The effect of linguistic proximity on the occupational assimilation of immigrants

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Extended Preliminary Abstract-

This paper contributes to the analysis of the integration of immigrants in the Canadian labour market by focusing in two relatively new dimensions. We combine the large samples of the restricted version of the Canadian Census (1991-2006) with both a novel measure of linguistic proximity of the immigrant's mother tongue to that of the destination country and with information of the occupational skills embodied in the jobs immigrants hold. This allows us to assess the role that language plays in the labour market performance of immigrants and to better study their career progression relative to the native born. Our preliminary results show that linguistic proximity (1) influences the path of participation in high skill occupations; (2) shapes the evolution of job-skill content of immigrant jobs over time and (3) affects patterns of wage assimilation of immigrants.

1. Introduction

For Western economies that rely on large influxes of immigrants as a way of encouraging economic growth and demographic sustainability, such as Australia and Canada, successful immigrant assimilation is of capital importance. Research highlights the influence of linguistic ability as a key determinant of immigrant economic success. This paper uses a novel measure of linguistic proximity to explore whether language ability greatly influences labour market performance of immigrants to Canada and how it affects their assimilation over time. Besides standard measures of labour market performance, such as wages, we also consider participation in highly skilled jobs and the evolution of the skill involved with the jobs immigrant hold.

Theories of immigrant assimilation consider that, upon immigration, the new entrant's lack of country specific human capital (language fluency, institutional knowledge, recognized credentials) will cause the depreciation of the human capital brought into the country. This depreciation accounts for lower initial earnings when compared to similar native-born workers. Economic theory predicts that, with time in the country, immigrants will experience an increase in earnings associated with the acquisition of country specific skills, bringing immigrants' earnings closer to those of similar native-born workers. There is a long tradition of academic and non-academic studies that document this phenomenon using different measures of labour market performance (Chiswick, 1978 and 1986; Borjas 1985). Since the 1990s, these studies report that new cohorts of immigrants to most major host countries have experienced a significant deterioration in their economic well-being relative to previous arrival cohorts (Borjas 1995; Bell, 1997; Aydemir and Skaterud 2005; Antecol et al, 2006; Clark and Lindley, 2009; Beenstock et al., 2010). In North America, the drop in earnings and employment has largely been attributed to changes in immigrant's background (Friedberg, 2000; Bratsberg and Raaum, 2004; Borjas (), Picott and Hou, 2009). More specifically, language ability has come across different studies as one of the main determinants of successful integration (Borjas, 2013; Bleakley and Chin, 2004; Chiswick et al., 2005).

We build on this literature to assess the influence of linguistic ability on the occupational assimilation of immigrants. This is of particular relevance in the Canadian case because the increase in the immigrant-native born wage differences - once education and other observable characteristics have been accounted for - has been particularly important in this country

(Aydemir and Skuterud, 2005). The fact that Canada's immigration policy has been targeted at educated immigrants for quite some time makes this increase in wage differences the more puzzling (Ferrer, Picot and Riddell, 2014). While part of the problem seems to be due to the fact that the skills involved within a given level of education might differ between the foreign and Canadian educated (Li and Sweetman (2013); Ferrer et al. 2006), a complementary explanation is that language ability impairs the successful transfer of skills across countries (Chiswick and Miller 2010). Although often acknowledged as a potential cause of differences in outcomes between immigrant and native born workers, this venue has been less explored in the case of Canada because the Canadian census lacks a proper measure of linguistic ability. We add to these studies by incorporating a measure of linguistic proximity to the analysis, which allows us to uncover rich patterns of the role of language on the assimilation of Canadian immigrants.

Lack of language fluency is likely to result in poor labour market outcomes upon arrival. An important issue to consider is whether these poor initial outcomes change with time in the country and, presumably, the picking up of language fluency. To this effect we incorporate data on the occupational skills involved in the jobs immigrants take to assess the extent to which assimilation in skills is influenced by linguistic proximity. Further, we will explore whether there are systematic differences in assimilation (in skills and wages) depending on the degree of linguistic proximity between immigrant's mother tongue and English or French.

