

Does Immigration Policy Affect the Education-Occupation Mismatch?

Evidence from Australia

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Abstract

This paper analyses the impact of a change in Australia's immigration policy, introduced on 1st July 1999, on migrants' probability of being over-/under-educated or correctly matched. The policy change consists of stricter entry requirements about age, language ability, education, and work experience. The results indicate that those who entered under more stringent conditions – the second cohort – have a lower probability to be overeducated and a correspondingly higher probability of being better matched than those in the first cohort. The policy change appears to have reduced the incidence of over-education among women, enhanced the relevance of being educated in Australia to be correctly matched, and attracted a higher proportion of immigrants that were already under-utilised (or over-achieving) in their home countries. Overall, the policy appears to have brought immigrants that reduced the over-under-education of Australia's labour market.

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1. Introduction

There is growing empirical evidence that the mismatch between a person's formal education and the job held is a common feature of the labour market. This mismatch is typically referred to as 'over-education' when the person has a formal level of education above the one required¹ for his/her job, and as 'under-education' in the opposite case. Over- and under-education exist in both developing and developed economies, and can affect as much as 50 per cent of the workforce (e.g. Metha et al, 2011; Hartog, 2000; Groot and Maassen van der Brink, 2000; McGuinness, 2006). Of the two types of mismatch, over-education emerges as the most common and problematic, since the affected people (predominantly young workers) suffer from substantial wage penalties and have lower job satisfaction and higher turnover than equivalent workers who are correctly matched (e.g. Fleming and Kler, 2008). Under-education is less studied, mainly because it is associated with unobservable person qualities such as motivation and ability that positively affect productivity. It can still be viewed, however, as the 'opportunity gap' of what an affected person could have generated if s/he acquired more formal education.

The costs of the education-occupation mismatch are not only private. Society also suffers from it. For once, the mismatch signals an inefficient use of the stock of human capital available to a country. Since this is finite, any wastage of this resource imposes a net cost to society. In the case of over-education the cost is compounded by the fact that education is publicly subsidized; hence there is also wastage of public resources that could have been used otherwise. In the case of under-education, the cost is the lost opportunity, in terms of future potential output, of not giving enough formal education (or setting adequate incentives for doing so) to otherwise capable people.

¹ The required level of education is in turn established using workers' self-assessment (Sicherman 1991; Dolton and Vignoles 2000), an occupation's average education level (Verdugo and Verdugo 1989), or an institutionally-set measure of the average education required for a job (Rumberger 1987).

Within the over-/under-education literature, a line of research has investigated the incidence of this mismatch amongst immigrants. Under the limiting assumption that the metric defining over-/under-education in the host country equally applies to the home country, existing work consistently finds that immigrants are significantly more over-/under-educated than comparable natives. This phenomenon tends to be more pronounced for those completing their education in the country of origin (Chiswick and Miller 2009; Nielsen 2011), though this conclusion varies according to differences in the level of economic development between host and home country (Chan 2011).

In the case of Australia, it is estimated that about one in three workers is mismatched, similarly split between over- and under-educated, while about 40 per cent of foreign-born workers have an educational level that does not conform to what is required by their jobs (Linsley 2005; Miller 2007; Green *et al* 2007). Recent work has shown that about half of the immigrants' mismatch can be attributed to being already mismatched in the country of origin, prior to migrating, and that the mismatch is path-dependent, continuing in Australia well after resettlement (Piracha, Tani and Vadean 2010). The higher and persistent incidence of mismatch amongst immigrants is a potential problem for countries where foreigners form a substantial part of the labour force and where employment growth is mainly driven by immigration, as in Australia. If over- and under-education signal an inefficient use of human resources in the labour market, then migrants seem to make matters worse. In such circumstances, migration policy appears to destabilise, and not only expand, the supply of skills in the host country by way of selecting people with a higher propensity to become mismatched in its labour market. Is this the case: does migration policy worsen the education-occupation mismatch of the host country?

This paper deals with this question for Australia by studying the effect of a shift towards skill-biased immigration on the incidence of over-/under-education amongst immigrants. On

1st July 1999 Australia adopted stricter admission criteria for immigration applicants in some of its visa categories (Independent and Concessional Family/Skilled-Australian Linked). From that date a revised point system set higher requirements for skill, age and English ability, and gave additional points to those with an occupation in short supply (as per an occupation on demand list compiled by employers) and with qualifications obtained in Australia (Richardson *et al* 2001). No other visa category was affected by this change (Preferential Family, Business and Employer Nomination schemes, and Humanitarian). This policy shift can be viewed as a ‘quasi-natural’ experiment on the population of potential applicants, and its effect can be measured through the average differences in over-/under-education between the ‘treatment group’ (Independent and Concessional Family/Skilled-Australian Linked visa holders who were targeted by the policy change) and the ‘control group’ (Preferential Family, Business/Employer Nomination, and Humanitarian visa holders, to whom the policy changes did not apply).

