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IZA DP No. 11370

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ABSTRACT

Selective Immigration, Occupational Licensing, and Labour Market Outcomes of Foreign-Trained Migrants

This paper studies occupational licensing as a possible cause of poor labour market outcomes among economic migrants. The analysis uses panel data from Australia, which implements one of the world's largest selective immigration programmes, and applies both cross-sectional and panel estimators. Licensing emerges as acting as an additional selection hurdle, mostly improving wages and reducing over-education and occupational downgrade of those working in licensed jobs. However, not every migrant continues working in a licensed occupation after settlement. In this case there is substantial skill wastage. These results do not change over time, after employers observe migrants' productivity and migrants familiarise with the workings of the labour market, supporting the case for tighter coordination between employment and immigration policies to address the under-use of migrants' human capital.

JEL Classification: J8, J24, J61

Keywords: skilled immigration, over-education, occupational downgrade, immigration policy, occupational licensing

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1. Introduction

Over the past decade migration policy discussions in both Europe and the United States have increasingly raised the merits of selecting economic migrants using a points-based system as an essential tool for the orderly management of population inflows (e.g. Beach, 2006; Tani, 2014; Fasani, 2016; Donald, 2016; Hunt, 2017). This is an approach based on scoring a set of observable determinants of productivity such as age and education, which lead an immigrant applicant to qualify for permanent residence when a minimum threshold, set by the host country's immigration authorities, is reached. The key feature of this mechanism is to effectively transform the decision to grant permanent residence into a relatively transparent administrative rather than political process that is easy to implement and adjust when circumstances change. At present a points-based system regulates the immigration of large volumes of economic immigration in Canada, New Zealand, and Australia. Experience suggests that this mechanism admits those possessing the desired observable characteristics, who are predominantly young professionals.

Despite the selection carried out, however, empirical evidence shows that the labour market outcomes of many foreign-educated migrant professionals are substantially lower than those of comparably educated natives. This arises regardless of whether or not selective immigration policies are in place (Migration Policy Institute, 2005; Kuptsch and Pang, 2006; OECD, 2009; Schuster, Desiderio, and Urso, 2013). For instance in Australia, Canada and New Zealand the proportion of tertiary-educated migrants carrying out jobs requiring only a high school diploma is as high as 30% versus natives' 10% (Green et al, 2007; Wald and Fang, 2008; Poot and Stillman, 2010), similarly to what has been documented in Europe (Nieto, Matano and Ramos, 2015; Joona, Gupta and Wadensjö, 2014; Alexsynka and Tritah, 2009) and the US (de Matos and Liebig, 2014).

The literature has advanced a number of possible explanations to reconcile the practice of screening economic migrants with evidence of their skills' wastage after settlement. Some studies have focused on labour supply, like inadequate or poor quality skills (Dustmann, 1999; Piracha et al, 2014; Chiswick and Miller, 2009; Basilio and Bauer, 2010). Others have focused on labour demand, like host country employers' taste (Battu and Sloane, 2004; Altonji and Pierret, 2001; Lange, 2007) and statistical discrimination (Tani, 2017).

So far little attention has been placed on the role of institutional settings within the host country's labour market. This paper contributes to fill this gap by focusing on the fact that while selective immigration policies tend to favour young professionals, entry into many professional jobs in engineering, education, medical services, financial, and legal advice is restricted, by law, to those holding an occupational license. Does occupational licensing contribute to migrants' education-occupation mismatch? If so, what are the implications for immigration policy?

To address these questions, I use Australian data collected through the Longitudinal Survey of Immigrants to Australia (LSIA), one of the most comprehensive surveys containing detailed information on labour market status and employment immediately before and after settlement. Reasons behind this choice include Australia's established formal process of assessing and recognizing foreign qualifications [1], a strong tradition of self-regulated

[1] This is administered by the Department of Immigration and Border Security (Overseas Qualifications Units), whose stated objective is "to assist migrants to obtain recognition of their overseas gained skills and qualifications" especially with respect to "statements of educational comparison for qualifications obtained overseas; and information on where and how to obtain specific occupational assessments and which occupations have licensing and regulatory requirements" as described in http://www.immi.gov.au/asri/os-qual-units.htm - (accessed 14 January 2014). Since the late 1980s Australia has reformed its recognition of foreign qualifications, establishing the National Office of Overseas Skills Recognition (NOOSR) and developing Country Education Profiles to define the quality of education and training in source countries, and facilitate benchmarking against Australian standards. Peak national pre-migration assessment bodies were also established in major professional fields (such as medicine, nursing, accounting and engineering) and an Australian Qualifications Framework was implemented from 2000, to enhance mapping of global against national standards, and to act as a reference point for licensing and regulatory bodies (Hawthorne, 2015). Despite this activity, over-education among foreign

professional associations (Hawthorne, 2015), and migrants' substantial skill wastage despite their selection via the points-based system and (Green et al, 2007; Piracha et al, 2012).

The empirical analysis uses both cross-sectional and panel estimators to estimate the effect of occupational licensing on wages and three measures of quality of the education-occupation match: over-education[2], job prestige[3], and occupational downgrade[4]. The results show that licensing acts as an additional screening mechanism beyond the selection implemented by the points-based system. For those continuing to work in licensed occupations, licensing contributes to higher wages and lower incidence of educational-occupational mismatch relative to those working in non-licensed jobs. For those who worked in licensed jobs prior to migration but not afterwards, licensing is associated with the poorest quality of the education-occupation match. This group contributes two thirds of migrants experiencing over-education and occupational downgrade post-migration.

It is unlikely that this outcome reflects individual preferences, as this group is predominantly composed of migrants trained in Science, Technology, Engineering and Mathematics (STEM), who were in high demand at the time of the LSIA survey. Furthermore, their occupational penalty worsens if they change employer, which would be irrational if working for the same employer is possible. A more likely explanation is an insufficient coordination between immigration and employment policies, since these tend to be carried out

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university-trained migrants runs at multiples of the corresponding figure among Australia-trained natives (Green et al, 2007).

[2] Throughout this paper the education-occupation mismatch is measured by over-education as defined using the "job analysis" method, which draws on occupational definitions developed by specialists. The Australian Bureau of Statistics (ABS) performs this analysis in the case of Australia (ABS, 2006). A worker is considered to be over-educated if the education is one or more levels above what required by the occupation carried out. A bachelor-degree holder carrying out a job where only high school education is required is considered to be 'over-educated'. Advantages and limitations of this definition are explored in detail in previous work and will not be further discussed here (Halaby, 1994; Hartog, 2000; Dolton and Vignoles, 2000; Chevalier, 2003; Leuven and Oosterbeek, 2011).

[3] This is measured using the Australian National University ANU4 scale: http://ipumsi.anu.edu.au/SiteTools/Status_Scales/scalesgen.php

[4] This is measured as the difference in the occupational prestige of the last job held before migration less the corresponding measure of the job held after migration. A positive value indicates a downgrade.

independently of each other. Yet, there may be substantial lags between the collection of labour market information from employers and its incorporation in migration policy actions, which may cause unbalances between past and present demand for skills, or effective rationing of licensed occupations. Either case supports the case for tighter coordination between employment and immigration agencies to limit the under-use of migrants' human capital.

The rest of the paper is organised as follows: Section 2 provides a literature background. Section 3 presents the data. Section 4 discusses the empirical strategy. Section 5 presents the results. Section 6 highlights some policy implications.

2. Literature

Economic migration is generally seen as the outcome of a cost-benefit analysis, where individuals or households compare the net expected benefits of staying in the home country versus those obtained by moving elsewhere (Sjaastad, 1962). As personal characteristics and circumstances differ, migration is not a random phenomenon but the result of individual self-selection. This however is not always welcome news for the host country, as migrants can be either positively or negatively selected, respectively, when sourced from the top or the bottom part of the ability distribution of the countries of origin.

Roy' model (1951) considers income inequality of home and host countries as key indicators to gauge whether migrants are positively or negatively selected (Roy, 1951; Borjas 1987 and 1991). This approach rests on the hypothesis that the distribution of ability in each country's population is reflected in the distribution of income. In other words, income (a price measure) contains by assumption all the information about an individual's productivity and worth in the labour market. When home and host countries place a similar value on abilities then

relative average incomes per capita are similar and there is little incentive to migrate[5]. However, if income inequality is higher in, say, the host country, then the most able individuals from the home country will find it attractive to migrate there, as their ability is better rewarded. Conversely, the least able individuals of the host country will find it attractive to migrate to the home country, which has a more compressed income distribution, because this is where their ability is better rewarded.

A selective immigration policy becomes relevant if the host country has a relatively high average income compared with the home country (most home citizens would want to emigrate), a compressed income distribution (low-skill/low-ability home citizens want to emigrate), and possibly a comprehensive welfare system for its low-income earners[6] (Tani, 2014).