2. Methodology and Data

Our analysis of the labour market outcomes of immigrants follows seminal work in the literature by Borjas (1985). We estimate an equation of the following form,

$$Y_{it} = X_{it}\beta_1 + L_i\beta_2 + skill_s\beta_3 + \beta_{jt}\sum_{j=1}^{4} Coh_j * t + t + \epsilon_{it} \quad (1)$$

where the dependent variable (Y_i) is a measure of labour force performance of individual i, whom we observe (only) in survey year t; X_{jt} is a vector of that individual/household characteristics. L_i is a measure of linguistic proximity (LP) between the individual's mother tongue and the language in the destination; $skill_s$ are dummies for each the job skills considered here; Coh_j, are indicators designating j five-year immigrant arrival cohorts, which we interact with the indicator for survey year (t) to track the evolution of different entry cohorts over time. Cohorts are defined over five years (i.e. the 91 cohort includes individuals arriving between 1986

and 1991), which result in ten relevant interactions. β_{jt} are coefficients for the cohort-time indicators measuring the assimilation of immigrant cohorts. β_2 and β_3 are vectors of coefficients for the LP proximity and job skill indicators. The reference group for the LP indicators are native speakers. The coefficients for the time-cohort indicators correspond, by default to those of immigrant with LP=1.

2.1 Linguistic Proximity

A distinctive feature of our analysis is the incorporation of a measure of LP to assess its role on the assimilation of immigrants. As suggested by previous research, both fluency in the language of the destination country and the ability to learn it quickly will influence immigrant's success in destination countries' labor markets (Kossoudji (1988), Chiswick and Miller (2002, 2007, 2010), Dustmann (1994), Dustmann and van Soest (2001 and 2002), and Dustmann and Fabbri (2003). Bleakley and Chin (2004 and 2010) exploit differences on adult English proficiency between immigrants from non-English speaking source countries who arrive as young children versus the others and find that linguistic competence is a key variable to explain immigrant's disparities in terms of educational attainment, earnings and social outcomes. Recent studies (Chiswick and Miller, 2005; Isphording and Otten, 2011) also show that it is easier for a foreigner to acquire a language if her native language is linguistically closer to the language to be learned. Unfortunately, since the Canadian Census has no measure of linguistic fluency it is not possible to replicate the same type of analysis in the sample we employ.

As a proxy of fluency we use a measure of linguistic proximity between two countries developed in Adserà and Pytliková (2014) and based on information from the encyclopaedia of languages Ethnologue (Lewis, 2009). The LP index ranges from 0 to 1 depending on how many levels of the linguistic family tree the languages of both the destination and the source country share. Thus the LP index equals 0 if two languages do not share any level of the linguistic tree; 0.1 if two languages are only related at the most aggregated linguistic tree level, e.g. Indo-European languages; 0.25 if two languages belong to the same first and second- linguistic tree level, e.g. Germanic languages; 0.45 if two languages share the same first up to third linguistic tree level, e.g. Germanic North languages; and 0.7 if both languages share all four levels of linguistic tree family, e.g. Scandinavian East (Danish, Norwegian and Swedish) and finally the index equals 1 if both languages are the same. The measure provides a continuous metric of

proximity between any pair of languages and provides a far better adjusted and smoother indicator of proximity than the standard dummy for common language used in most of the literature. We match this measure with an indicator variable denoting the individual's country of birth available in the Canadian census. We use three measures of LP: the proximity between the first official languages denoted "*First*", minimum proximity between any official language at origin and destination denoted "*Any*" and, the proximity between the most common used language denoted *"Most used*". Taking the first measure as a benchmark proximity to English, the second will produce more flexible results taking into account potential familiarity between languages other than the official language at origin and either English or French. The third measure is likely to be more accurate as will pick up actual familiarity between the most common language used at origin and English.

In robustness analysis we employ a number of alternative measures of linguistic distance such as the Levenshtein distance which relies on phonetic dissimilarity of words in two languages for all world languages and the Dyen index based on the similarity between samples of words among Indo-European languages. We also take into account multiple official languages in origin to account for potential previous familiarity with French or English. With this measure we calculate the minimum distance of any of the official languages in the country of origin to English or French (see Adserà and Pyliková 2014 for more details of these additional measures).