The use of an education-occupation matrix to identify possible mismatches in the labour market deserves more justification, as the literature has pointed out that education is too generic a variable to identify ‘involuntary’ mismatches that truly represent a labour market under-utilisation. Some workers may actually choose less demanding jobs to suit better their desired leisure-work balance or may possess lower abilities than are signalled by their educational qualifications. Unfortunately, cross-sectional analyses do not control for people’s unobserved heterogeneity (Chevalier, 2003). Involuntary matches are better detected by the joint combination of the educational variable with self-reported measures of job satisfaction or skill usage that are often collected by survey, as well as the use of econometric techniques that control for unobservables (Mavromaras *et al* 2010; Green and Zhu 2010; Pecoraro 2011). Notwithstanding the rapid development of a literature focusing on skills mismatches, the use of education as the variable against which to measure what is required on the job is justified

in analyses of policies where education determines whether or not a person is selected, as is the case for immigration policies, which is the focus of this paper. The selection criteria applied to prospective immigrants include only the level of formal education completed but not the usage of skills at work or job satisfaction.

The empirical analysis is carried out using the Longitudinal Survey of Immigrants to Australia (LSIA) and complements the literature on the labour market effects of this policy change for Australia. Throughout the paper the identification of over- and under-education is based on the ‘job analysis’ (JA) method (Rumberger, 1987) whereby the average required education for a particular job, as assessed by the Australian New Zealand Standard Classification of Occupations (ANZSCO), is compared with the actual educational level of the person performing it. In the context of ANZSCO a ‘skill level’ is a function of both the range and complexity of tasks performed in a particular occupation, with a greater range and complexity of tasks according with a higher occupational skill level (ABS 2006). As a result, using the ANZSCO’s classification mitigates the main criticism about the JA method, which is the assumption that workers with the same occupation title do jobs with the same difficulty (Dolton and Vignoles 2000). The lack of data of ANZSCO equivalent measures for each country of origin does, however, constrain the empirical analysis in applying the host country’s metric to identify over-/under-educated immigrants regardless of where they were educated.

The results suggest that the shift towards skill-based immigration reduced the gender bias affecting women among over-educated workers and increased their probability of being correctly matched. The policy change also raised the probability of attracting applicants with educational qualifications obtained and assessed in Australia, and attracted more immigrants who were already under-educated in their country of origin. As under-education is generally associated with desirable unobserved attributes, such as motivation and ability, the change in

migration policy appears to have resulted in the relocation of better quality workers. Overall, the results suggest that the policy change contributed to a better education-occupation match in Australia.

The rest of the paper is organised as follows. Section 2 briefly presents the literature on over-education and provides some context to the policy change. Section 3 presents the methodology. Section 4 summarises the data and Section 5 presents the results. Concluding remarks and discussion on the implications of the policy change for Australia and the source countries are presented in Section 6.

2. Theoretical Context and Immigration Policy Background

It is generally believed that the education-occupation mismatch is affected by the person's experience in the labour market. The theoretical perspectives differ in the emphasis attributed to supply and demand as driving factors of the labour market (for a brief summary see Linsley 2005). On the supply side, human capital theory (HCT) suggests that experience and skills acquired through on-the-job training complement formal schooling (Sicherman 1991). If the labour supply of people with high levels of formal education increases relative to demand (which the HCT posits to move only through exogenous shocks), then employers will fill low-skill jobs with high-skill workers and raise over-education (Freeman 1976). A variation of this approach notes that at the start of their careers people may voluntarily accept jobs below their education level in order to accumulate valuable experience and skills usable to move later to better jobs. Within this literature over-education emerges as a natural feature of the labour market rather than a sign of inefficiency, and it decreases with job experience. As a result, people experience an education-occupation mismatch during their working lives, with higher incidences of over-education in their early career and a rising probability of under-education as job experience increases. Search-and-match theory suggests that workers might take up jobs for which they are over-educated when they enter the labour market

because they have imperfect information about it. They would continue to search for higher job levels and eventually move up the occupational ladder to positions that match or even exceed their formal qualifications (Groot and Maassen van den Brink 2000; Hartog 2000; Chiswick and Miller 2009).