The key economic principle underpinning the use of a points-based system is the use of observable established determinants of individual productivity to admit only those likely to make a net positive economic contribution. Points are generally awarded to (i) young immigrants, who benefit the host country through longer working lives and a lower likelihood of accessing welfare; (ii), high levels of formal education or vocational training, as this human capital can be immediately employed with no further training costs for the host country; and (iii) proficiency in the host country's language, as this reduces retraining costs while facilitating integration and speedy access to labour market opportunities. Yet, as

[5] Of course, average differences in incomes between home and host countries play a critical role in determining who migrates where, as does the quality of the information set facing migrants. If information is complete and average incomes at home are below those of the host for each level of skill, then every home citizen will have an incentive to emigrate. If the information is incomplete or imperfect then 'irrational' migration behaviours may be observed (e.g. Mbaye, 2014).

[6] Clemens and Pritchett (2016) test the idea that restricting migration from low-income countries could be efficient because it prevents migrants of countries where average productivity is low from 'transmitting' their lower productivity to high-income countries, where average productivity is high. The authors find that current restrictions to migration are still excessive for the 'low productivity contagion hypothesis' to be empirically supported based on current migration flows.

illustrated in Table 1, migrants' skill wastage is similar across several high-income host countries, regardless of whether or not they apply selective immigration policies.

The topic of migrants' skill wastage is addressed in four distinct areas of research. The first is the literature on migrant selection. These studies debate the effects of imposing restrictions using a point-based system[7], especially with reference to the determinants of selection on education (McKenzie and Rapoport, 2010; Beine et al., 2011) and the influence of immigration policies on the selection process from both a theoretical (Docquier et al., 2007; Bertoli and Brucker, 2011; Bertoli and Rapoport, 2015) and an empirical perspective (Antecol et al., 2003; Jasso and Rosenzweig, 2009; Aydemir, 2011; Belot and Hatton, 2012). Although this literature is mainly concerned with migrants' selection process rather than subsequent outcomes, its key message is that screening potential migrants on the basis of education and other observable characteristics can reduce the skill quality of those admitted. This occurs as education also influences migrants' self-selection on variables that are not measured, like ability and motivation (e.g. Bertoli, Dequiedt and Zenou, 2016). An increase in selectivity based on education may lead to admitting less able and motivated migrants. After all, history shows that successful migrants, often entrepreneurs, tend to be highly motivated and hard working but not necessarily have acquired high levels of formal education.

The second group of studies documents occupational downgrade as a common migration outcome. This result arises from the evolution of migrants' career patterns before and after migration. Migrants experience a U-shape occupational pattern as a result of migration, with entry into generally low-skilled jobs in the host country just after settlement and progressive improvement thereafter. Such a pattern has been observed on migrants from the new member

[7] Examples are Borjas (1987), Antecol et al. (2003), Chiquiar and Hanson (2005), Jasso and Rosenzweig (2009), Moraga (2011), Ambrosini and Peri (2012), Dequiedt and Zenou (2013), and Kaestner and Malamud (2014).

states of the European Union to Ireland (Voitchovsky, 2014; Barrett and Duffy, 2008) and the United Kingdom (Drinkwater, Eade and Garapich, 2009), as well as among Eastern European and Central Asian migrants to the European Union (Danzer and Diez, 2014), and among migrants to the United States (Akresh, 2006 and 2008). This literature generally overlooks the role of occupational licensing, which is the focus of this paper.

The third group studies focuses on education-occupation mismatch, or over-education, as an economic problem of inefficient use of human capital (Leuven and Oosterbeek, 2011; McGuinness, 2006; Schuster et al, 2013). This body of work focuses on the determinants of over-education, identifying factors associated with labour demand (e.g. Farber and Gibbson, 1996; Altonji and Pierret, 2001; Lange, 2007; Tani, 2017) and supply (e.g. Battu and Sloane, 2004). In general this literature overlooks the role of frictions in the host country's labour market, and especially that associated with occupational licensing.

The fourth group of reference studies focuses on occupational licensing as an institutional labour market friction that calls for reforms in public policy. This research documents that licenses are typically issued by self-regulating professional associations, which have a monopolistic power over certain occupations within set jurisdictions in several host countries. Professional associations are common labour market institutions in the United States (Kleiner, 2000, 2013; Gittleman and Kleiner, 2015), the United Kingdom (Humphries, Kleiner and Koumenta, 2011) and the European Union (Koumenta et al, 2014). Their influence has also grown over time, covering, in the US, about 20% of those employed, up from 4.5% in the 1950s (Kleiner, 2006).

Licensing effectively curbs the maximum number of prospective suppliers in numerous professional and vocational jobs (e.g. Kleiner and Krueger, 2010). This in turn reduces productivity and efficiency in resource allocation in the labour market, as well as the quality of the services provided (Benham and Benham, 1975; Peltzman, 1976; Becker, 1986; Kleiner,

2000 and 2013). It is estimated that licensing raises members' hourly wages by about 15%, with wide variations among professions, similarly to a trade union (Kleiner, 2006; Kleiner and Kruger, 2010).

From a theoretical point of view the inefficiency caused by licensing is justified on the grounds that it solves a problem of asymmetric information surrounding the quality of a practitioner, as the practitioner is the only party with full knowledge of his/her quality. To protect the public against incompetent practitioners, public screening and the enforcing of minimum standards are delegated to professional associations and the expertise of their members (Gellhorn, 1976; Leland, 1979). The very existence of asymmetric information rules out the government as the natural institution capable of carrying out a screening function, as it cannot know the quality of each practitioner. As a result, a higher cost of service is viewed as compensating for a higher quality in the professional services delivered.

While working in theory empirical evidence show that occupational licensing only leads insiders to enjoy rents, with no detectable effect on the quality of the services delivered. This result applies to licensed jobs carried out by professionals as diverse as physicians (Kugler and Sauer, 2005; Peterson, Pandya, and Leblang, 2013), cosmetologists (Adams, Jackson, and Ekelund, 2002), midwifery (Adams, Jackson, and Ekelund, 2003), dentists (Kleiner and Kudrle, 1997), accountants (Carpenter and Stephenson, 2006), teachers (Wiswall, 2007), manicurists (Federman, Harrington, and Krynski, 2006), lawyers (Pagliero and Timmons, 2013), and radiologists (Timmons and Thornton, 2008) to name a few.

Furthermore, occupational licensing seems to draw negatively selected individuals in several cases including medical doctors (Kugler and Sauer, 2005), teachers (Wiswall, 2007), and other licensed professions in the US (Kleiner, 2000 and 2006) and the UK (Kleiner and Kruger, 2010). One cause of negative selection is that the restrictions imposed by occupational licensing are ineffective in weeding out weak candidates and may impose job-

specific sunk costs that make a profession less attractive among applicants possessing generic skills that can be transferred, with higher returns, to a wider set of jobs.

Notwithstanding the links with these four streams of literature, very little work seems to exist on the relationship between occupational licensing and the international mobility of professionals, which is the focus of this paper. The scant existing research purports that occupational licensing reduces the within-country mobility of certain categories of workers (Pashigian, 1979; Kleiner, 2000). The jurisdiction controlled by professional associations is local, typically state-based for federal countries such as the United States and Australia, and different jurisdictions do not automatically recognise qualifications and memberships granted by another. This results in the internal migrant having to reapply to practise their profession in the place of destination, causing at once local over-supply and skill shortages.

With reference to migration and licensing, Peterson, Pandya and Leblang (2013) find that a tightening of requirements for migrant physician licensure in the United States over the period 1973-2000 reduces the inflow of new migrant physicians. In particular, the migration rate of foreign-educated physicians is higher in states where occupational licensing is less restrictive. This result is used to highlight the role of local institutions, and their unelected officers in some circumstances, in determining the distribution of an internationally mobile workforce.

Similarly to Peterson, Pandya and Leblang (2013), this paper studies the role of occupational licensing but focusing on migrants' labour market outcomes rather whether migration policy follows public or protectionist interests. Furthermore, this paper exploits longitudinal data to trace the effect of licensing over time, and hence contributes a set of results that better control for individual heterogeneity than cross-sectional analyses.

3. Data

The LSIA is an extensive longitudinal survey of migrants commissioned in the 1990s to collect better information on the settlement of new immigrants relative to what was available through the national census. It is based on a representative sample of 5% of permanent migrants from two successive cohorts[8]. LSIA1 surveys migrants who arrived between September 1993 and August 1995 and is composed of three waves collected between 4-6 months after settlement and up to 41 months afterwards. LSIA2 surveys immigrants arrived between September 1999 and August 2000 and contains two waves collected between 4-6 months after settlement and about a 15 months later[9]. Despite being a short panel, the LSIA captures valuable information about migrants' conditions prior to moving and during the initial stages of settlement. One of its strengths is information prior to migration, including the occupation at a 4-digit code in the last job prior to migrating and the job subsequently carried out in Australia. An informative description of the LSIA is in Cobb-Clark (2001).