In a final set of robustness analysis, we conduct separate exercises for the province of Quebec where French is more dominant.

2.2 Wages and Skill Progression

The Census collects information on the wage received and weeks worked the previous year; however information on hours of work is collected over the census reference week. This introduces problems in constructing a reliable measure of hourly wages and we follow other Canadian studies in using weekly wages as our main measure of labour market performance.

A distinctive feature of this paper is a focus on occupational skills involved in the jobs held by immigrants. Occupational skills might track immigrant assimilation better than wages. Skilled immigrants in particular might be switching between unskilled and skilled jobs as they acquire language proficiency, experiencing little effect on pay, as initially some skilled jobs might be

lower paid than some unskilled jobs. Hence in alternative specifications of the model, Y_{it} will become a measure of occupational skills.

This focus on skills rather than on occupation is significant. Typically, most job changes (and their accompanying wage responses) involve substantial adjustments in skill requirements, but might not result in a change in the occupational category, particularly when measured broadly as pointed by Autor and Handel (2013). The occupational matching literature uses detailed information in occupation databases - either the Dictionary of Occupational Titles (DOT) or the Occupational Information Network (O*NET) – to derive a small set of fundamental skill requirements for each job. The skills we consider here come from Imai et al (2011) and are derived from the O*NET. These include two indexes for cognitive skills (social and analytical) and three indexes for manual skills (fine motor skills, physical strength, and visual skills). To facilitate interpretation of the data, the detailed information in the O*NET is summarized by constructing a low-dimensional vector of occupational characteristics using Principal Component Analysis (PCA).[1] The result is a vector of skills necessary to perform the job tasks associated with each 4-digit occupational category using the O*NET. The factor analysis uses as weights the distribution of the skill distribution of the Canadian working population; hence a unit of the skill score (with mean zero) can be interpreted as one standard deviation in the skill distribution of the Canadian population.

2.3 Sample Description

The rest of our data comes from the restricted files of the Canadian Census (1991 through 2006). The confidential files offer detailed information on individual fertility, occupation, country of birth, year of arrival and mother tongue that we need to match the Census with the additional variables. The large samples contained in the restricted Census files will also help reducing attenuation bias (Aydemir and Borjas, 2010).

We consider men and women separately to correctly address differences in labour force attachment between them and exclude aboriginal individuals. For the sample of women, we construct several fertility indicators based on the number of children in the household. These

[1] In the PCA, factor loadings are calculated so that variation of the data explained by the constructed variable is maximized. A detailed description of the procedure can be found in Imai et al. (2011).

include the number of births, age of children, and mother's age at different births to allow potential interruptions in experience to have different effects depending on when they happen in the life cycle. This is an important characteristic in which immigrant and Canadian-born females appear to diverge (Adserà and Ferrer, 2013). Finally, in order to reduce computing time to reasonable length, from each census we select all immigrants plus a 25 percent random sample of Canadian born individuals and weight the observations accordingly.

The preliminary results shown here, however, are limited to the sample of men and that of married or common-law (CL) women. We restrict ourselves to immigrants who arrived as adults (at age 18 or over), because the behaviour of child immigrants is likely very different from that of adult immigrants (Adsera and Ferrer, 2013; Mayer and Riphalm, 2000; Beck et al. 2012). For women, we separate the sample into one of single women and one of married women 18 to 45, because marital status is a potentially endogenous variable that can have strong influence in women's labour market decisions.[2] Unfortunately with Census data, we cannot address this endogeneity because we lack marital history. Nevertheless, most adult immigrant women are married at the time of arrival (approximately 73% of all adult immigrant women, according to Census data) as marriage is a requirement for spousal visa, which is the more common visa among female immigrants during the time period considered here. The age restriction also renders more reliable our measures of fertility, which reflects the number of children living in the household, rather than actual births. Our vector of individual (household) characteristics, X, contains location (province, and cma), education, experience and experience squared, and indicator for GDP at the country of origin (either when the immigrant immigrated, or at age 18). For women we also add age, age squared, all the fertility indicators mentioned above, total fertility rate at the country of origin and a measure of the spouse's wage.