On the labour demand-side, it is suggested that employers prefer to hire workers with high levels of education as this substitutes for expensive training costs. Workers are ranked according to their potential training costs for employers, which are inversely related to the education level. Over-education arises when there is an exogenous increase in the supply of more educated workers. Since jobs determine productivity and pay, over-education generates a shift in the distribution of workers along the 'job queue', leading employers to hire them in place of workers that are less educated but more costly to train.

Research on immigrants' over/under-education has posited additional reasons for their higher incidence of mismatch. These include imperfect international transferability of human capital, a combination of language and country of origin effect (Chiswick and Miller 2009, 2010 and 2011; Green *et al* 2007) and outright discrimination against immigrants in the labour market (Battu and Sloane 2004). Unobservable factors such as motivation and innate abilities are also ascribed as likely reasons behind the results obtained in all studies analysing the labour market mismatch for immigrants (for a review see Chiswick and Miller 2009). It is likely that a combination of both demand and supply factors are at work in causing over-/under-education, but as their identification is not the main focus of this paper, the literature in this area is not reviewed in more detail.

The labour market effects that followed Australia's immigration policy changes throughout the 1990s are studied in a relatively large literature due to the availability of the LSIA, which contains very detailed information collected from a representative sample of the immigrant population entering the country before and after the policy change. The literature commonly

finds that post-change immigrants have a higher average level of formal education, higher participation rates in Australia's labour market (Cobb-Clark 2003; Chiswick and Miller 2006) and lower duration to access the first job upon resettlement (Thapa and Goergens 2006), albeit this is of lower quality (Junankar and Mahuteau 2005), than immigrants arrived pre-policy change.

No analysis appears to have investigated the role of immigration policy on the incidence of over-/under-education in the host country's labour market, which is the subject of this paper. Instead, existing work has focused on measuring the mismatch among immigrants (Miller 2007). This literature focuses predominantly on over-education², consistently reporting that Australian employers do not appear to recognise fully educational qualifications obtained abroad. Immigrants' visa class (Kler 2007; Green *et al* 2007), the type of employer prior to migration (Kler 2007) and the country of origin (Green *et al* 2007) emerge as the main determinants of over-education.

To contextualize the development of immigration policies leading to the changes in the mid-1990s, and more precisely the one implemented on 1st July 1999, some historical background is necessary. Australia formally ended a migration policy based on ethnicity ('white Australia policy') in 1972, replacing it with a focus on internal economic conditions. Eliminating racial discrimination from immigration selection resulted in higher volumes of applicants and refugees from non-European countries and consequently higher stocks of immigrants with non-English speaking background (NESB). Two major trends have characterised Australia's immigration policy between 1972 and the early 1990s. One is the development of systematically selective immigration policies based on the needs of domestic employers. It

² Voon and Miller (2005) and Linsley (2005) are notable exceptions as their concern includes under-education. The former study provides a measure of the incidence of over- and under-education in Australia using the 1996 Census of Population and Housing. The latter also quantifies the incidence of over-/under-education using the 1997 wave of the Negotiating in Life Course Survey, but tests the theoretical approach that best explains the phenomenon (job competition – demand-side) and examines whether over-education is associated with career mobility.

started with the introduction of the Numerical Multifactor Assessment System (NUMAS) (1979-1982), which selected immigrants on the basis of family ties and occupational and language skills, and continued with the introduction of a points test system in 1988, which was set annually. The minimum pass mark to be eligible for migration reflected the educational qualifications, work experience, age and English language proficiency of the potential immigrant. Extra points could be gained if the applicant was qualified to work in one of the occupations listed in a Priority Occupation List, which summarized employers' views and recent recruitment difficulties.

The other trend in Australia's immigration policy is the development of publicly-funded activities aimed at facilitating the active participation of immigrants, especially those with non_english-speaking backgrounds (NESB), in Australia's economic life. These were accompanied by instruments and targeted data collections to study migrants' economic performance (e.g. the LSIA). Thus NESB immigrants were provided with financial incentives to attend English language courses to make them more employable in Australia (Adult Migrant English Program - AMEP); private sector employers were encouraged to adopt Equal Opportunity principles towards NESB immigrants; and specialist labour market programs were implemented to prepare NESB professionals for mandatory entry exams in a range of traditionally 'closed' professions such as medicine, engineering and nursing (Hawthorne 2005). In 1996, a new government began a series of reforms affecting all immigration streams aside from political refugees. The reforms abolished social security benefits to new immigrants in the first two years after their arrival, passed to immigrants the cost of accessing the Adult Migrant English Program and attending specialist labour market programs (in this case after securing work), allocated the highest point weighting to

‘employability’³ and outsourced pre-migration qualification screening to professional bodies. As from 1 July 1999, the minimum number of points set for migrants who had applied through the Concessional Family and Skilled Independent visa streams was substantially raised⁴. The restrictions resulted in tougher conditions to earn points towards the minimum required to be eligible for migration and intended to favour migrants with skills immediately usable in Australia’s labour market. These included higher language proficiency requirements, occupational skills, education and younger age. This policy change did not apply to the Humanitarian, Family Preferential, Business and Employer Nomination streams.