The LSIA has a number of limitations. It surveys a relatively small sample, so that categories within relevant explanatory variables often need to be aggregated. It covers neither native Australians nor New Zealanders, who face no work restrictions if settling in Australia, forcing comparisons only between different immigrant groups. It does not covers onshore applicants, like international students already in Australia, whose contribution to the skilled independent immigrant flow has been substantial over the past two decades. Furthermore it does not contain information on whether the job held requires occupational licensing. Identifying which occupations requiring a license is challenging, as each of Australia's six states and two territories has different occupational requirements. These are generally similar and in some occupations guided by peak bodies at national level, but differences occur to the

[8] The LSIA oversamples some groups of individuals notably on visa categories. The humanitarian (refugee) category is over-represented but the weights to recover population statistics are available in the database.

[9] A third cohort, LSIA3, was collected using a substantially reduced version of the questionnaire. These data are not suitable for the analysis carried out in this paper and are hence not used.

extent that mobility within a given licensed occupation across states remains limited. I use the description of each occupation provided by the Australian Bureau of Statistics (ABS) and hence identify as licensed all the occupations that the ABS describes as 'may be subject' to such restriction[10]. This choice can introduce measurement errors in the main explanatory variable, which is acknowledged. An additional limitation is that licensed and non-licensed jobs are identified only using Australian requirements rather than those of each country of origin.

Despite these limitations, existing research typically finds that the outcomes of migrants from English-speaking countries tend to reflect those of native Australians, and uses the LSIA to compare foreign and native outcomes in a variety of settings (e.g. Chiswick and Miller, 2009). To improve the comparability between those working in a job requiring an occupational license and those in a job not subject to it, the sample is restricted to primary applicants in working age (20-65), and holding a foreign tertiary or higher degree. Additional restrictions include the removal of observations with missing occupational data and information on the education-occupation mismatch in the year before migration, which is used as a proxy for ability. As shown in Table 2, the data trimming reduces the working sample to 1,305 observations in the first wave of LSIA, of which 743 belong to LSIA1 and 562 to LSIA2. The drastic reduction in the number of observations is controlled for by the addition of an

[10] Finding which occupation requires a licence is not feasible at this stage, as Australia does not have a national system of licensed occupations. These are managed at a State level. The Council of Australian Governments (COAG) began discussions to introduce a national occupational licensing system for certain occupations in 2008. The aim was to remove "duplicate and inconsistent regulation for specific occupations between states and territories". The proposed regulatory change however faced substantial opposition by States and professional associations, and was abandoned in 2013, following a change in federal government. For more information, see http://www.coag.gov.au/node/516 (accessed 26 December 2014). Nowadays, licensing requirements are explicitly reported in the description of some occupations, such as those in the medical profession. However, the description of several other professions only highlights that a licence "may be required", implying different regulations based on the type and location where a profession is carried out. I use this broader definition to construct a dummy variable equal to one for occupations that do or may require licensing, and zero otherwise. Occupations in LSIA are reported at a 4-digit ASCO code. This however is not sufficient to know exactly if the occupation is subject to licencing, as more precise information is available only at 6-digit level. The consequent measurement error attributes licensing to occupations that may not and hence contributes to the attenuation bias. The estimates obtained therefore measure the lower bound.

indicator of selectivity in the regressions performed, as commonly carried out in the empirical literature (Green et al, 2007).

Table 3 presents preliminary evidence about the possible role of occupational licensing as a determinant of migrants' wages and job matches. The first column shows the shares of migrants with varying types of experience in licensed jobs before and after settlement: in the top row is the share of migrants who worked in non-licensed jobs before and after migrating (group 1: 48.8%). This is used as reference group in the rest of the analysis. The next two rows show the shares of those who are currently licensed and either did not work in a licensed job before migrating (group 2: 7.1%) or did so (group 3: 28.3%). In the bottom row is the share of those who worked in a licensed job before migrating but not after settlement (group 4: 15.8%).

The identification of licensed versus non-licensed jobs is important, as access to a profession is normally easier when one has relevant prior experience. There are only 7.1% of migrants working in a licensed job but having worked in a non-licensed occupation before migration. Many of them are employed in the education sector, and are foreign graduates undertaking academic jobs in Australian universities.

The remaining columns of Table 3 show the average values of the labour market outcome indicators for the four chosen categories of migrants. On average, those in a licensed job (groups 2 and 3) emerge as having better labour market outcomes than those working in a non-licensed job: they have higher wages, lower incidence of over-education, higher occupational prestige and lower chances of occupational downgrading. In contrast, those who used to work in licensed jobs before migration but not afterwards (group 4) have the poorest labour market outcomes: they have the lowest average wage and occupational prestige, and the highest incidence of over-education and occupational downgrade. This group includes several migrants with higher degrees in STEM, and raises a puzzle about the motives behind

their under-use: Australian employers were complaining about skill shortages in STEM fields at the time[11], and no clear hint emerges when cross-tabulating this migrant group with potential explanatory variables.

Table 4 reports the summary statistics for the working sample by occupation in licensed jobs before and after migration, and visa category, highlighting the immigration channels that contribute the most to each group. About half of the migrants working in non-licensed occupations are screened through the points-based system (skilled independent and concessional, or sponsored, family visa categories), with most of the remaining migrating through family reunification visa (preferential family).

The migrants working in a licensed job prior to migration but not afterwards, who experience the poorest labour market outcomes, are generally screened through the points-based system. The largest contributor to this group arrives with skilled independent visa (32%), though family reunification and concessional family visa account for about half of migrants in this group.

Table 5 reports the unconditional means and standard deviations of several attributes used in the empirical analysis. The first two columns on the left of the table focus on those working in licensed jobs. The next two columns focus on those working in non-licensed jobs. The last two columns report differences between licensed and non-licensed groups and the t-statistics of the Kruskal-Wallis test of differences in means. Statistically significant differences at the 1%, 5%, and 10% level are noted with the symbols *, **, and ***.

Migrants working in licensed and non-licensed jobs are different in many respects, including demographic and educational characteristics, type of visa, and residential choices post-migration. These differences identify suitable control variables for the regression analysis.

[11] See reports prepared by the Australian Industry Group (*World Class Skills for World Class Industries*, 2004), the Department of Employment and Workplace Relations (DEWR, *Workforce Tomorrow*, 2005), and the Department of Education, Science and Technology (DEST, *Audit of Science, Engineering, and Technology Skills*, 2006).

Non-licensed workers are on average younger, have a higher share of females applying as primary applicant, and are less likely to have children. The case of women not continuing working in a licensed job may instead reflect family circumstances whereby females are the primary applicant of their household by virtue of a younger age (which may yield more points if migrating under the points-based system). They may however choose not to be the primary income earner after settlement, especially if still looking after young children.

Those working in non-licensed jobs also graduated from a wider variety of countries than those in licensed jobs, who predominantly graduate from English-speaking countries. Those in non-licensed jobs are more likely to migrate with a family reunification or skilled independent visa, and tend to settle in New South Wales, the most populous state.

Table 5 also reports the unconditional mean of the dependent variables. On average, these are slightly lower for those working in non-licensed jobs, suggesting the possible influence of self-selection. To disentangle the effect of licensing from other institutional settings and selection mechanisms that influence migrants' labour market choices, the empirical analysis includes several institutional variables, which include:

(a) average income per capita and income inequality, which proxy the level of development and for self-selection into emigration, respectively;
(b) whether English is used as an official language, which accounts for cultural similarities between the places of origin and Australia;
(c) the home country network of previous immigrants in Australia, which proxies for information available to new migrants and support in their job searching efforts; and
(d) whether the country of origin is a member of the Commonwealth, which proxies for similarity of institutions and historical links and exchanges.

Table 6 reports the attrition rates of LSIA1 and LSIA2 to highlight the possible over/under-representation of migrants working in licensed and non-licensed occupations assessed across waves, which may cause distortions in the analysis of panel data. On average 14.2% of LSIA1 and 16.3% of LSIA2 original respondents do not continue the survey in later waves. The corresponding figures among the licensed in the working sample are 10.4% for LSIA1 and 15.5% for LSIA 2, respectively. Those proportions do not appear out of line with the overall sample attrition.

4. Methodology

The empirical analysis consists of two components. The first uses the cross-sectional data of the first LSIA wave and it applies an Ordinary Least Squares estimator (OLS) to the linear probability model:

$$y_{ij} = \beta_0 + \beta_1 \tilde{X}_{ij} + \beta_2 Z_{ij} + \beta_3 P_{ij} + \beta_4 P_{ij} Z_{ij} + \tau_{ij} \qquad (1)$$

where τ_{ij} is an i.i.d. error term and $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$,and γ are parameters to be estimated. In particular:

y_{ij} indicates one of the four labour market outcomes used: wage, over-education, occupational prestige, and occupational downgrade;

$\tilde{X}_{ij}$ is a set of personal as well as institutional characteristics of the countries of birth, education, and destination[12];

[12] These include: experience and its square, gender, marital status, whether there are school-aged children, the level of education, where education was acquired, if the country of birth is part of the Commonwealth, whether English is its, or one of its, official language(s), income inequality (as a control for emigrants' self-selection), GDP per capita, the size of the migrants from the same country of origin living in Australia, whether the observation was recorded in LSIA1 or LSIA2, and the interaction between cohort and visa class. The choice of control variables tries to reduce the possible pathways through which licensing may influence migrants' labour market outcomes. These include the use of English as an official language of the country of birth (Chiswick and Miller, 2009; Dustmann and Fabbri, 2003; Isphording, 2014), institutional links between home and country via membership to the Commonwealth, self-selection into emigration through the degree of income inequality in the home country, and information and help about finding work via the size of the network of migrants from the same country of origin who already lived in Australia at the time of settlement (Montgomery, 1991; Munshi, 2003; Ioannides and Loury, 2004; Bertoli and Rapoport, 2015). These controls are added to indicators capturing measures of educational quality (where education was acquired and the level of economic development of the

Z_{ij} and P_{ij} are dummy variables indicating whether the migrant carried out a job subject to licensing after settlement or before migration, respectively. The interaction term $P_{ij}Z_{ij}$ is also used to identify those continuing to work in a licensed occupation after settlement. The reference category is those who did not work in licensed jobs before and after migration;

τ_{ij} is an i.i.d. error term.