In out sample, immigrants are generally older than the native born, and more likely to have university education than natives. Immigrant women hold jobs with higher strength score and lower analytical and interpersonal score, both characteristics of low status occupations than Canadian-born women. For instance, the average skill requirements in jobs held by immigrant women involve interpersonal and analytical skills that are on average 0.09 and 0.012 standard deviations (SD) below those of the average Canadian worker. Their motor and strength skill

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[2] Results for single women not shown in this paper

requirements are 0.12 SDs below that of the average Canadian worker. This is in sharp contrast with the skills involved in jobs held by Canadian-born women, who typically involve social and quantitative skills 0.24 and 0.06 SDs *above* – and motor and strength skills around 0.3 SDs *below* - those of the average worker. This makes the gap in skills of the jobs held by native born and immigrant women quite significant. Immigrant men, on the other hand, hold jobs that require, on average, similar interpersonal skills and higher analytical skills than the average Canadian-born males. Jobs held by immigrant men also require less motor and strength skills than Canadian-born males. Figure 1 shows the full distribution of quantitative and physical strength skills for married women.[3]

Regarding LP (first official language), a large fraction of immigrant men (34%) come from a country where the first official language has no branch in common with English. The main countries in this category are China, Philippines and Korea, those where the first official language is Arab (Egypt, United Arab Emirates) and most African countries. The main countries remain classified as 0 LP even if we use the "*most commonly used*" metric. A further 40% of immigrant men come from countries where the first official language has only one branch in common. This category includes countries where Spanish is the first official language (Mexico), most of Eastern and Southern Europe (France, Ukraine) and some Eastern Asian countries, such as Afghanistan, Bangladesh, India, and Sri Lanka.[4] Countries with LP= 0.25 are Northern European (Denmark, Iceland, Norway and Sweden) and countries with LP=0.45 are those where the first official language is of Germanic origin (Switzerland, Germany, Belgium, The Netherlands and their colonies). The main countries with LP=1 are the US and the UK, using the first official language includes additional smaller commonwealth countries (such as Mauritius) but most of them are not classified as such if we used the "*most commonly used*" language criteria.

3. Regression results

3.1. Wage and linguistic proximity

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[3] Note that skills here measure the skills involved in performing the job, not the actual skills of the worker.
[4] Iran and Pakistan have a LP=0.1 according to first official language, but a LP=0 according to "most used language"

Figure 2 reports results from estimates of equation (1), showing the difference in log wages between different cohorts of immigrant and similar native-born individuals, when controlling for skills and linguistic proximity. We show here preliminary results for the *"Most used language"*. We report the coefficients for the cohort time interactions, as well as those for the skill indexes and the measure of linguistic proximity. Note that these time-cohort coefficients would correspond, by default, to those with LP=1.

As mentioned above, the literature on immigrant assimilation has emphasized the role of language fluency as a key determinant of successful labour market integration in various countries (Chiswick and Miller, 2010; Clark and Lindley, 2009; Dustmann and van Soest, 2002). To examine this, we introduce in equation (1) an interaction between the time-cohort indicators and the different levels of linguistic proximity, which allows us to follow over time immigrant cohorts with different levels of linguistic proficiency. Figure 2 show, for men and women respectively, how the wages of cohorts with different degrees of linguistic proximity fare with time in Canada. The results show that for men, cohorts from countries with LP=0 (dotted line) have significantly lower wages at entry (45 to 65 percent lower in the case of men) than the native born. These cohorts do experience some improvement with time in the country although their performance remains well below that of the Canadian born. Under any metric used, immigrant men with LP=1 (solid line) fare better, relatively speaking, than those with zero linguistic proximity, although the difference resides more in levels than on the shape of the assimilation profile. There are significant differences in levels – but not in earnings profile - of earnings when measuring LP by *"any official language"* indicators rather than linguistic proximity to *"most used language"*. Wages of immigrant men with LP=1 are around 10 percentual points higher than those of immigrant men with LP=0 if using the former measure, but almost 30 percent higher if using the later. Using the *"first official language at destination"* metric is fairly similar to those in "*most used*" shows that those with LP=1 have earnings very close to those of the native-born that experience little change with time spent in Canada.