3. Empirical Methodology

To analyse the effectiveness of this policy change, the probability of over-/under-education is analysed as a function of individual and labour markets characteristics for two cohorts of immigrants entering Australia in 1993-95 (cohort 1) and 1999-2000 (cohort 2), surveyed in the LSIA. Cohorts 1 and 2 happen to have migrated to Australia just before and after the policy change, respectively, thus enabling one to test whether the probability of mismatch is higher for the latter cohort after taking into account a number of individual, timing (cohort) and compositional changes among migrants. The migration policy change can be estimated using the following equation:

$$\Pr(E_{ih}) = \beta_0 + \beta_1 X_i + \beta_2 C_i + \beta_3 C_i X_i + \beta_4 R_i + \beta_5 R_i X_i + \beta_6 C_i R_i + \beta_7 C_i X_i R_i + \varepsilon_i \quad (1)$$

where $\Pr(E_{ih})$ is the probability that immigrant i is over-/under-educated in Australia after migration; β_0 is a constant term; and X_i is a vector of personal and occupational

³ Age-related points for applicants over the age of 45 were abolished while bonus points were awarded to those with relevant Australian or international professional work experience, a job offer, a spouse meeting the skill application criteria, an Australian sponsor who had to provide a guarantee, and carrying \$A100,000 or more in capital.

⁴ There are three broad visa categories of entrants to Australia: (1) independent skills, family concessional and employer nomination schemes, (2) family reunification, and (3) refugee/humanitarian. Only independent skills and family concessional are tested through the point system. See Richardson *et al* (2001), Green *et al* (2007), and Chiswick and Miller (2006).

characteristics. The characteristics cover features such as gender, age, country of birth, time since migration and household size, as well as whether the migrant was also over-/under-educated in his/her country of origin in the 12 months prior to migrating, and whether education was completed and/or assessed in Australia. C_i is a dummy variable that is equal to one if the migrant belongs to the second cohort, and zero otherwise. R_i is a dummy variable that indicates whether the migrant has relocated to Australia with a preferential family reunification, business or employer nomination visa. Such visas were not subjected to the policy change analysed in this paper (humanitarian visa are excluded as refugees' resettlement is mostly dictated by non-economic conditions). ε_i is an idiosyncratic error term.

This methodology is akin to what is termed 'difference-in-difference' estimation, as it measures the effect of a 'quasi natural' experiment (the policy change) on the average difference in the probability of being mismatched in Australia's labour market between the treatment group (immigrants in the family concessional and skilled independent visa categories) and the control group (migrants in the preferential family, and business and employer nomination streams, to whom these policy changes did not apply).

The effect of policy change is detected by the difference $(\beta_3 - \beta_7)$ – the probability of being over-/under-educated after the policy reform – after controlling for a set of personal and occupational characteristics including: over-/under-education prior to migration (β_1); changes in the composition of migrants and labour market conditions (β_2); characteristics and over-/under-education among those who entered Australia with a preferential family reunification; and business and employer nomination visa ($\beta_4, \beta_5, \beta_6$). The difference $(\beta_3 - \beta_7)$ has a casual interpretation if there is no change in both observed and unobserved characteristics in the first and second cohort. Since this is unlikely, the results are subject to the possibility of bias due to unobserved individual heterogeneity. This source of bias can be controlled through the use of panel data techniques (Mavromaras *et al* 2010; Pecoraro 2011). This is not possible,

however, here as the estimators become quickly unstable if too many control variables are used - the number of cells with only a handful of observations rises rapidly when adding controls. As a result, the empirical analysis uses dummy variables to control for the wave of the interviews (migrants are interviewed three times in cohort 1 and twice in the second cohort of the LSIA) and corrects the standard errors of the estimators for individual clustering, enabling one to take into account the correlation between multiple observations for an individual.