The second component of the empirical analysis focuses on the panel dimension of the LSIA, studying the effect of licensing over time, once employers observe migrants' productivity and migrants have a better knowledge of the workings of the host country's labour market. This analysis applies the panel random effects estimator to the linear probability model:

$$y_{ijt} = a_0 + a_1\tilde{X}_{1ijt} + a_2\tilde{X}_{2ijt} + a_3\tilde{X}_{2ijt}d + a_4Z_{ijt} + a_5Z_{ijt}d + a_6P_{ijt} + a_7P_{ijt}d +$$

$$+a_8Z_{ijt}P_{ijt} + a_{97}Z_{ijt}P_{ijt}d + \theta_{ijt} \quad (2)$$

where *t* indicates the LSIA wave, *d* is the time (in days) since the first interview, the vector $\tilde{X}_{1ijt}$ includes variables that are not interacted over time (experience and its square, gender, and characteristics of the country of birth and the country of education). The vector $\tilde{X}_{2ijt}$ includes indicators that are interacted with time since arrival (regions where education was completed, number of children) as their influence is likely to vary.

The error term $\theta_{ijt} = \delta_{ji} + \eta_{ijt}$, by assumption contains a time-invariant individual component δ_{ij}, and an i.i.d. error term η_{ijt}.

The coefficients, $a_0, \ldots, a_9$ are the parameters to be estimated. The time effect of occupational licensing for the three occupational groups discussed in the cross-section is measured by a_4-a_9.

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country of highest education), and an indicator of over-education in the country of origin in the job prior to migrating, which acts as an observed measure of ability (Piracha et al., 2012).

As licensing likely reflects self-selection in the field of study and occupation, its use as explanatory variable may correlate with characteristics that are not observed and hence are part of the error term in both models (1) and (2). As a result, its estimate is biased. Since the LSIA contains no suitable proxies to be used as instruments, the empirical analysis follows the approach of Kleiner and Krueger (2010), who address this problem by adding a full set of occupational dummies. The occupational fixed effects used in the analysis include 34 dummy variables, reflecting the ASCO classification of occupations at 2-digit level.

5. Results

Cross-sectional results

Table 7 presents four sets of cross-sectional estimates, one for each labour market outcome. The two upper rows present the estimates of working in a licensed job (relative to working in a non-licensed occupation). These results echo Kleiner and Krueger (2010), as licensing emerges as an additional form of selection on ability: both groups working in licensed jobs have higher wages than those with no prior experience of licensed occupation. This is +13.8% in the case of those with no prior experience of licensed occupation and + 16.9% in the case working in licensed jobs both before and after migrating. As a comparison Kleiner and Krueger find a 15% premium. Those working in a licensed job have also no or lower incidence of over-education, a higher level of occupational prestige in their current job (+11.4% and +13.0%) and a lower rate of occupational downgrade (-12.9% and -18.3%).

In contrast those with licensing experience before but not after migration have the poorest outcomes than any other category of migrants. In particular, they experience a substantial wage penalty (14.2%), have a higher incidence of over-education (+10.3%), lower occupational prestige (-9.7%) and higher occupational downgrade (+31%) than the reference group and any other category of migrants.

On average individual characteristics such as work experience, gender, and marital status do not have statistically significant effects, as the estimated coefficients hardly differ from zero. Only the presence of children living at home has a weak positive effect on salaries and occupational downgrade, perhaps reflecting longer working hours or stronger incentives in finding jobs to maintain the family. English language skills (ileng) are important only insofar as the wage is concerned (+.369 and statistically significantly different than zero) but do not appear to make any difference to the indicators of quality of the education-occupation match. Similarly, the level of education and where it was acquired have no statistically meaningful impact on outcomes other than the wage. These results likely reflect the inclusion of occupational dummies[13], and suggest that variation in labour market outcomes tend to reflect job-specific attributes rather than individual characteristics.

Among the other explanatory variables, the level of income in the country of birth positively affects labour market outcomes by raising wages and occupational prestige and lowering the incidence of over-education and occupational downgrade. This result is not surprising as it reflects the easy economic assimilation of migrants from other English-speaking countries as well as North-Western Europe, which has been noted before by the literature (e.g. Chiswick and Miller, 2009). In contrast, income inequality in the country of birth, the home country network of previous immigrants in Australia, and a country of origin's membership of the Commonwealth do not seem to play a role in affecting labour market outcomes in significant and consistent ways.

The only other explanatory variables affecting wages and the education-occupation match are the type of visa used for migration and the time of migration. With reference to the visa class,

[13] Without occupational dummies there are statistically significant penalties associated with being female, being educated in a non-English speaking country, and living in states other than those where Sydney and Canberra are located. There are instead premia for English language skills, and for having children living at home. These results are similar to those reported by the literature focusing on migrants' labour outcomes in Australia.

employer-sponsored migrants have better labour market outcomes as clearly arising in the results, with substantially improved outcomes and large and statistically significant non-zero coefficients. It is perhaps not surprising that reforms to immigration policy in Australia over the past few years have enlarged the migrant intakes sponsored by employers and progressively reduced those settling with skilled independent and family-sponsored visa[14].

The time of migration emerges as another important determinant of labour market outcomes, with improved results experienced by the second cohort. This reflects the more stringent skill selection criteria introduced after the first LSIA, resulting in a higher proportion of highly educated immigrants and English language skills in the second cohort.

Table 8 explores heterogeneity by type of work, visa, and field of education. Licensing offers women a premium when carrying out a job post-migration but not when they move from a licensed to a non-licensed job after settlement. This result is probably influenced by the gender-balanced hiring of foreign-educated females migrating to Australia to work in a tertiary institution.

In contrast, the poor education-occupation mismatches among migrants admitted under the points-based tested are puzzling. Occupational downgrade for those with background in STEM and medicine is much higher than for those who graduated in humanities (.309 and .430, respectively, vis-à-vis .262). It is possible that budgetary considerations and the need to learn quickly about the new Australian environment lead them to accept job offers

[14] Over the past year immigration authorities have been reforming the criteria for temporary migration, which was uncapped though supplied large volumes of applicants to the permanent point-based tested migration program, to prevent the arbitraging, and abuse, between their relatively relaxed qualifying criteria and those applied to grant permanent residence (e.g. salaries below minimum wage rates). While those changes continue to rely on employers to attract suitably skilled migrants, the new restrictions about the number of occupations effectively experiencing skill shortages along with new requirements about work experience, minimum language skills and salary rates are intended to better screen migrants who, once onshore, decide to apply for permanent residence. The reform is ongoing, with additional changes expected in March 2018, but the recent changes highlight the general need for a holistic approach to the design of migration policies so that the reasons for selecting migrants based on a point system are not compromised by the possibility of carrying out the same tasks in other non-screened visa categories.

that are not commensurate with their experience and ability. This conclusion however contrasts with the fact that these migrants are predominantly composed of STEM graduates, who were in high demand at the time of the LSIA. One possible explanation is that STEM education and previous job experience develop skills that tend to be country-specific possibly limiting their international transferability (Robst, 2007). In contrast, Humanities graduates tend to develop generic skills that can be more easily transferred across borders.

Table 9 analyses the effect of occupational licensing on other indicators of performance and wellbeing. As in previous cases, those licensed before but not after migration experience the poorest outcomes when it comes to hours of work (lower: 1.76 hours and significantly different from zero at 10% level of statistical significance) and skill usage. No difference arises with reference to happiness about the job carried out, suggesting that other job attributes may compensate for the over-qualification recorded like job security and convenience (e.g. no or limited communitng).

