Specifically, only 2% of first generation immigrants arrive to the U.S. with a foreign education qualification. Therefore, to address the immigrant wage gap in the U.S. attention needs to be targeted to the well-documented educational attainment and achievement gaps between immigrants and natives (Harris, Jamison & Trujillo, 2008; Portes & Rumbaut 2001). Policies that aid persistence by supporting the transition of immigrants into the American education system and train educators on how to properly support learners that are culturally and linguistically diverse are essential to reduce the wage gap. Closing the attainment gap is especially crucial given the high wage premium placed on education credentials in the U.S.

The issues and potential solutions to the immigrant wage gap in Canada differ largely due to their point based immigration policy that has successfully attracted higher skilled and more educated immigrants than the family reunification focused policy of the U.S. Given the education advantage of immigrants in Canada and fact that over 68% of the immigrants in Canada arrive after the age of 20, solutions should be targeted at larger immigration and economic policy. Our results suggest at least three factors contribute to the immigrant wage gap in Canada. First, immigrants in Canada are underemployed. There is little difference in the years of education completed by immigrants regardless of their occupational field, suggesting that many immigrants in Canada have educational credentials well above that generally required in their occupation. Second, the limited return on education in Canada disproportionately plagues immigrants whose significantly greater levels of education are their primary economic advantage. This is demonstrated by the minimal correlation between mean years of education and mean occupational wage for immigrants in Canada (see Figure 11), a correlation well below the positive associations present for natives in Canada and both populations in the U.S. Third, the limited return on education may be due to international education credentials signaling different information to employers in Canada. As the majority of immigrants in Canada arrive after the

age of 20, many have completed their education in their country of origin. Specifically, approximately 50% of first generation immigrants arrive to Canada holding a foreign educational qualification beyond that of secondary school completion. International credentials may be downgraded in the economy due to perceived discrepancies with Canadian credentials. The education advantage for immigrants coupled with their persistent skills gap suggests that this signal may have some merit.

It is important to recognize that the wage gap in Canada is not a by-product of controlling for education—which essentially compares natives and immigrants with similar education, eliminating the education advantage from the wage gap equation—but is present before adjusting for education. Controlling for the immigrant education advantage in Canada does not expose the immigrant wage gap but expands it. The presence of a wage gap across nearly all occupational fields in Canada suggests that there may be underlying cultural preferences or practices that lead to differential wage outcomes. The presence of discriminatory practices across occupational fields in the country leads to policy recommendations centered on diversity training and equitable hiring procedures. Additionally, continuing education targeting adult immigrants may help immigrants align their literacy and numeracy skills with their education credentials and eliminate the undervalued signal from their international credential. Finally, although the point based immigration policy in Canada appears to be successful at recruiting highly educated immigrants, more needs to be done to support their transition once they arrive in-country. Included in this support should be occupational placement services to alleviate the mismatch between qualifications and occupational opportunities available.

This comparative study provides important insights into the immigrant wage gap in the U.S. and Canada; however, like all studies the analysis has limitations that can direct future research. The differential return on skills and education leads to potential research that utilizes post-hoc matching procedures to estimate whether the immigrant wage gap in Canada is indeed a systematic issue or dependent on the unique characteristics of immigrants in Canada. In addition, conclusions regarding differences between international and national education credentials are preliminary and based on immigrant age of arrival. Incorporating information specific to where the highest education credential was obtained would corroborate and extent our findings. In addition, to maintain the direct comparison between the U.S. and Canada, the small U.S. sample limited the depth of the investigation. Although the variance in wage is greater between the large occupational fields than within them, we cannot rule out heterogeneity of wage in occupational fields as a contributing factor to wage gaps in Canada. It is possible that within a field, like elementary occupations, immigrants are concentrated in lower wage positions leading to the wage gap present in the larger occupational field. This could be addressed by expanding the occupational identifier to the second level ISCO-08 code. However, given the small sample in the U.S. further disaggregating occupational groups would reduce the power needed to complete our analysis. Future studies focused on the role of heterogeneity within occupational fields on the wage gap in Canada are suggested. Additionally, the exclusion of individuals that are of school age (age 16-23) may clarify the results of this study. However, removing the school age population was not done in this study as approximately 90% of the first generation immigrants in the U.S. are under the age of 24 the omission of this age group would make the analysis impossible. In comparing the education of immigrants and native in the 16-23 age group in the U.S. immigrants have less education (approximately 50% complete 12 years or less compared to 40% of U.S. natives between age 16 and 23). Finally, as outlined in past research country of origin plays an important role in the experience of immigrants (Bertrand & Mullainathan, 2003;

Jacquemet & Yannelis, 2012; Oreopoulos, 2009). However, due to the limited U.S. sample country of origin was not included in our analysis.

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Appendix A: Unstandardized Coefficients Predicting the Direct Effect on Wage from the Complete Model

United States

	Total Sample	Managers	Professionals	Technicians and Assoc. Professionals	Clerical Support Workers	Service and Sales Workers	Crafts and Related Trades	Plant and Machine Operators	Elementary Occupations
Monthly Earnings	3964.64 (3511.57)	7557.76 (5633.78)	5747.90 (3922.54)	4192.12 (2681.45)	2742.20 (1332.24)	1965.40 (1366.00)	3467.37 (2112.83)	2864.85 (1561.15)	1538.33 (1059.53)
First Generation	273.39^ (145.07)	-890.41 (1059.05)	369.55 (364.55)	195.55 (318.58)	149.21 (204.04)	154.99 (104.45)	-32.08 (390.82)	64.57 (201.69)	-153.76 (139.48)
Yrs Schooling	349.09*** (21.66)	626.76*** (122.28)	264.25*** (61.83)	205.41*** (45.30)	83.54** (29.60)	82.26*** (20.84)	117.06^ (68.47)	80.33^ (40.73)	56.29* (26.42)
Literacy	5.74 (3.16)	-10.78 (57.66)	15.95* (6.72)	2.51 (4.25)	1.33 (3.30)	3.09 (2.48)	2.74 (8.60)	3.65 (4.08)	0.42 (2.84)
Numeracy	5.82^ (2.94)	19.08 (57.27)	1.95 (5.68)	5.17 (3.94)	2.72 (3.04)	0.88 (1.97)	6.77 (8.04)	-1.17 (3.59)	2.54 (2.51)
ICT Skills	147.96 (182.49)	1071.89 (1156.95)	596.90 (528.58)	596.96 (382.33)	203.56 (277.57)	-135.16 (144.84)	-733.84^ (372.67)	-348.91 (224.86)	-138.72 (160.90)
Age	29.01*** (4.32)	49.27^ (25.27)	58.54*** (11.55)	37.99*** (8.40)	9.58* (4.80)	1.96 (1.84)	22.23* (9.88)	-3.24 (6.00)	19.33*** (4.59)
Female	-587.15*** (101.10)	-606.85 (567.31)	-884.27** (264.83)	-1010.28*** (195.61)	-219.53^ (130.62)	-336.46*** (77.33)	-265.53 (365.36)	-218.02 (158.77)	-319.76* (133.89)
Hours/Week	96.19*** (4.63)	193.40*** (24.18)	107.31*** (9.20)	90.49*** (7.80)	64.87*** (5.80)	59.30*** (3.72)	79.05*** (8.96)	97.08*** (6.94)	42.71*** (4.03)
Yrs in Position	47.25*** (6.47)	38.90 (32.50)	28.82^ (16.08)	39.38** (11.53)	53.26*** (7.37)	47.89*** (6.49)	17.50 (14.71)	52.04*** (7.87)	9.46 (8.04)
Constant	-9250.91 (571.47)	-16911.79 (3680.75)	-12595.13 (1723.90)	-6666.00 (1267.75)	-2415.04 (757.33)	-1883.91 (420.22)	-4047.27 (1503.42)	-2855.26 (757.19)	-1744.03 (566.01)