Since the education-occupation mismatch is observed only for those who are employed, focusing only on immigrants who have a job may overlook that this is a non-randomly selected sub-sample. Estimates would be therefore biased (Bauer 2002). This problem can be avoided by adding a second equation to control for self-selection into labour force participation. Hence the occurrence of the mismatch j for person i is represented by the two linear latent dependent variable equations:

$$y_{1ij}^* = x_i' \beta + u_i \quad (2)$$

where $y_{1ij} = 1$ if the person has attained the respective mismatch ($y_{1ij}^* > 0$) and $y_{1ij} = 0$ if not ($y_{1ij}^* \leq 0$). Equation (2) is a short-hand expression for equation (1).

And

$$y_{2i}^* = z_i' \gamma + v_i \quad (3)$$

where $y_{2i} = 1$ if the person is employed ($y_{2i}^* > 0$) and $y_{2i} = 0$ if not ($y_{2i}^* \leq 0$).

The variable y_{1ij} is observed only if $y_{2i} = 1$. Equation (3) is fully observed and can be estimated separately, but separate estimation of equation (2) is subject to selection bias if the error terms u_i and v_i are correlated. The model can be estimated stepwise (i.e. introducing the inverse Mill's ratio from equation (3) as a covariate in equation (2) - 'Heckman selection model') or simultaneously by maximum likelihood (binomial probit). The two-step method is

perceived to give inconsistent results when there is strong multicollinearity between covariates in equations (2) and (3), as is the case when there is a common set of covariates (Lahiri and Song 2000). Nevertheless it seems sufficient to ensure that the first step of the estimation is non-linear (e.g. regression by probit) to identify the parameters in both equations even when the two vectors contain the same variables (Leung and Yu 2000). In this paper additional exclusion restrictions are imposed in order to reduce the collinearity between the explanatory variables of the outcome and self-selection equations. Following Green *et al.* (2007), who study over-education among migrants using the second cohort of the LSIA, the covariates chosen to identify the model (i.e., variables appearing in z_i' but not in x_i') include participation in the labour market prior to migration, whether the immigrant had own funds at the time of arrival and their value, car ownership and the number of dependent children. Immigrants who face liquidity constraints might be more likely to be under pressure to take up employment, as are those who have young children. Owning a motor vehicle might also increase the area where the person can take up a job and thus widen employment opportunities. Other control variables include age and gender, the proficiency level of English, whether migrants had visited Australia prior to immigration, the number of adults in the household, the time since migration and whether education was completed, and if not if it was assessed, in Australia.

4. Data

The LSIA is based on a representative sample of 5 percent of migrants/refugees from successive cohorts of migrants and was commissioned in the early 1990s to fulfil the need to have better information on settling in Australia than was available from the census. It contains more than 300 questions about the settlement process and conditions experienced pre-emigration in the home country and after relocating to Australia. The questions were

asked separately to primary applicants and their migrating spouses.⁵ The first cohort, arrived in 1995-1996, contains 5,192 primary applicants and 1,838 spouses, surveyed 5, 17 and 41 months after arrival. The second cohort, arrived between 2000 and 2001, contains 3,124 primary applicants and 1,094 spouses surveyed after 5 and 17 months after immigration. Since Cohort 2 includes 175 migrants who qualified under the less restrictive migration criteria (i.e. before 1st July 1999), these observations are reallocated to Cohort 1 in the empirical analysis.

Table 1 presents the descriptive statistics. Immigrants are typically in their mid-30s (*agemig*), have a small family (*nbhouse*), with one or two dependent children (*ch_res*). Immigrants typically carry with them funds equivalent to about a year of Australia's average wage (*val_funds*). Most are highly educated, with approximately two thirds holding diplomas or certificates or higher educational qualification. They are mostly from Europe (*COB2*) and East Asia (*COB4*). Almost half of respondents have previously visited Australia (*previs*), and close to 70 per cent were interviewed in English at the time of their first interview (*langint*). About 28 per cent of those in Cohort 1 settled in Australia with hopes of better economic prospects (*hope*). This proportion rises to 60 per cent for Cohort 2. Owning a car (*car*) immediately after arrival appears far more common among immigrants of the first cohort (78.3 per cent) than in the second (58.7 per cent). Immigrants were mostly correctly matched in their home country (*prev_ok*: about 60 per cent for both cohorts), while about one fourth is under-educated (*prev_un*). Over-education in the home country (*prev_ov*) affects about 10 per cent of immigrants in both cohorts. A negligible proportion of immigrants in both cohorts completes education in Australia (*hfqu_AUS*: 3.8 per cent for cohort 1 and 6.8 per cent for cohort 2), though a far higher proportion has the educational qualification assessed in the country (*qual_AUS*: cohort 1: 27.5 per cent; cohort 2: 21.5 per cent).