Panel data results

Table 10 reports the results of the panel random effects estimators based on model (2) and the labour market indicators, which appear across columns. The advantage of the panel estimator is to control for time-invariant individual heterogeneity hence operating as a robustness test for the cross-sectional results previously described. In general, the magnitude of the coefficient obtained with the random effect estimator is comparable to that obtained in the cross-section, suggesting limited correlation between the licensing indicator dummy and the other covariates. Table 10 confirms most results already emerged in the cross-sectional analysis. Namely, that occupational licensing worsens the labour market outcomes of migrants who performed licensed jobs before migrating but not after settlement. Similarly to the cross-section, those who had licensed jobs before and after migration experience the best

outcomes. As the attrition rate amongst those working in a licensed job in the first wave is not very different from the overall attrition in the LSIA (Table 3) sample selection across waves is unlikely to drive this outcome.

A novel result from the panel estimator arises from the interaction of time with the licensing variables, allowing one to detect whether the quality of the education-occupation match improves as employers observe migrants' productivity and migrants learn the working of Australia's labour market. In the case of those working in a licensed job before migrating but not afterward, there is evidence of an improvement in wages and occupational prestige but this emerges only at a modest 10% level of statistical significance. A clearer sign of improvement is the decline of occupational downgrade, though this is not enough to eliminate the penalty experienced soon after settlement. By and large the estimates of the interaction between occupational licensing and time since settlement are generally zero. This implies persistent conditions and penalties experienced at entry in the labour market.

Table 11 exploits heterogeneity with respect to the field of study, visa class, and change in employer between waves. With time passing by there seems a slight improvement in the occupational prestige of those who had a licensed job before migrating but not afterward, though the magnitude of the change is only a fraction of the initial penalty (+.049 vs. -.369).

Migrating via the selection operated by the points-based system generates the worst results for those with licensed jobs before migration but not afterwards. Their penalty is -.329 versus -.185 for those immigrating in non-tested visa classes. Over time the penalty experienced by not entering into a licensed occupation reduces but only if one continues working for the same employer. Changing jobs has no effect on occupational prestige over time, implying that mobility within the labour market is not an option to improve an initially poor education-occupation match. In fact this results supports the hypothesis that changing employer is not rational if working with the same employer is possible. No further insights arise when

working in a licensed job is used as dependent variable in a regression where demographic, institutional, and occupational characteristics are used as explanatory variables.

6. Implications for migration policy

The empirical results suggest that licensing operates as an additional selection mechanism besides that carried out by the points-based system, and generally leads to better labour market outcomes for those working in licensed jobs. However the results also identify the group with the worst outcomes in migrants often admitted under the points-based system.

It would be easy to conclude that these outcomes reflect an overall effective immigration policy in selecting migrants with attributes valued by Australian employers, notwithstanding the fact that some of the professionals admitted through the points-based system have either inadequate skills or prefer trade off their human capital with job characteristics that are not measured, such as security or convenience (e.g. no commuting). However, attributing only to labour supply, and indirectly to immigration policy, the entire responsibility of the result is contradicted by the use of panel data estimators (which control for individual skill inadequacy when time-invariant) and evidence of worsening labour market outcomes when changing employers. This implies an irrational decision if holding a job with the same employer is a possibility.

These results suggest that migration policy alone is not entirely responsible for the quality of the education-occupation match experienced by tertiary educated immigrants. Employment policy contributes, too, to this outcome. In Australia domestic employers inform migration authorities about current and emerging skill shortages in the labour market, and the type of skills and individuals they find most difficult to hire. Delays between collecting employers' information and their incorporation in migration policy discussions and decisions could open up a mismatch between the demand for skills and the supply sourced through immigration.

Additionally, it may be possible that existing licensing barriers are too restrictive to absorb the inflow of migrant professionals despite the higher demand due to population growth. These interpretations support the need for tighter coordination between immigration and employment policy than what is currently implemented. This in turn sheds light on three implications.

The first is for immigration and employment policy agencies to carry out a regular joint review of the usage of migrants' human capital. This can promptly inform whether current immigration policy works effectively and if there is need for fine-tuning. If the two agencies operate independently of each other, and there are delays in the transmission of information or misunderstanding on the actual number of licensed job catering for the population, how can the labour market adequately inform migration policy design?

A related aspect is the critical need for regular and detailed information about the selected migrants' labour market outcomes over longer periods of time. The monitoring of migrants' performance is sometimes left to surveys covering only the first couple of years, if at all. This is valuable but insufficient as the point system is generally used to grant a permanent leave to stay, and important aspects of the policy can be better assessed only with a longer longitudinal data collection. These data requirements are easier nowadays thanks to technologies enabling one to link data from multiple sources (e.g. immigration office and tax authority). Yet, the topic is hardly included in public discussions about the merit and drawbacks of a point based system to select immigrants.

Finally, policy design in immigration and employment may balance objectives of 'productive efficiency', which is geared towards supplying services and goods at the lowest possible cost, and 'allocative efficiency', which addresses how productive resources are utilised. If existing incentives target predominantly raising resources, there may nevertheless sub-optimal

outcomes for the society, as the example of a factory producing only boots for the left foot illustrates. If skills wastage occurs as a result of inadequate policy coordination in immigration and employment, migrants suffer from the private costs accruing to their under-use. There are however also indirect social costs for the host country's society, which receives lower taxation revenues and, consequently, can dispose of lower amounts of funds for initiatives for the public like hospitals and education, and operates with less savings, consumption and investment expenditure. This potential problem is more acute at times of slow wage or economic growth, when the under-use of foreign-trained human capital becomes an increasingly costly luxury to afford.

References

Adams, A. F., Ekelund, R. B., and Jackson, J. D. (2003). "Occupational licensing of a credence good: the regulation of midwifery". *Southern Economic Journal*, 659-675.

Adams, A. F., Jackson, J. D., and Ekelund, R. B. (2002). "Occupational licensing in a "competitive" labor market: The case of cosmetology". *Journal of Labor Research*, 23(2): 261-278.

Akresh, I.R. (2006). "Occupational Mobility Among Legal Immigrants to the United States. *International Migration Review"*, 40(4): 854-884.

Akresh, I. R. (2008). "Occupational trajectories of legal US immigrants: Downgrading and recovery". *Population and Development Review*, 34(3), 435-456.

Aleksynska, M. and Tritah, A. (2009). Immigration, income and productivity of host country: a channel accounting approach, CEPII.

Altonji, J. and C. Pierret (2001). "Employer learning and statistical discrimination". *Quarterly Journal of Economics*, 116(1): 313-350

Ambrosini, J.W. and Peri, G. (2012), "The determinants and the selection of Mexico–US migrants", *World Economy*, 35(2): 111-151.

Angrist, J. D., and J.S. Pischke (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press.

Antecol, H., Cobb-Clark, D.A. and Trejo, S.J. (2003), "Immigration policy and the skills of immigrants to Australia, Canada, and the United States", *Journal of Human Resources* 38(1), 192-218.

Australian Bureau of Statistics (2006). *ANZSCO: Australian and New Zealand Standard Classification of Occupations*. Australian Bureau of Statistics/Statistics New Zealand. http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/B4B626DEB4A0C558CA2571E600092D5A/$File/12200_2006.pdf

Aydemir, A. (2011), "Immigrant selection and short-term labor market outcomes by visa category", *Journal of Population Economics* 24(2), 451-475.

Balsa, A. I., and T.G. McGuire (2001). "Statistical discrimination in health care". *Journal of Health Economics*, 20(6): 881-907.

Barrett, A., S. McGuiness and M. O'Brien. (2012). "The immigrants earnings disadvantage across the earnings and skills distribution: the case of immigrants from the EU's New Member states in EU". *British Journal of Industrial Relations*, 50(3): 457-481.

Barrett, A. and D. Duffy (2008). "Are Ireland's immigrants integrating into its labor markets?", *International Migration Review*, 42(3): 597-619.

Basilio, L., and T.K. Bauer (2010). Transferability of human capital and immigrant assimilation-An analysis for Germany. *Ruhr Economic Paper*, 164.

Battu, H. and P.J. Sloane (2004). "Over-education and ethnic minorities in Britain". *The Manchester School*, 72: 535-559.

Baum, C.F., Lewbel. A., Schaffer, M.E., and O. Talavera (2012). Instrumental variables estimation using heteroskedasticity-based instruments. Available at http://repec.org/usug2012/UK12_baum.pdf accessed 10 January 2017.

Baum, C.F., Schaffer, M.E., and S. Stillman (2010). ivreg2: Stata module for extended instrumental variables/2SLS, GMM and AC/HAC, LIML and k-class regression. http://ideas.repec.org/c/boc/bocode/s425401.html

Beach, C. (2006). Employment-based permanent immigration. Examining the value of a skills based immigration system. Presentation statement before the US Senate Committee on health, education, labor and pensions. https://www.help.senate.gov/imo/media/doc/Beach.pdf

Becker, G. (1986). "The public interest hypothesis revisited: a new test of Peltzman's theory of regulation". *Public Choice*, 49: 223-234.

Beine, M., Docquier, F. and Oden-Defoort, C. (2011), "A panel data analysis of the brain gain", *World Development* 39(4), 523-532.

Belot, M., and Hatton, T.J. (2012), "Immigrant selection in the OECD", *Scandinavian Journal of Economics* 114(4), 1105-1128.