Note: Monthly Earnings provides mean (standard deviation) for interpretation purposes. Unstandardized coefficients provided with standard errors in parentheses. ^p<.10 *p<.05 **p<.01 ***p<.001

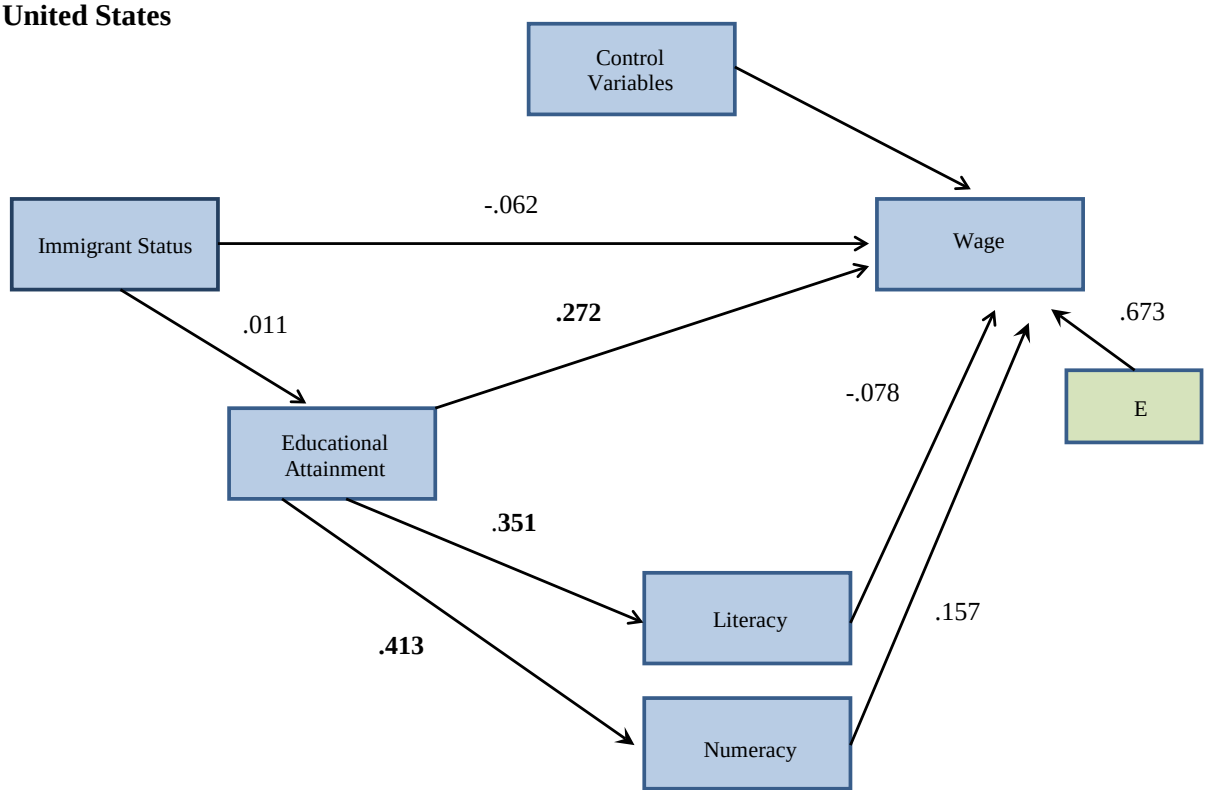
Canada

	Total Sample	Managers	Professionals	Technicians and Assoc. Professionals	Clerical Support Workers	Service and Sales Workers	Crafts and Related Trades	Plant and Machine Operators	Elementary Occupations
Monthly Earnings	3398.77 (2511.77)	5580.44 (3600.62)	4468.24 (2499.24)	3502.53 (2169.16)	2465.11 (1252.80)	1839.55 (1439.79)	3667.01 (2082.35)	3369.09 (2085.72)	1883.49 (1380.83)
First Generation	-333.12*** (62.69)	-495.60* (197.98)	35.02 (84.47)	-291.27*** (81.77)	-274.43*** (71.75)	-333.74*** (49.33)	-601.36*** (120.56)	-402.15** (141.63)	-223.75** (70.41)
Yrs Schooling	165.90*** (7.79)	246.99*** (35.28)	182.73*** (19.05)	109.53*** (17.54)	46.24** (14.72)	73.49*** (8.64)	85.22*** (19.13)	7.16 (18.57)	22.46* (9.74)
Literacy	2.85** (0.95)	2.50 (3.99)	0.77 (2.12)	1.58 (1.60)	0.97 (1.62)	1.97 (1.11)	2.42 (1.81)	2.41 (2.64)	-0.94 (1.71)
Numeracy	5.19*** (1.03)	11.80** (3.48)	4.08^ (2.04)	4.17* (1.59)	0.78 (1.44)	0.28 (0.96)	1.64 (1.68)	2.65 (2.77)	1.50 (1.72)
ICT Skills	6.46 (51.70)	889.34** (265.16)	120.79 (131.79)	-305.43* (117.74)	225.71* (112.02)	-83.99 (65.00)	-152.89 (108.81)	220.68^ (129.26)	-8.39 (78.09)
Age	19.34*** (1.83)	68.84*** (7.17)	39.06*** (3.88)	14.08*** (2.89)	2.93 (2.24)	2.16 (1.41)	26.75*** (3.54)	-6.04^ (3.62)	0.70 (1.82)
Female	-577.42*** (28.25)	-835.04*** (140.65)	-678.52*** (71.08)	-667.71*** (61.65)	-111.93* (56.22)	-418.63*** (54.21)	-715.49*** (123.34)	-272.55* (116.91)	-317.39*** (48.94)
Hours/Week	82.59*** (3.06)	87.05*** (6.96)	83.01*** (3.98)	83.71*** (3.73)	62.57*** (3.39)	59.65*** (2.77)	110.97*** (4.73)	85.16*** (4.10)	62.79*** (3.03)
Yrs in Position	32.29*** (2.44)	20.88** (7.72)	13.78** (4.19)	30.24*** (3.78)	27.12*** (3.31)	36.91*** (3.13)	7.36 (4.51)	35.00*** (4.94)	17.79*** (3.47)
Constant	-5346.11 (339.90)	-11157.38 (1011.44)	-4627.06 (515.23)	-3178.42 (417.71)	-1203.06 (384.56)	-1279.16 (240.69)	-4847.89 (462.74)	-2436.90 (489.51)	-734.98 (399.38)