⁵ Migrating unit in this context includes all members of the family migrating to Australia under the same visa application. The term spouses is used for husband/wife, civil partners, fiancé(e)s and de facto partners.

The top part of Table 2 presents the education mismatch transitions between the status in the last 12 months before migration and the status at five months after arrival in Australia for males and females of working age (20-65). The bottom part of the table reports the transition at 17 months after arrival. Table 2 summarises the high persistence in the education-occupation mismatch (and correct matches) of people moving from the labour market of their country of origin to that of their country of resettlement. The probabilities of transiting from over-education in the home country to under-education in Australia (or from under- to over-education) are very low, suggesting that the use of Australia's measure of mismatch in the case of the country of origin works reasonably well. For both cohort 1 and 2, about two thirds of the over-educated in the home country remain over-educated in Australia 5 months after arrival. The persistence increases further after 17 months since arrival mainly because some of those who are initially unemployed find jobs, but these often require less education than the immigrants have. Such high persistence may also indicate that employers in the labour markets of both countries of origin and destination share a similar view of the immigrants' education when it comes to job assignment. Overall, most immigrants are correctly matched. About half are not, with a slight prevalence of over-educated. The main difference between cohorts is the reduced incidence of correct matches, particularly 17 months after arrival, which is lower for the second cohort. This may reflect the changed macro-economic conditions facing later immigrants to Australia, as highlighted by Junankar and Mahuteau (2005), following the economic slowdown that accompanied the internet boom in the late 1990s.

5. Results

Equation (1) and the system (2)-(3) are estimated as a series of pooled cross-sections to maintain an adequate number of observations to carry out the analysis, with time dummies

controlling for the separate waves. Immigrants resettling under the preferential family reunification and employer nomination scheme are used as a control group (β_4), as these settlers were not affected by the policy change considered. Observations representing humanitarian migrants are excluded from the analysis as these mostly reflect non-economic motives and selection criteria (their inclusion, however, does not modify the results discussed below).

The determinants of over-/under-education in Australia appear to be confined to a handful of explanatory variables, which include the previous education-occupation mismatch in the country of origin, gender and previous knowledge of Australia – possibly labour market experience in the country as well. These determinants are briefly reviewed before discussing the estimate of the effects of the policy change ($\beta_3 - \beta_7$).

Table 3 presents the marginal effects of the determinants of immigrants' over- and under-education and correct matches in Australia. These represent the change in the probability of the dependent variable when the explanatory variable changes by one unit as measured from the baseline (in the case of dichotomous variables) or the mean (for continuous variables). Three sets of marginal effects are presented, reflecting the three types of possible education-occupation match (over-/correct/under-education). For each type, two marginal effects are displayed depending on whether equation (1) is estimated as a single process (labelled 'probit') or as the system (2)-(3) with a selection equation controlling for migrants' ability to find a job and their choice of labour force participation ('Heckman').

The general regression statistics are reported at the bottom of Table 3. As shown, the regressions explain about 20 per cent of the variance of the dependent variable in the case of over-education and correct matches. The model summarised by (1) fares much better in explaining under-education (pseudo- R^2 is 49.36 per cent), underlying a stronger effect from the explanatory variables. The general regression statistics also reveal that selection into

participation does not appear to be a significant problem: the value of ρ (rho) is statistically significantly different from zero only in the case of over-education and at the lowest level of statistical significance (i.e. 10 per cent): the positive value (+0.609) suggests that the probability of mismatch and the decision to participate to the labour market are not independent from each other: participating increases the over-education outcome, as would occur to people ready to supply labour with a high elasticity. In contrast, the covariance between the error terms of equations (2) and (3) is statistically insignificantly different from zero, implying that the decision to participate in the labour market is decoupled from either achieving a correct education-occupation match or being under-educated.

With reference to the main determinants of the job-education match, the most significant predictor is the home country job-match experience. This confirms the results discussed by Piracha, Tani and Vadean (2010). Having been over-educated and correctly matched in the home country raises the probability of being over-educated and correctly matched in Australia by 40 per cent. In the case of under-education, the probability of mismatch in Australia rises to 60 per cent. The 'home bias' effect is very large in both coefficient and statistical significance and deserves more research, as it supports the idea that employers, even if located in very different labour markets, assign jobs to employees using a similar view of their education. Migrating does not appear to 'solve' being over-educated at home, but, on the contrary, reinforces this mismatch. Of course, this apparent international 'transferability' of a person's job-education match across labour markets is open to alternative interpretations. It may signal employers' correct valuation of the abilities of their employees: this is low in the case of over-education and high in the case of under-education. Alternatively, it may be the result of the applicant's imperfect knowledge about where to look for a job that suits his/her ability. Research focusing on the possible links between education-

occupation outcomes and job search methods will help to shed light on these, and possibly other, competing explanations.