Benham, L., and Benham, A. (1975). "Regulating through the professions: a perspective on information control". *Journal of Law and Economics*, 18(2): 421-447.

Bertoli, S. and Brücker, H. (2011), "Selective immigration policies, migrants' education and welfare at origin", *Economics Letters* 113(1), 19-22.

Bertoli, S., and Rapoport, H. (2015). "Heaven's swing door: endogenous skills, migration networks, and the effectiveness of quality‐selective immigration policies". *Scandinavian Journal of Economics*, 117(2): 565-591.

Borjas, G. J. (1987). "Self-selection and the earnings of immigrants". *American Economic Review* 77: 531–553.

Borjas, G.J. (1991). Immigration policy, national origin, and immigrant skills: A comparison of Canada and the United States (No. w3691). National Bureau of Economic Research.

Carpenter, C. G., and Stephenson, E. F. (2006). The 150-hour rule as a barrier to entering public accountancy. *Journal of Labor Research*, *27*(1), 115-126.

Chevalier, A. (2003). "Measuring over-education". *Economica*, 70(279): 509-531.

Chiquiar, D. and Hanson, G.H. (2005), "International migration, self-selection, and the distribution of wages: Evidence from Mexico and the United States", *Journal of Political Economy* 113(2), 239-281.

Chiswick, B. R. and P.W. Miller (2009). "The international transferability of immigrants' human capital". *Economics and Education Review*, 28: 162-169.

Clemens, M.A. and Pritchett, L. (2016), "The new economic case for migration restrictions: an assessment", IZA Discussion Paper 9730.

Cobb‐Clark, D. (2001). "The longitudinal survey of immigrants to Australia." *Australian Economic Review*, 34(4): 467-477.

Danzer, A. M., and Dietz, B. (2014). "Labour migration from eastern Europe and the EU's quest for talents". *Journal of Common Market Studies*, 52(2): 183-199.

de Matos, A.D. and Liebig, T. (2014). The qualifications of immigrants and their value in the labour market. *Matching Economic Migration with Labour Market Needs*, pp.187-228.

Docquier, F., Lohest, O. and Marfouk, A. (2007), "Brain drain in developing countries", *World Bank Economic Review* 21(2), 193-218.

Dequiedt, V. and Zenou, Y. (2013), "International migration, imperfect information, and brain drain", *Journal of Development Economics* 102, 62-78.

Dolton, P., and A. Vignoles (2000). "The incidence and effects of overeducation in the U.K. graduate labour market". *Economics of Education Review*, 19: 179–198.

Donald, A. (2016). Immigration points-systems compared. http://www.bbc.com/news/uk-politics-29594642

Drinkwater, S., J. Eade and M. Garapich. (2009). "Poles Apart? EU enlargement and the labour market outcomes of immigrants in the United Kingdom", *International Migration*, 47(1).

Dustmann, C., and F. Fabbri (2003). "Language proficiency and labour market performance of immigrants in the UK". *The Economic Journal*, 113(489): 695-717.

Farber, H.S., and R. Gibbons (1996). "Learning and Wage Dynamics". *Quarterly Journal of Economics*, CXI: 1007-1047.

Fasani, F. (2016). Refugees and economic migrants: facts, policies, and challenges. https://voxeu.org/article/new-ebook-refugees-and-economic-migrants-facts-policies-and-challenges

Federman, M. N., Harrington, D. E., and Krynski, K. J. (2006). "The impact of state licensing regulations on low-skilled immigrants: The case of Vietnamese manicurists". *American Economic Review*, 96(2): 237-241.

Fletcher, J. M., and Sindelar, J. L. (2009). *Estimating causal effects of early occupational choice on later health: Evidence using the PSID* (No. w15256). National Bureau of Economic Research.

Gellhorn, W. (1976). "The abuse of occupational licensing." *The University of Chicago Law Review*, 6-27.

Gittleman, M., and Kleiner, M. M. (2015). "Wage Effects of Unionization and Occupational Licensing Coverage in the United States". *International Labor Relations Review*, doi: 0019793915601632.

Green, C., P. Kler, and G. Leeves (2007). "Immigrant overeducation: Evidence from recent arrivals to Australia". *Economics of Education Review*, 26(4): 420–432.

Halaby, C. N. (1994). "Overeducation and skill mismatch". *Sociology of Education*, 47-59.

Hartog, J. (2000). "Over-education and earnings: where are we, where should we go?". *Economics of Education Review*, 19(2): 131-147.

Hawthorne, L. (2015). "The impact of skill migration on foreign qualification recognition reform in Australia". *Canadian Public Policy*, 41(1): S173-S187.

Humphries, A., Kleiner, M.M., and M. Koumenta (2011). How Does Government Regulate Occupations in the UK and US? Issues and Policy Implications, in (David Marsden ed.) Labour Market Policy for the 21st Century, Oxford University Press.

Hunt, J. (2017). Would the US benefit from a merit-based immigration system? https://www.pbs.org/newshour/economy/analysis-u-s-benefit-merit-based-immigration-system

Ioannides, Y. M., and Loury, L. D. (2004). "Job information networks, neighborhood effects, and inequality". *Journal of Economic Literature*, 42(4): 1056-1093.

Isphording, I. (2014). "Disadvantages of linguistic origin: evidence from immigrant literacy scores". *Economics Letters*, 123(2): 236-239.

Jasso, G. and Rosenzweig, M.R. (2009), "Selection criteria and the skill composition of immigrants: A comparative analysis of Australian and US employment immigration" in J. Bhagwati and G.H. Hanson, eds., *Skilled Migration Today: Prospects, Problems, and Policies*, New York: Oxford University Press, 153-183.

Jones F.L. and J. McMillan (2001). "Scoring occupational categories for social research: A review of current practice, with Australian examples", *Work, Employment and Society*, 15(3): 539-563.

Joona, P.A., Gupta, N.D. and Wadensjö, E. (2014). Overeducation among immigrants in Sweden: incidence, wage effects and state dependence. *IZA Journal of Migration*, *3*(1), p.9.

Kaestner, R. and Malamud, O. (2014), "Self-selection and international migration: new evidence from Mexico", *Review of Economics and Statistics* 96(1), 78-91.

Kleiner, M. M. (2013). *Stages of Occupational Regulation: Analysis of Case Studies*. WE Upjohn Institute.

Kleiner, M. M. (2006). Licensing Occupations: Ensuring Quality or Restricting Competition? Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, 1-15. http://dx.doi.org/10.17848/9781429454865

Kleiner, M. M. (2000). "Occupational licensing". *Journal of Economic Perspectives*, 14(4): 189-202.

Kleiner, M. M., and Krueger, A. B. (2010). "The prevalence and effects of occupational licensing". *British Journal of Industrial Relations*, 48(4): 676-687.

Kleiner, M. M., and Kudrle, R. T. (1997). *Does regulation improve outputs and increase prices?: the case of dentistry* (No. 5869). National Bureau of Economic Research.

Koumenta, M., Humphries, A., Kleiner, M.M., and M. Pagliero. (2014). Occupational regulation in the EU and UK: prevalence and labour market impacts. *Final Report, Department for Business, Innovation and Skills, School of Business and Management, Queen Mary University of London, London*.

Kugler, A. D., and Sauer, R. M. (2005). "Doctors without borders? Relicensing requirements and negative selection in the market for physicians." *Journal of Labor Economics*, 23(3): 437-465.

Kuptsch, C. and E.F. Pang (eds.) (2006). Competing for global talent. International Labour Office, Geneva.

Lange, F. (2007). "The speed of employer learning". *Journal of Labor Economics*, 25(1): 1-35.

Leland, H. E. (1979). "Quacks, lemons, and licensing: A theory of minimum quality standards". *Journal of Political Economy*, 1328-1346.

Leuven, E., and Oosterbeek, H. (2011). "Overeducation and mismatch in the labor market." *Handbook of the Economics of Education*, 4: 283-326.

Mbaye, L. (2014), "Barcelona or die: understanding illegal migration from Senegal", *IZA Journal of Migration* 3: 21.

McGuinness, S. (2006). "Overeducation in the labour market". *Journal of Economic Surveys*, 20(3): 387-418.

McKenzie, D. and Rapoport, H. (2010), "Self-selection patterns in Mexico-US migration: the role of migration networks", *Review of Economics and Statistics* 92(4), 811-821.

Migration Policy Institute (2005). http://www.migrationpolicy.org/article/top-10-migration-issues-2005-issue-8-growing-competition-skilled-workers-and-foreign. Accessed 28 April 2015.

Montgomery, J. D. (1991). *Social networks and persistent inequality in the labor market*. Center for Urban Affairs and Policy Research.

Moraga, J. (2011), "New evidence on emigrant selection", *Review of Economics and Statistics* 93(1), 72-96.

Munshi, K. (2003). "Networks in the modern economy: Mexican migrants in the US labor market". *Quarterly Journal of Economics*, 549-599.

Nieto, S., Matano, A. and Ramos, R. (2015). Skill mismatches in the EU: Immigrants vs. natives. *International Journal of Manpower* 36(4): 540-561.