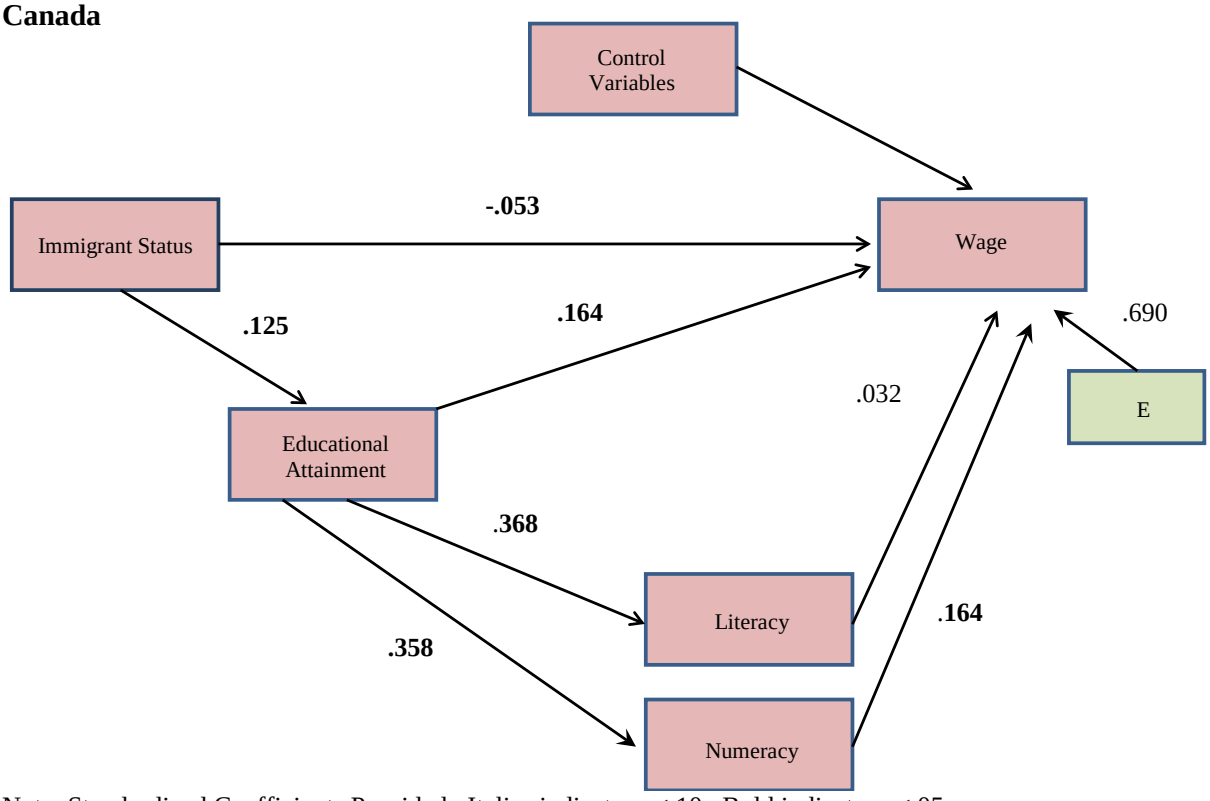
Note: Monthly Earnings provides mean (standard deviation) for interpretation purposes. Unstandardized coefficients provided with standard errors in parentheses. ^p<.10 *p<.05 **p<.01 ***p<.001

Appendix B: Complete Path for Managers: U.S. (n=260) & Canada (n=1480)