The case of women is somewhat different, with small differences between those with the closest and those with the farthest linguistic proximity, particularly if using linguistic proximity to *"any official language"* (not shown here). Immigrants with LP=1 experience an initial wage disadvantage relative to similar native-born women of 20 to 40 percent lower initial wages,

whereas women with LP=0 experience initial wages that are 50 to 30 percent below those of the native born. Both groups, however, experience similar assimilation over time.

Does linguistic proximity affect the returns of some skills more than others?

University Education and LP

Given the emphasis of Canadian policy during the 1990s and early 2000s on selecting immigrants with high levels of human capital, in particular high levels of formal education, a natural question to ask would whether the transfer of skills embodied in formal education depends greatly on the degree of linguistic proximity. To study this, we will assess the association between wages and LP and job skills for a subsample of university educated individuals Further we will conduct a similar analysis (introducing an interaction between university education and LP) to see whether LP is an important variable in rewarding immigrant's formal education. Finally it is plausible that LP is more important in determining pay when jobs require a specific set of skills. For instance, LP could matter more when associated with jobs requiring social skills than with jobs requiring physical strength. We will explore this possibility introducing an interaction between LP and skills in equation (1).

$$Y_{it} = X_{it}\beta_1 + L_i\beta_2 + skill_s\beta_3 + \beta_{ls}\sum_{s=s1}^{s5} \quad \sum_{l=0}^{0.7} L_l * skill_s + \beta_{jt}\sum_{j=1}^{4} Coh_j * t + t + \epsilon_{it}$$

(2)

where s_1 to s_5 denote the skills (social, motor, visual, strength and analytical) and l denotes the levels of LP (from 0 to 0.7 or 0 to 0.45 depending on the definition used).

The Analysis of Skills

Another dimension along which to examine the performance of immigrants in the labour market is by looking at the skills imbibed in the jobs they do. To this effect we use the skills index as the dependent variable in a regression that looks into the effect of LP on the skills required for the jobs immigrants hold.

Some Preliminary findings

From our initial analysis we have found the following main regularities.

- Linguistic Proximity plays a significant role on the transfer of skills:

- Low Linguistic Proximity imposes larger penalties to the university educated than to those with lower educational attainment

- Low Linguistic Proximity implies lower returns to all required job skills for men and social skills for women

- Cohorts of immigrant with low Linguistic Proximity experience large entry wage penalties, but even these groups experience substantial wage assimilation over time.

- In general, high Linguistic Proximity results in flat skill progression and low Linguistic Proximity results in changes in required job skills over time.

- There are important gender differences. For men, low Linguistic Proximity results in increasing levels of job required strength skills. For women, low Linguistic Proximity results in declining job required strength and increasing analytical skills over time. Also, low Linguistic Proximity results in considerable wage penalties to all skills and formal education for men, but only to social skills and university education for women