Organisation for Economic Cooperation and Development (OECD) (2009). The future of international migration to OECD Countries. Paris: OECD.

Pagliero, M., and Timmons, E. (2013). "Occupational regulation in the European legal market". *European Journal of Comparative Economics*, 10(2): 243-254.

Pashigian, B. P. (1979). "Occupational licensing and the interstate mobility of professionals". *Journal of Law and Economics*, 22(1): 1-25.

Peltzman, S. (1976). "Toward a more general theory of regulation", *Journal of Law and Economics*, 19: 211-240.

Peterson, B., Pandya, S., and Leblang, D. (2013). Occupational licensing as an implicit barrier to high skill migration. University of Virginia. Forthcoming in *Public Policy*.

Piracha, M., Tani, M., and Vadean, F. (2012). Immigrant over-and under-education: The role of home country labour market experience. *IZA Journal of Migration*, *1*(1), 3.

Poot, J., and S. Stillman (2010). *The importance of heterogeneity when examining immigrant education-occupation mismatch: evidence from New Zealand*. IZA Discussion paper series No. 5211.

Robst, J. (2007). "Education and job match: The relatedness of college major and work". *Economics of Education Review*, 26(4): 397-407.

Roy, A. D. (1951). "Some thoughts on the distribution of earnings". *Oxford Economic Papers*, 3(2): 135-146.

Schuster, A., M.V. Desiderio, and G. Urso (eds.) (2013). Recognition of qualifications and competences of migrants. International Organization for Migration.

Sjaastad, L. A. (1962). "The costs and returns of human migration". *Journal of Political Economy*, 70(5, Part 2): 80-93.

Tani, M. (2014). "Is the point system an effective policy instrument? Yes or no", *IZA World of Labour* (http://wol.iza.org/articles/using-a-point-system-for-selecting-immigrants).

Tani, M. (2017). “Local signals and the returns to foreign education” *Economics of Education Review* (published online- DOI: http://dx.doi.org/10.1016/j.econedurev.2017.07.006)

Timmons, E. J., and Thornton, R. J. (2008). “The effects of licensing on the wages of radiologic technologists”. *Journal of Labor Research*, 29(4): 333-346.

Voitchovsky, S. (2014). “Occupational downgrading and wages of new member states immigrants to Ireland”. *International Migration Review*, 48(2): 500-537.

Wald, S., and T. Fang (2008). “Overeducated immigrants in the Canadian labour market: Evidence from the workplace and employee survey”. *Canadian Public Policy*, 34(4): 457-479.

Wiswall, M. (2007). Licensing and occupational sorting in the market for teachers. New York University, Working Paper.

Appendix

Table 1 – Over-education rates among natives and migrants

Country	Year	Natives	Foreign-born	Author(s)
Australia*	1996-2000	7.4%	~30%	Green, Kler, and Leeves (2007)
Canada*	1999-2001	12%	30%-50%	Wald and Fang (2008)
NZ*	1996-2006	36%	41%	Poot and Stillman (2010)
US	2009-11	Ref: 0%	5%	de Matos and Liebig (2014)
EU (22)	2002-09	13.7%	22%	Alexsynka and Tritah (2009)
EU 27	2007	22%	35%	Nieto, Matano and Ramos (2015)
Sweden	2008	11.9%	25%-30%	Joona, Gupta and Wadensjö (2014)
Denmark	1995-02	8%	13%	Nielsen (2007)

* = country selects immigrants based on a point system.

Table 2: Baseline sample trimming – Wave 1

Baseline analysis	LSIA 1	LSIA 2
Primary applicants 1st wave, and	5,201	3,124
are aged 20-65	4,922	2,808
migrated 1993-1995 or 1999-2000	4,919	2,805
have tertiary education obtained abroad	1,818	1,019
participate by 1st wave	1,311	738
are employed by 1st wave	853	626
have information on occupation and education	848	616
have information on pre-migration over-education	777	583
have information on controls (Gini, network…)	743	562
Observations used in the baseline analysis	1,305	

Table 3: Occupational choices before and after migration, and outcomes – Wave 1

	Share	Wage (log)	Over-education	Occupational prestige	Occupational downgrade
1. No license before and after migration	48.8%	6.43	37.5%	3.95	.16
2. Licence after migration but not before	7.1%	6.57	21.5%	4.27	-.12
3. Licence before and after migration	28.3%	6.62	14.4%	4.37	.04
4. Licence before migration but not after	15.8%	5.93	67.5%	3.57	.81
Total	1,305	6.41	34.5%	4.03	.21

Table 4: Occupational choices before and after migration by visa class – Wave 1

Visa category	Group 1 No license before and after	Group 2 No license before; license after	Group 3 License before and after	Group 4 License before; no license after	Total
Point-based system					
Concessional	N = 106	18	55	52	231
Family	*16.6%*	*19.3%*	*14.9%*	*25.2%*	*17.7%*
Independent	205	26	101	66	398
	32.2%	*28.0%*	*27.4%*	*32.0%*	*30.5%*
Other visa classes					
Preferential	187	12	36	55	290
Family	*29.4%*	*12.9%*	*9.8%*	*26.7%*	*22.2%*
Business Skills	135	37	176	26	374
	21.2%	*39. 8%*	*47.7%*	*12.6%*	*28.7%*
Humanitarian	4	0	1	7	12
	0.6%	*0%*	*0.27%*	*3.4%*	*0.9%*
Total	637	93	369	206	1,305
	100%	*100%*	*100%*	*100%*	*100%*

Table 5: Baseline working sample – Primary applicant aged 20-65. First wave only

	Licensed Jobs		Non-licensed Jobs		Difference	p-value
Key variables:	**Mean**	**Std**	**Mean**	**Std**		
Dependent variables						
Wage	6.613	.631	6.302	.809	0.311***	.0001
Probability over-education	.159	.366	.447	.498	-.288***	.0001
Occupational prestige	4.350	.291	3.854	.588	0.496***	.0001
Occupational downgrade	.010	.305	.319	.604	-.219***	.0001
Country of education						
Qualification assessed	.422	.494	.386	.487	.036	.1911
English as main language	.701	.458	.612	.488	.089***	.0012
Log GDP per capita (PPP)	9.08	1.35	8.58	1.56	.50***	.0001
Europe/N America+	.764	.425	.591	.492	.173***	.0000
Asia/MENA	.177	.381	.292	.454	-.115***	.0001
S America/S Asia	.060	.237	.118	.322	-.058***	.0003
Have BA+	.344	.476	.563	.496	-.219***	.0001
Have Postgraduate dipl.	.183	.387	.141	.348	.042**	.0457
Have Master/PhD	.473	.500	.296	.457	.177***	.0001
Field of study						
Humanities+	.454	.498	.473	.500	-.019	.5104
Sciences	.361	.481	.439	.497	-.078***	.0055
Medical and Health	.174	.380	.048	.213	.126***	.0001
Country of birth						
English as main language	.648	.478	.571	.495	.077***	.0066
Commonwealth member	.516	.500	.425	.495	.091***	.0015
Network in host country	.063	.096	.052	.086	.011*	.0809
Gini	.385	.096	.390	.095	-.005	.4077
Demographics						
Female	.284	.452	.348	.477	-.064**	.0173
Married	.622	.485	.663	.473	-.041	.1451
Has resident children	.652	.960	.598	.964	.054	.1771
Experience	14.40	7.46	12.40	6.75	2.00***	.0001
Interview in English	.968	.176	.944	.230	.024*	.0481
Labour market						
Pre-migration license	.800	.400	.244	.429	.556***	.0001
Self-employed++	.061	.240	.104	.306	-.043*	.0100
Part-time++	.130	.337	.203	.402	-.073***	.0012
Over-qualified pre-migr.	.123	.329	.230	.421	-.107***	.0001
Migration visa						
Family reunification+	.104	.306	.288	.453	-.184***	.0001
Family sponsored	.159	.366	.186	.390	-.027	.2132
Employer nomination	.461	.499	.197	.398	.264***	.0001
Skilled independent	.274	.446	.316	.465	-.042	.1108
Humanitarian	.002	.046	.013	.113	-.011**	.0485
Other controls						
LSIA2 (cohort 2)	.410	.492	.445	.497	-.035	.2122
Lives in NSW, ACT+	.357	.479	.528	.499	-.171***	.0001
VIC, SA, TAS	.312	.463	.259	.438	.053**	.0378
QLS, WA, NT	.331	.471	.213	.410	.118***	.0001
N	**462**		**843**			

Source: LSIA 1 and LSIA 2. Number of observations: 743 (LSIA1) and 562 (LSIA2), respectively. The symbol + indicates the reference group of a categorical variable. The symbol ++ indicates a lower number of observations for that variable. The symbols *, **, *** indicate statistical significance at 10%, 5%, and 1%, respectively.