United States



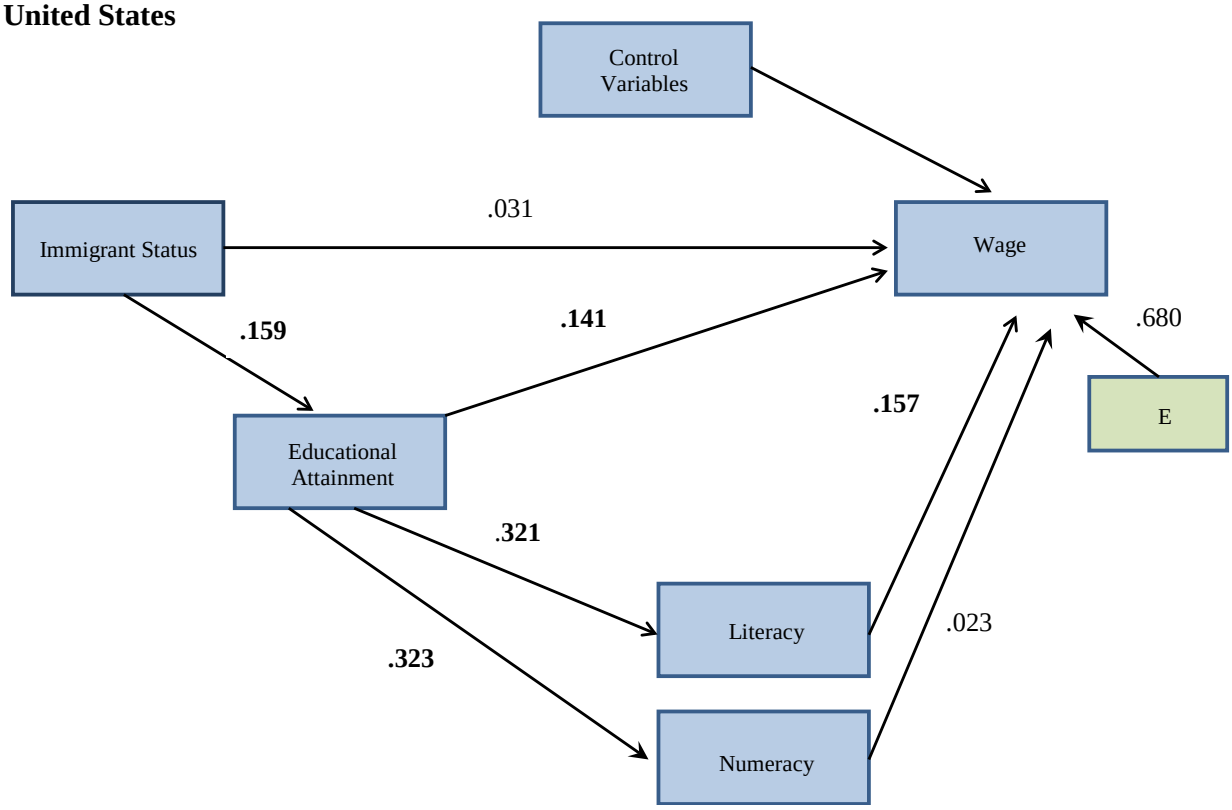
Canada



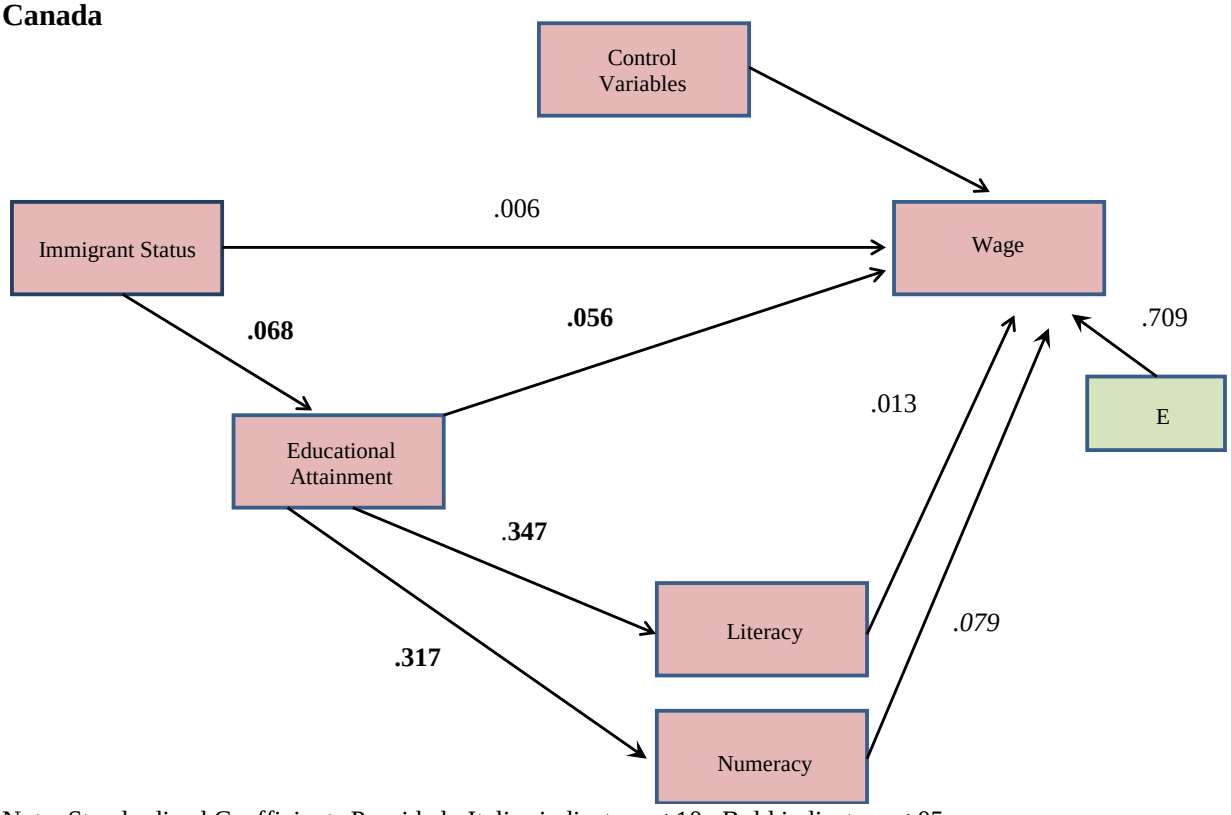
Note: Standardized Coefficients Provided. Italics indicates p<.10. Bold indicates p<.05.

Appendix B: Complete Path for Professionals: U.S. (n=620) & Canada (n=3350)

United States



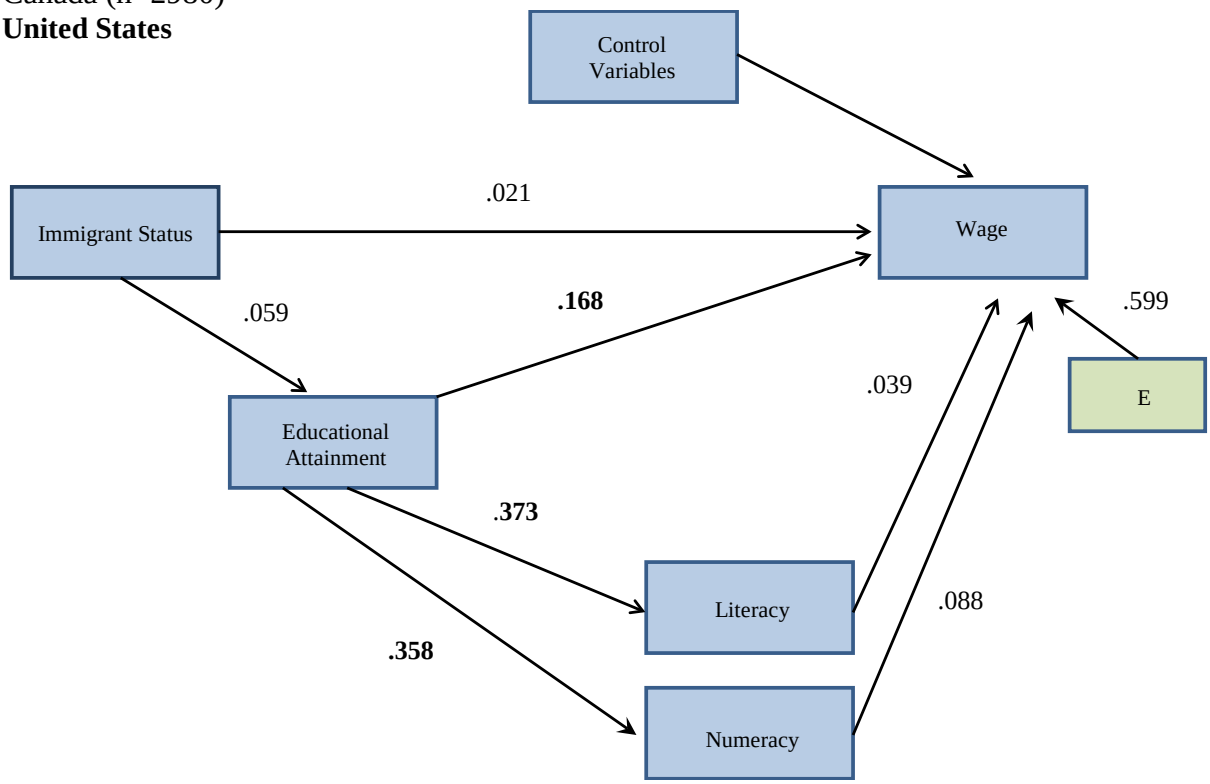
Canada



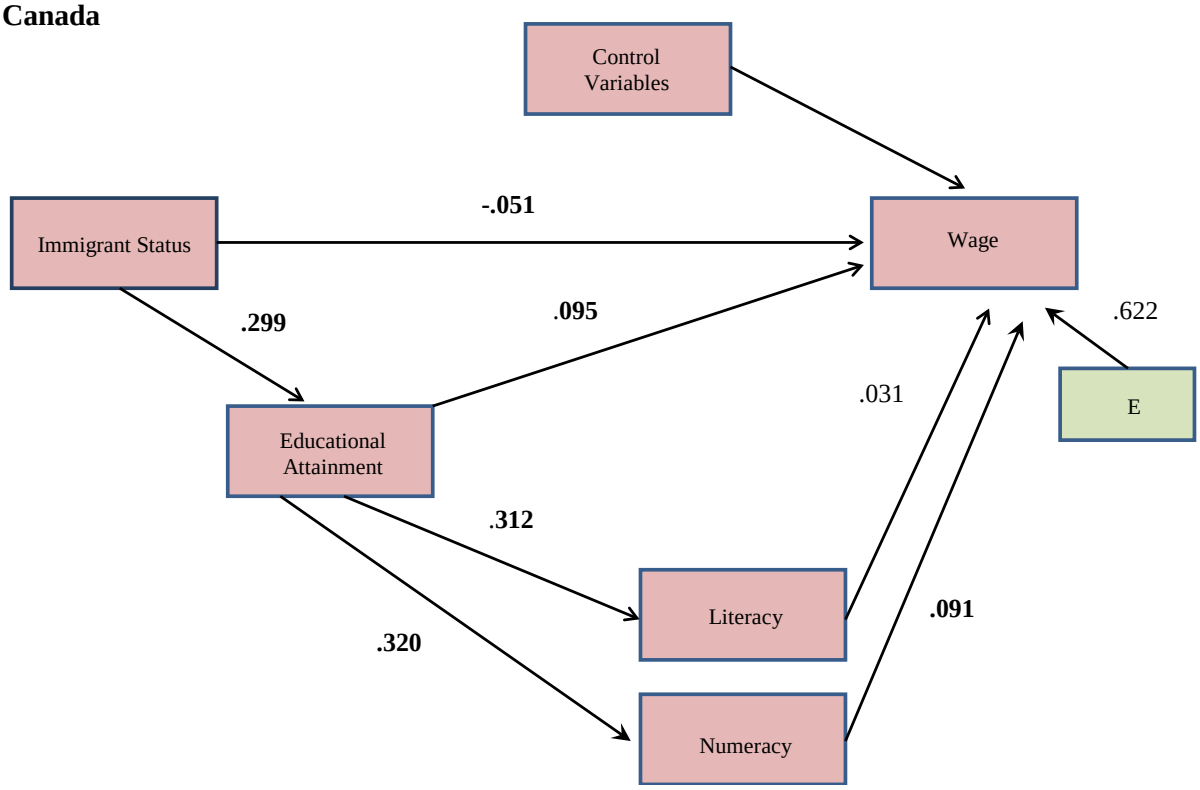
Note: Standardized Coefficients Provided. Italics indicates p<.10. Bold indicates p<.05.