A second important determinant of education-occupation mismatches is where education is acquired. Completing one's education in Australia raises the probability of over-education by almost 7 per cent and reduces the probability of under-education by about 6 per cent. Similarly signed and sized marginal effects occur if an immigrant decides to have his/her educational qualifications assessed in Australia. No statistically significant effect arises in the case of correct matches. These results *prima facie* reveal a discrepancy between Australian educators and employers about an immigrant's ability when this is measured by schooling or occupation. No detectable effect arises from the use of English (language – statistically insignificantly different from zero), which, if poor, could explain why immigrants are employed in jobs for which they over-qualify and shy away from jobs beyond their qualifications. Two other indicators, however, point to a genuine lack of knowledge of Australia's labour market and readiness to accept a job quickly after migration as more likely explanations of the marginal effects of acquiring/assessing education in Australia. One is the strong negative effect of previous visits to Australia in the case of over-education (previs: -12.7 per cent), the even stronger but positive effect of the same variable in the case of correct matches (previs: +16.5 per cent), and no statistically significant effect for under-education (previs: +2.2 per cent with a standard deviation of 2 per cent). With more prior knowledge of Australia, education-occupation mismatches are less likely and correct matches are more likely. Acquiring education, or having it assessed, in Australia provides prior knowledge of the country but also expedites an immigrant's access to its labour market, regardless of whether the first job is the most suitable. It will still help to reduce the cost of migration and resettlement, especially if only one partner works and there are dependent children who need access to schooling. The other indicator is that the incidence of over-education declines (t1d:

-.0005 and statistically significantly different from zero at the 5 per cent level) at a rising rate (t1d2: +0.000003 and similarly statistically significant), and correspondingly that of under-education rises (+0.0003 and statistically significantly different from zero at the 5 per cent level) at a declining rate (-.000002 and similarly statistically significant). No statistical effect arises in the case of correct matches. Time helps to improve immigrants' initial labour market choices and, with it, the education-occupation match.

The third significant determinant of immigrants' education-occupation match is gender. Being a woman raises the probability of over-education by about 6 per cent and reduces that of correct matches by 9 per cent. Gender bias in the labour market is not new, but these marginal effects highlight some systematic under-utilisation of women by Australian employers. This may still reflect lack of information or the availability of appropriate jobs in the locale chosen by the immigrant (e.g. due to affordable housing) rather than outright discrimination, and targeted research in this area can provide an answer.

The probability of mismatch is also affected by the country of birth. Being born in Europe, including Eastern Europe and countries in the former Soviet block (vis-à-vis being born in New Zealand and Oceania) and Middle East and Africa raises the probability of both over- and under-education and reduces that of a correct match. These countries of origin appear to 'destabilise' the matching between schooling and jobs' educational requirements in Australia's labour market. This result may reflect the large migration waves of highly educated people from countries undergoing significant economic and political transition in Europe (e.g. the end of the Soviet block, war in the Balkans), the Middle East (war in Iraq), and Africa (end of apartheid in South Africa, economic decline in Zimbabwe). Migrants from East Asia appear more likely to take up jobs for which they are over-educated, while those from other part of the world include a heterogenous group of countries that provide both highly trained and untrained immigrants.

The effect of the migration policy change on the probability of education-occupation match is summarised by the estimators of the difference ($\beta_3 - \beta_7$) reported in Table 4. Statistically significant effects arise as to where the education was acquired, gender and, in the case of under-education, immigrant selection. The more selective policy introduced in 1999 resulted in a lower probability of being over-educated when education was acquired in Australia. The effect is large and statistically significant, as shown by the negative coefficient of about -1.30, which corresponds to a reduction of about 52 per cent in the probability of being over-educated. Clearly the policy tightening raised the profile and value of being educated in Australia, and this large effect is consistent with the policy giving additional admission points to applicants who completed education in the country. Gaining extra points does not, however, entirely explain the effect on education, as the policy change seems to have also resulted in the reduction by about 30 per cent of an immigrant's probability of getting a job for which s/he was over-qualified if her/his qualifications were assessed in Australia (the estimated coefficient of the difference ($\beta_3 - \beta_7$) is about -0.8). The policy seems therefore to have made a difference to the assessment of education, perhaps by way of generating a signal that was recognised by Australian employers. The policy change also had a positive effect in reducing the gender bias for over-educated workers, as shown by the corresponding estimator reported in Table 4 (female) (-.638), implying that the probability of over-education due to gender fell by about 25 per cent.