Table 6: Baseline sample characteristics – Primary applicant aged 20-65

	Cohort 1			Cohort 2	
	Wave 1	**Wave 2**	**Wave 3**	**Wave 1**	**Wave 2**
All sample	1,818	1,560	1,301	1,019	853
Attrition rate		*14.2%*	*16.6%*		*16.3%*
Baseline sample	754	669	555	575	487
Attrition rate		*11.2%*	*17.0%*		*15.3%*
Attrition on job licensing status after migration					
Licensed job	278	249	202	193	163
Attrition rate		*10.4%*	*18.8%*		*15.5%*
Attrition on job licensing status before migration					
Licensed job	362	318	261	240	208
Attrition rate		*12.1%*	*17.9%*		*13.3%*

Source: LSIA 1 and LSIA 2. Excludes qualifications obtained between waves 1-2 and 2-3.

Table 7: Estimates of the effect of licensing on labour market outcomes six months after migrating

Reference: no licensed job before/after migration	Wage	Over-education	Occupation prestige	Occupation downgrade
In licensed job after migrating	.138**	.009	.114***	-.129***
	(.057)	(.034)	(.037)	(.041)
Licensed before but not now	-.142**	.103***	-.097***	.310***
	(.065)	(.026)	(.030)	(.032)
Licensed before/after migrating	.169**	-.123***	.130***	-.183**
	(.084)	(.040)	(.043)	(.048)
Experience	.011	.002	-.001	.010**
	(.012)	(.004)	(.004)	(.004)
Experience square	-.0002	-.0004	.00001	-.0002*
	(.0003)	(.001)	(.0001)	(.0001)
Female	-.119***	-.004	.002	-.010
	(.043)	(.016)	(.018)	(.020)
Married	.024	-.021	-.005	-.009
	(.042)	(.017)	(.006)	(.021)
Children living at home	.036*	-.012	.012	-.021**
	(.020)	(.008)	(.020)	(.009)
Interviewed in English	.369***	-.030	.051	-.062
	(.132)	(.028)	(.034)	(.039)
Education: Masters or PhD	.040	-.015	.058***	-.014
	(.047)	(.017)	(.018)	(.020)
Other postgraduate	-.025	-.011	-.0011	.002
	(.048)	(.021)	(.024)	(.028)
Educated in East Asia	-.142*	-.007	-.019	-.013
	(.079)	(.024)	(.031)	(.030)
Educated in RoW	-.255***	-.008	-.032	.002
	(.080)	(.026)	(.027)	(.034)
Home country: uses English	.033	.065**	-.013	.026
	(.072)	(.026)	(.029)	(.031)
GDP/capita	.066***	-.016***	.022**	-.034***
	(.023)	(.008)	(.009)	(.010)
Prior migrants' network	-.086	-.069	-.081	.126
	(.212)	(.099)	(.104)	(.119)
Gini	-.038	-.197**	.061	-.055
	(.242)	(.088)	(.116)	(.128)
Commonwealth member	.147**	-.019	.019	-.030
	(.058)	(.024)	(.025)	(.028)
LSIA2 cohort	.196**	-.068**	.133***	-.147***
	(.084)	(.033)	(.040)	(.043)
Over-educated before migrating	.039	. 133***	-.062**	-.523***
	(.049)	(.027)	(.028)	(.036)
Visa: concessional family	.101	-.013	.063	-.060
	(.085)	(.042)	(.046)	(.053)
Business sponsored	.351***	-.127***	.181***	-.181***
	(.080)	(.036)	(.040)	(.043)
Skilled independent	-.0003	-.069*	.125***	-.107**
	(.077)	(.037)	(.043)	(.046)
Humanitarian	-.184	-.117**	.181*	-.219*
	(.389)	(.048)	(.100)	(.127)

Interactions cohort x visa	Yes	Yes	Yes	Yes
Selection into employment	Yes	Yes	Yes	Yes
State fixed effects (x2)	Yes	Yes	Yes	Yes
Occupational fixed effects (x34)	Yes	Yes	Yes	Yes
Constant	5.462***	.374***	3.699***	.569***
	(.302)	(.114)	(.124)	(.140)
R^2	.4690	.7722	.7834	.7133
N	1,176	1,305	1,305	1,305

Source: LSIA1 and LSIA 2. Estimates obtained by Ordinary Least Squares (OLS) and robust standard errors.

Table 8: Heterogeneity based on occupational downgrade and occupational dummies

	Gender		Visa Category		Discipline		
	Males	**Females**	**Point based**	**Other**	**STEM**	**Med.**	**Hum.**
Licensed job	-.081	-.287***	-.140*	-.099**	-.043	-.142	-.180***
after migrating	(.051)	(.064)	(.080)	(.043)	(.081)	(.105)	(.058)
Licensed before	.284***	.352***	.330***	.281***	.309***	.430***	.262***
but not after migr	(.039)	(.056)	(.050)	(.040)	(.056)	(.110)	(.040)
Licensed before	-.196***	-.092	-.216**	-.165***	-.236**	-.216*	-.114*
and after migr	(.060)	(.076)	(.094)	(.050)	(.095)	(.127)	(.062)
R^2	.6999	.7876	.7153	.7400	.7368	.9276	.7195
N	880	425	629	674	540	123	604

Source: LSIA1 and LSIA 2. Estimates obtained by Ordinary Least Squares (OLS) and robust standard errors. The independent variables are all those reported in the previous table including fixed effects from 34 occupations.

Table 9: Other labour market outcomes

	Hours of work	**Self-employed**	**Uses skills**	**Happy about job**
Licensed job	.080	-.185***	.0002	.040*
after migrating	(1.39)	(.054)	(.051)	(.021)
Licensed before	-1.76*	.053	-.098***	.020
but not after mig	(1.05)	(.062)	(.037)	(.027)
Licensed before	3.141*	.012	.230***	-.024
and after mig	(1.73)	(.082)	(.059)	(.032)
R^2	.2925	.1359	.3953	.1588
N	1,251	1,305	1,295	1,298

Source: LSIA1 and LSIA 2. Estimates obtained by Ordinary Least Squares (OLS) and robust standard errors. The independent variables are all those reported in the previous table including fixed effects from 34 occupations.

Table 10 – Labour market effects of licensing over time. Panel Random Effects estimator

Reference: no licensed job before/after migration	Wage	Over-education	Occupation prestige	Occupation downgrade
Licensed job after migrating	.047 (.060)	.011 (.028)	.123*** (.028)	-.205*** (.042)
Licensed job after migrating x time	-.033 (.028)	.030** (.014)	-.019 (.014)	.058*** (.022)
Licensed before but not after mig	-.127*** (.049)	.093*** (.020)	-.094*** (.021)	.392*** (.031)
Licensed before but not after mig x time	.037* (.020)	-.014 (.010)	.018* (.010)	-.158*** (.015)
Licensed before and after mig	.188** (.077)	-.115*** (.035)	.120*** (.036)	-.264*** (.053)
Licensed before and after mig x time	-.031 (.035)	.006 (.018)	-.009 (.018)	.119*** (.027)
Occupational fixed effects	Yes	Yes	Yes	Yes
R^2 within	.1495	.0112	.0991	.1303
R^2 between	.4338	.8584	.8810	.5016
R^2 overall	.4168	.7429	.7882	.2888
Wald-Chi	1,414.30	8,792.70	11,313.66	1,235.50
N	2,796	3,112	3,112	3,112

Source: LSIA 1 and LSIA 2.

Table 11: Heterogeneity based on occupational prestige the random effects estimator

Reference: no licensed job before/after migration	Discipline			Visa		Employer	
	STEM	**Med**	**Hum**	**Point**	**Other**	**Same**	**Change**
Licensed job after migrating	.162*** (.060)	.153 (.118)	.334*** (.052)	.308*** (.056)	.182*** (.049)	.203*** (.041)	.285*** (.101)
Licensed job after migrating x time	.005 (.027)	-.051 (.058)	-.060** (.025)	-.031 (.026)	-.034 (.023)	-.031* (.018)	.009 (.052)
Licensed before but not after mig	-.369*** (.048)	-.411*** (.096)	-.149*** (.043)	-.329*** (.045)	-.185*** (.041)	-.204*** (.035)	-.237*** (.076)
Licensed before but not after mig x time	.049*** (.019)	.076* (.041)	.032* (.019)	.038** (.018)	.062*** (.018)	.039*** (.013)	.043 (.035)
Licensed before and after mig	.307*** (.078)	.475*** (.138)	.145** (.069)	.257*** (.073)	.245*** (.064)	.197*** (.054)	.297** (.132)
Licensed before and after mig x time	-.041 (.036)	-.054 (.065)	-.002 (.032)	-.018 (.033)	-.033 (.030)	-.015 (.023)	-.105 (.067)
Occupational fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 within	.1108	.3900	.0859	.1484	.0513	.0756	.1506
R^2 between	.5163	.6990	.5101	.3918	.5813	.4867	.5102
R^2 overall	.4670	.6564	.4738	.3624	.5513	.4359	.4404
Wald-Chi	815.77	N.M.	851.88	N.M.	N.M.	921.15	N.M.
N	1,357	275	1,379	1,587	1,522	1,934	625

Source: LSIA 1 and LSIA 2.