Appendix B: Complete Path for Technicians and Associate Professionals: U.S. (n=450) & Canada (n=2980)

United States



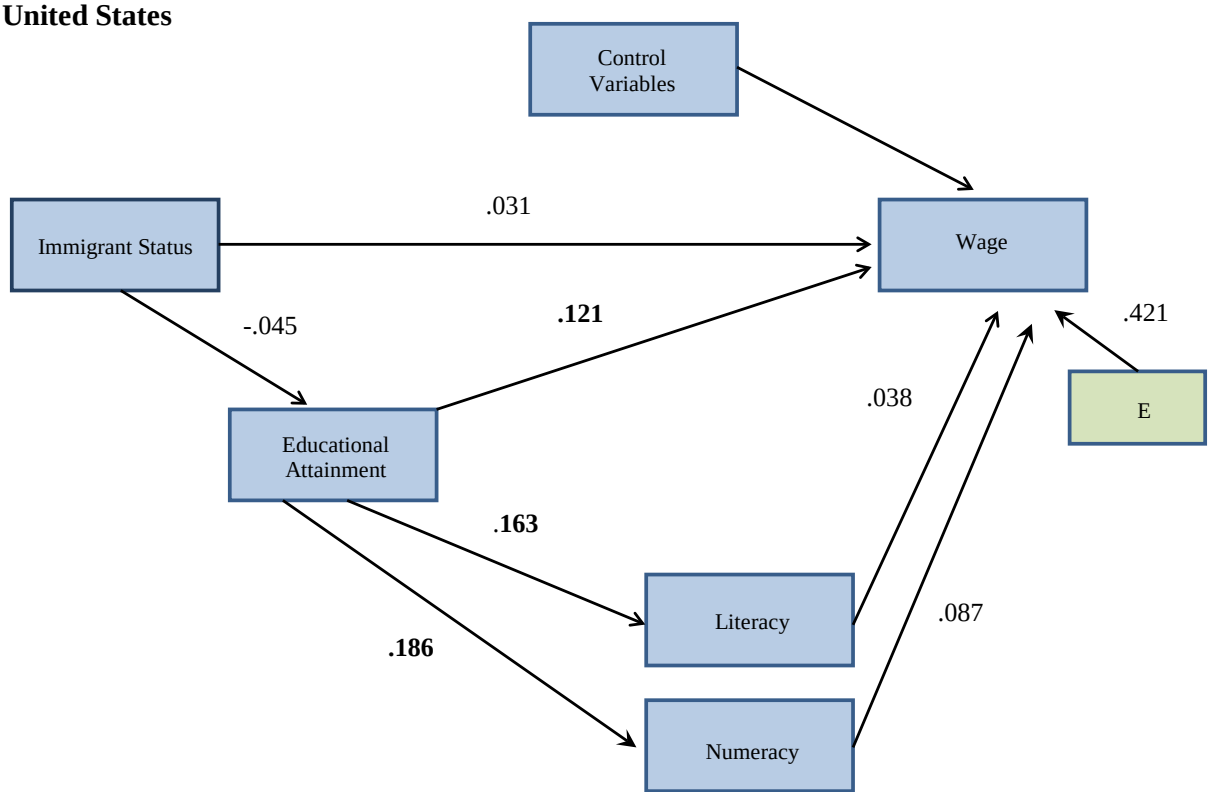
Canada



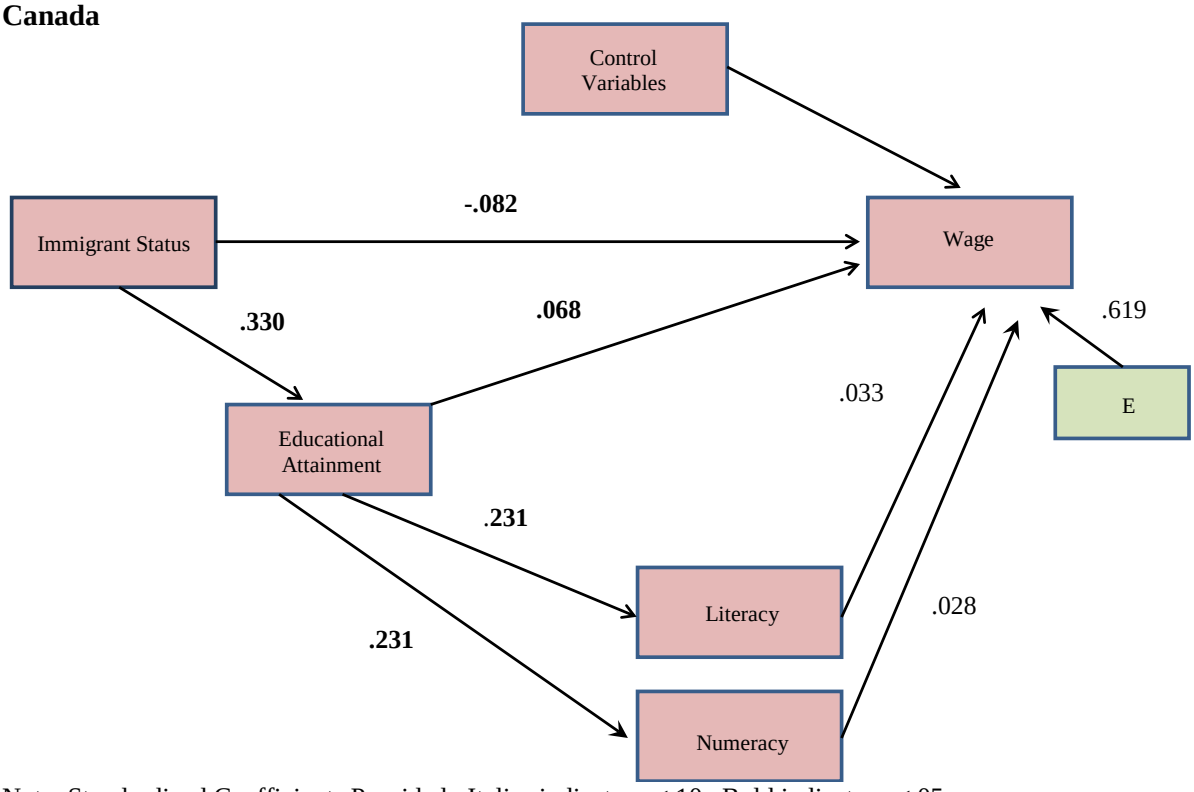
Note: Standardized Coefficients Provided. Italics indicates p<.10. Bold indicates p<.05.