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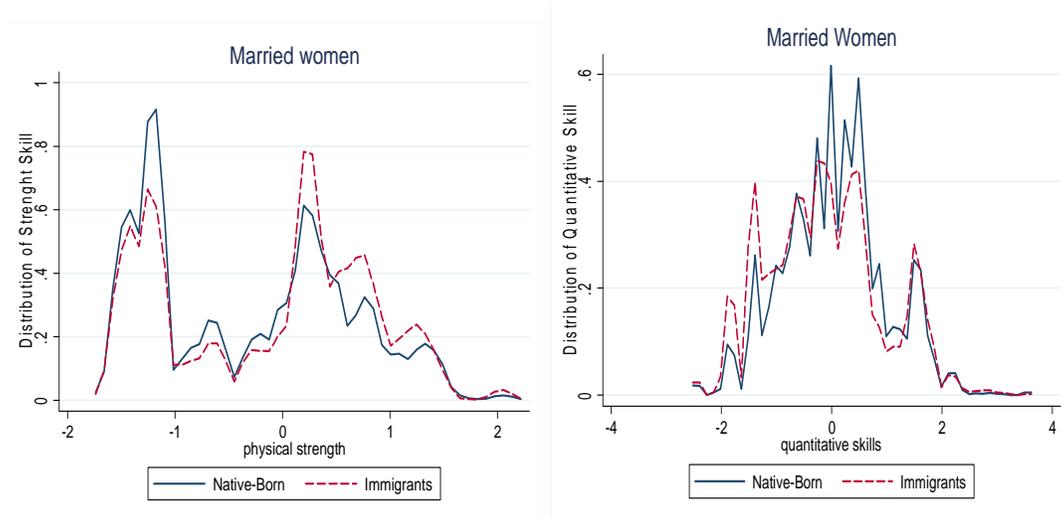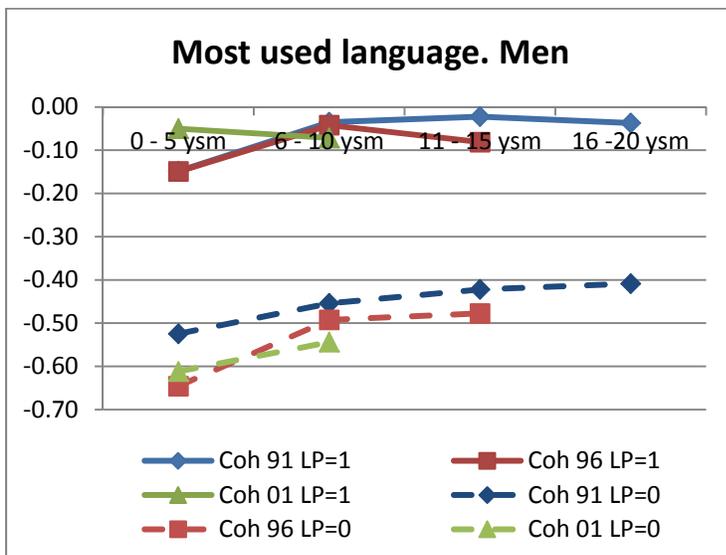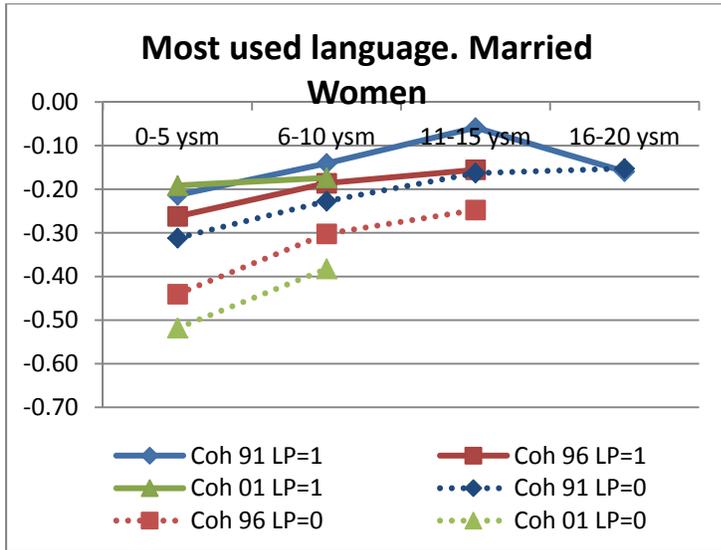**Figure 1. Distribution of strength and quantitative skills by immigrant status of married women**

Figure 2. Immigrants' wage assimilation by LP, arrival cohort and years since migration

Most used language. Married Women

Most used language. Men

Note: figures from model that includes cohorts of arrival and basic demographic characteristics. Figure shows predicted wage profile for the two extreme cases of linguistic proximity index: individuals with LP=1 (English as a mother tongue in this case) and for those with LP=0 (whose mother tongue does not have any common branch in the linguistic tree with English)