Appendix B: Complete Path for Clerical Support Workers: U.S. (n=220) & Canada (n=1350)

United States



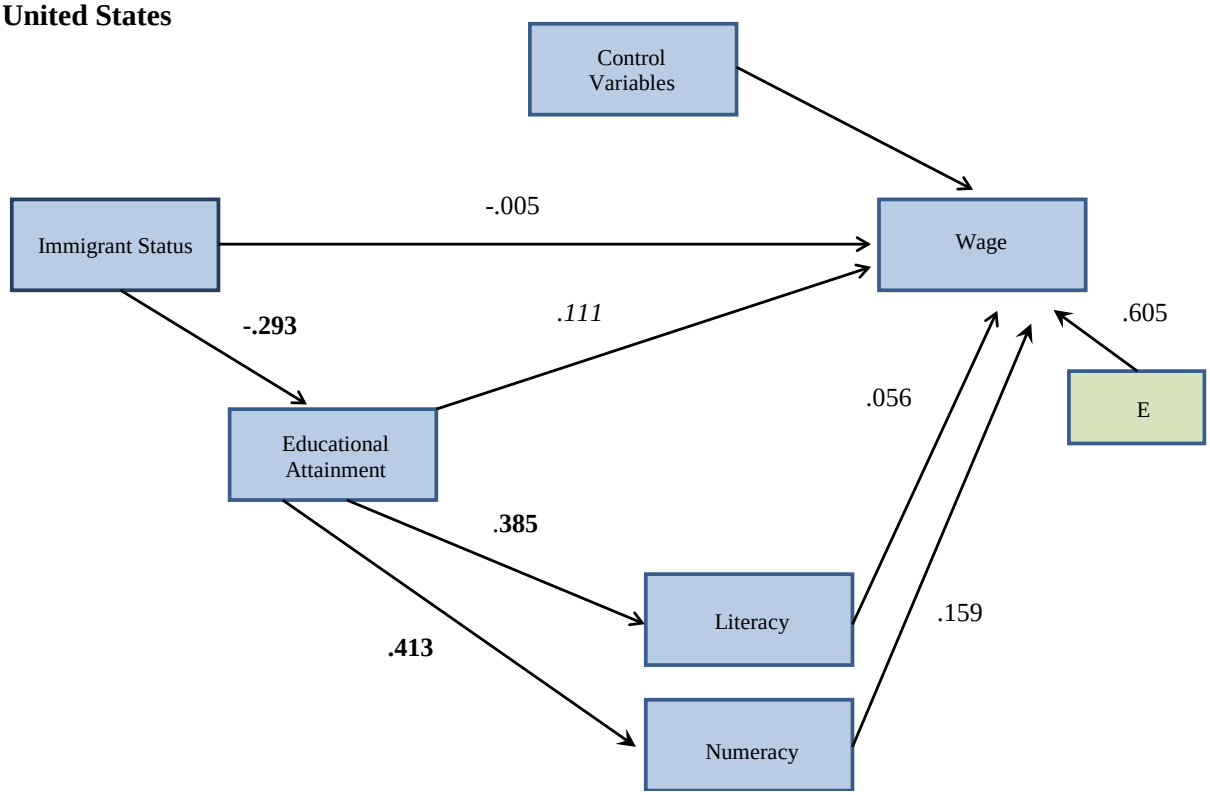
Canada



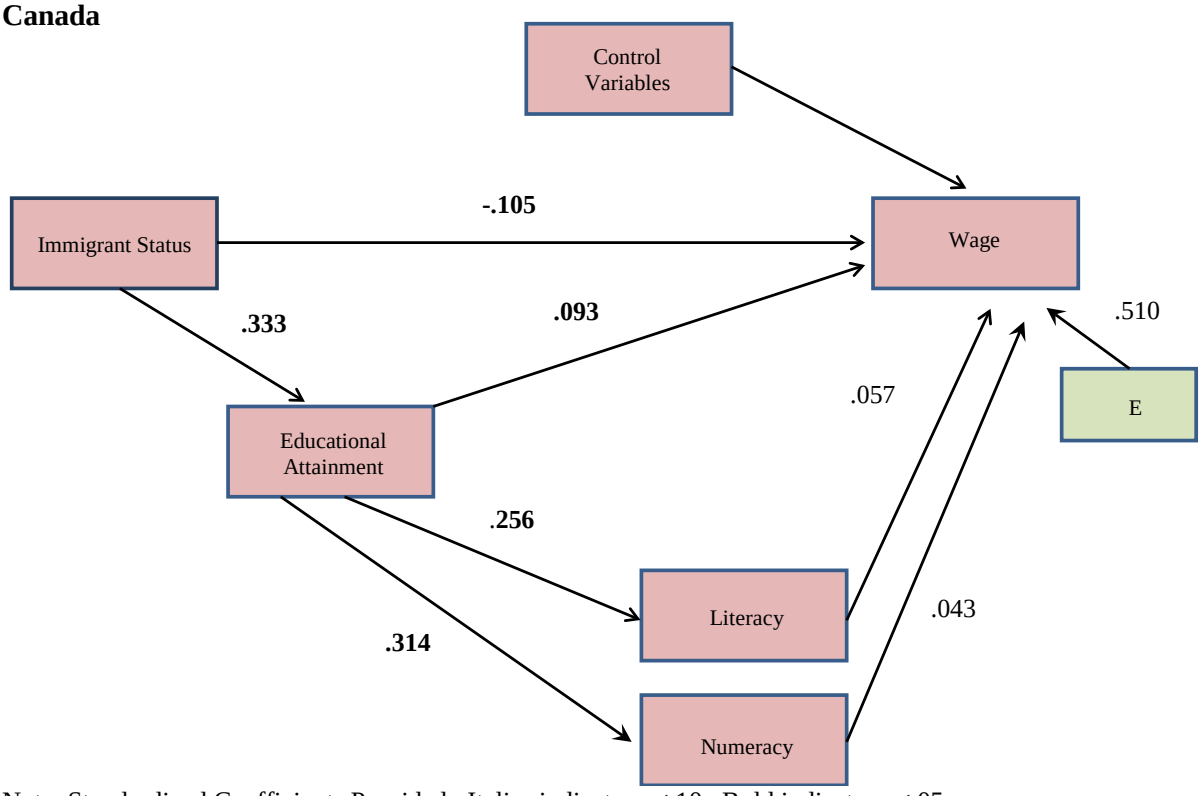
Note: Standardized Coefficients Provided. Italics indicates p<.10. Bold indicates p<.05.

Appendix B: Complete Path for Crafts and Related Trades: U.S. (n=200) & Canada (n=1300)

United States



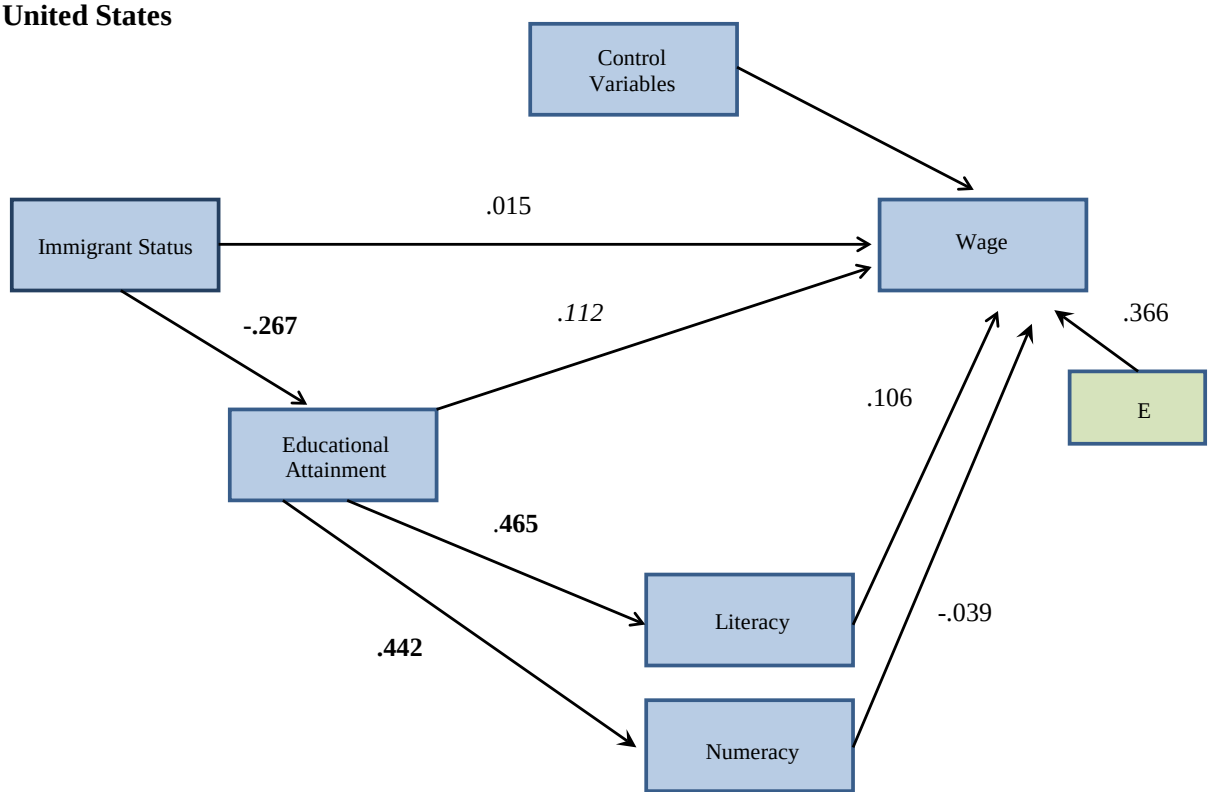
Canada



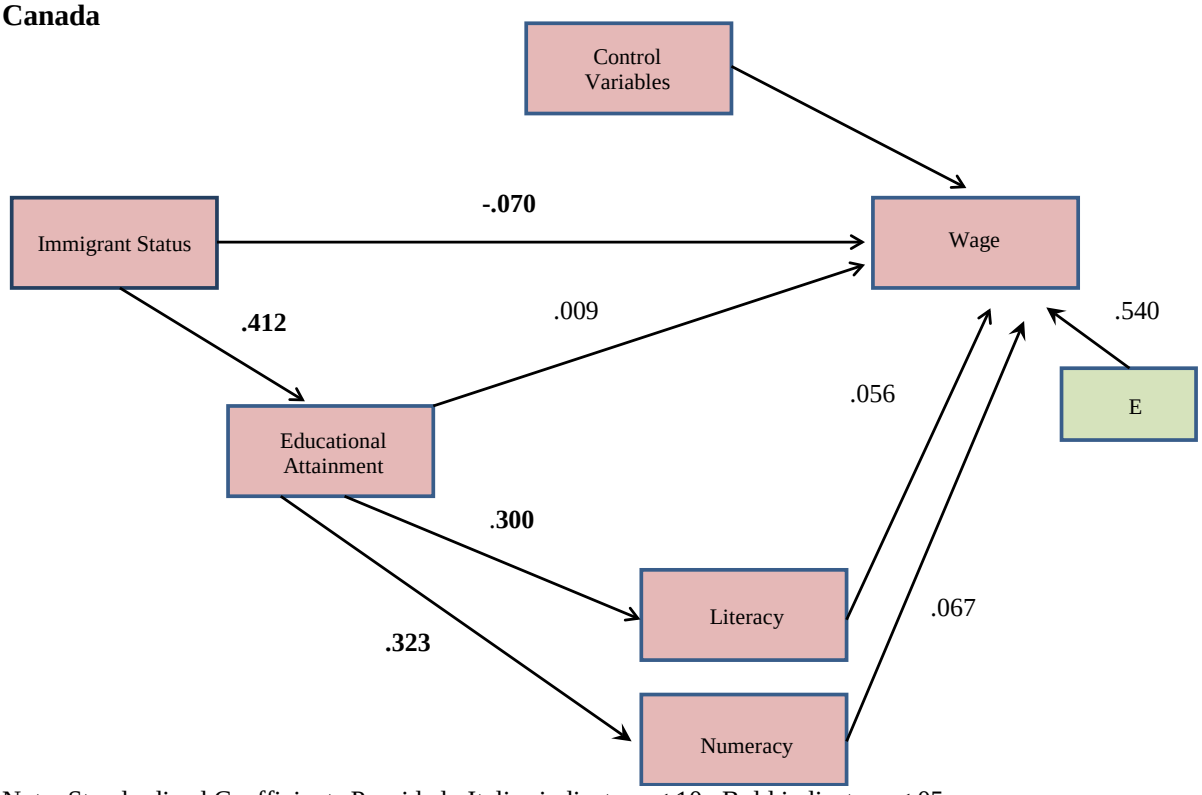
Note: Standardized Coefficients Provided. Italics indicates p<.10. Bold indicates p<.05.

Appendix B: Complete Path for Plant and Machine Operators: U.S. (n=170) & Canada (n=990)

United States



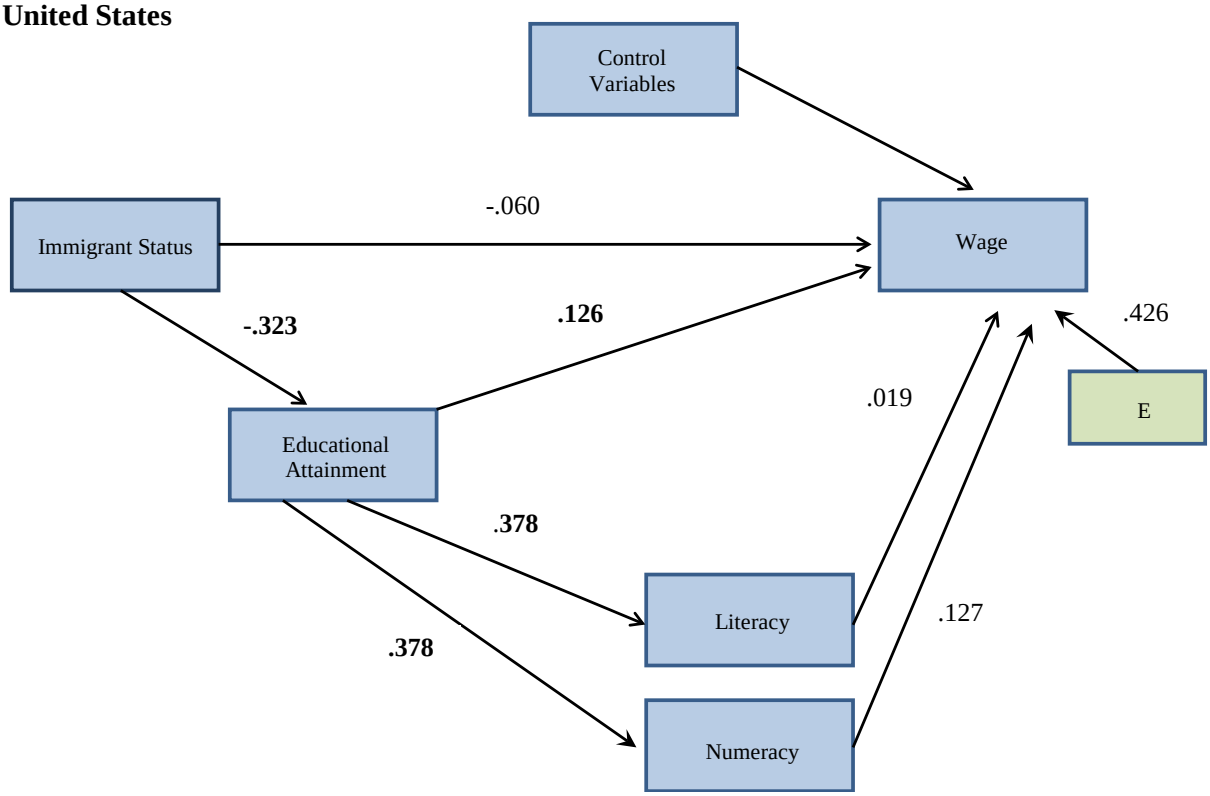
Canada



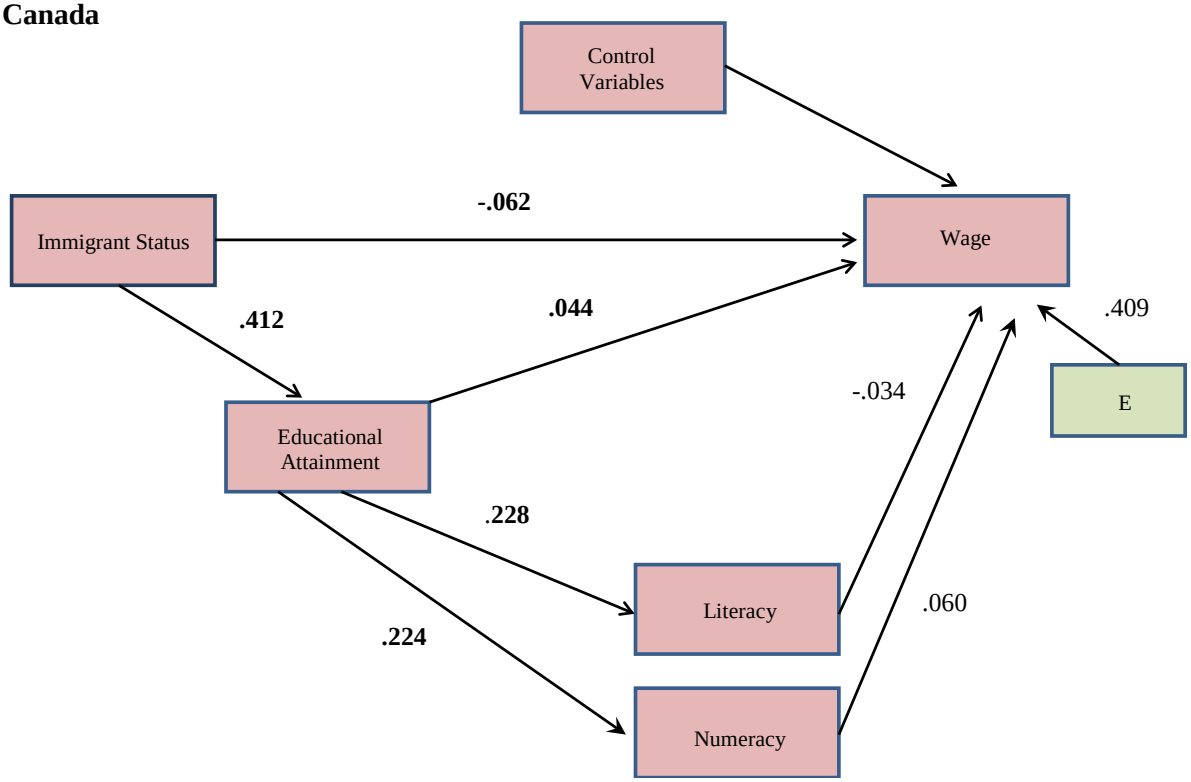
Note: Standardized Coefficients Provided. Italics indicates p<.10. Bold indicates p<.05.

Appendix B: Complete Path for Elementary Occupations: U.S. (n=180) & Canada (n=1220)

United States



Canada



Note: Standardized Coefficients Provided. Italics indicates p<.10. Bold indicates p<.05.

Appendix C: Occupational Fields

Occupational Field	Definition	Examples
Managers	“Managers plan, direct, coordinate and evaluate the overall activities of enterprises, governments and other organizations, or of organizational units within them, and formulate and review their policies, laws, and regulations.” (p. 87)	City Administrator; Chief Executive, University Dean, Restaurant Manager
Professionals	"Professionals increase the existing stock of knowledge; apply scientific or artistic concepts and theories; teach about the foregoing in a systematic manner; or engage in any combination of these activities." (p. 109)	Chemist; park ranger; civil engineer; fashion designer
Technicians and Associate Professionals	"Technicians and associate professionals perform technical and related tasks connected with research and the application of scientific or artistic concepts and operational methods, and government or business regulations." (p. 169)	Fire Inspector; Air Traffic Controller; Blood-Bank Technician; Medical Records Clerk
Clerical Support Workers	"Clerical support workers record, organize, store, compute, and retrieve information, and perform a number of clerical duties in connection with money-handling operations, travel arrangements, requests for information, and appointments." (p. 219)	Bank Teller; Hospital Admissions Clerk; Library Clerk; Scribe
Service and Sales Workers	"Services and sales workers provide personal and protective services related to travel, housekeeping, catering, personal care, protection against fire and unlawful acts; or demonstrate and sell goods in wholesale or retail shops and similar establishments, as well as at stalls and on markets." (p. 235)	Bartender; Janitor; Undertaker; Police Officer
Crafts and Related Trades Workers	"Craft and related trades workers apply specific technical and practical knowledge and skills to construct and maintain buildings; form metal; erect metal structures; set machine tools or make, fit, maintain and repair machinery, equipment or tools; carry out printing work; and produce or process foodstuffs, textiles and wooden, metal and other articles, including handicraft goods." (p. 277)	Carpenter; Motor Vehicle Mechanic; Electrician; Butcher
Plant and Machine Operators and Assemblers	"Plant and machine operators and assemblers operate and monitor industrial and agricultural machinery and equipment on the spot or by remote control; drive and operate trains, motor vehicles and mobile machinery and equipment; or assemble products from component parts according to strict specifications and procedures." (p. 313)	Sewing Machine Operator; Aircraft Assembler; Taxi Driver; Bulldozer Operator
Elementary Occupations	"Elementary occupations involve the performance of simple and routine tasks which may require the use of hand-held tools and considerable physical effort." (p. 337)	Car Detailer; Fast Food Cook; Meter Reader; Shoe-Polisher

Note: This table is based on the International Standard Classification of Occupations (ISCO-08) prepared by the International Labour Office. Two major groups, "Skilled Agricultural, Forestry, and Fishery Workers" and "Armed Forces Occupations" were not used in our analysis due to small sample sizes.