These results for over-education are the counter image of those obtained in the case of correct matches. In other words, the reduction in the probability of over-education due to the migration policy change appears to have been absorbed by a corresponding increase in the probability of being correctly matched. With regards to education, the positive coefficients in the range 1.34-1.477 suggest that the policy change raised by between 54 and 59 per cent the probability that an immigrant educated in Australia obtained a job for which his/education

was correctly matched to what the job required. The policy also raised by about 36-39 per cent the probability of females being correctly matched (the estimated coefficients are .967-.908).

The policy change does not appear to have had an impact on where education was acquired or assessed in the case of under-education. In contrast, the policy resulted in a much lower gender effect in the probability of being under-educated, to the advantage of being correctly matched. Unique to the case of under-education, the policy change resulted in a far higher probability (almost 75 per cent) of attracting migrants who were already under-educated at home and remained under-educated in Australia (coefficients: 1.84-1.95). Since under-education is generally thought of in terms of labour market over-achievement, as the person affected has a job that requires a level of education above the one obtained, the higher incidence of immigrants with previous under-education in their home countries suggests that the policy change has resulted in an increase of high-quality immigrants for Australia (and a corresponding net loss of human capital for the countries of origin).

The remaining cohort effects do not indicate other substantial differences between the two cohorts, as the estimators related to the country of birth are not statistically different from zero. From an Australian perspective, the policy change was positive. Overall, the new immigration selection criteria appear to have had a strong effect in reducing the gender bias in the mismatch between education and occupation, to the advantage of being correctly matched. The policy also raised the relevance of educational qualifications and assessment obtained in Australia, as these variables positively contributed to reduce the incidence of over-education and raised the probability of being correctly matched.

6. Conclusion

This paper attempts to explore the determinants of the education-occupation mismatch among immigrants in Australia, with a focus on the consequence of the change in immigration policy that resulted in more selection about age, qualifications and work experience. With reference to the determinants, the analysis highlights that those affected by an education-occupation mismatch in the home country before migration are more likely to be in the same mismatch type in Australia. The analysis also shows that being mismatched is more likely for immigrants who have a limited knowledge/experience of Australia, are females, and have completed their studies in Australia. More importantly, however, the analysis reveals that the policy change resulted in a reduction of the gender bias and in Australian education substantially enhancing the probability of being correctly matched. These results suggest that Australian immigration policy was successful in terms of attracting immigrants that reduced the domestic education-occupation mismatch.

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LEGEND

Abbreviation	Variable
visafam_pref	Family preferential visa
visafam_conc	Family concessional visa
Visaindp	Skill independent visa
Visabiz	Business visa
Agemig	Age (years) at time of migration
Agemigsq	Squared age (years) at time of migration
Female	Female respondent
Marry	Married
Fmabizm	Entrepreneur in country of origin
COB2	Country of birth: Europe and Russia
COB3	Country of birth: Middle East/Africa
COB4	Country of birth: East Asia
COB5	Country of birth: Rest of the World
nbhouse	Nr people living in household
hope	Migrated hoping to get better employment opportunity
previs	Visited Australia prior to migrating
t1d	Nr days since arrival
t1d2	Squared nr days since arrival
langint	Language of interview is English
hfquAUS	Formal education completed in Australia
qual_AUS	Education assessed in Australia
Oved_cr	Over-educated in Australia
Nomm_cr	Correctly matched in Australia
Unded_cr	Under-educated in Australia
Prev_ov	Over-educated in the home country prior to migration
Prev_ok	Correctly matched in the home country prior to migration
Prev_un	Under-educated in the home country prior to migration
Car	Owens a car
Ch-res	Number of resident dependent children
Val_funds	Value of funds brought to Australia (in thousand A\$)

TABLE 1 **SUMMARY STATISTICS: LSIA 1 AND 2. MALES AND FEMALES AGED 20-65**

	Cohort 1			Cohort 2	
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2
visafam_pref	0.477			0.548	
visafam_conc	0.188			0.128	
visaindp	0.206			0.170	
visabiz	0.129			0.154	
agemig	33.578			34.458	
agemigsq	1,221			1,283	
female	0.426			0.473	
marry	0.738			0.693	
fmabizm	0.132			0.137	
COB2	0.314			0.296	
COB3	0.170			0.113	
COB4	0.310			0.356	
COB5	0.181			0.193	
nbhouse	3.497			3.457	
hope	0.283			0.601	
previs	0.517			0.487	
t1d	138	509	1,258	151	524
t1d2	21,015	261,829	1,586,174	24,179	278,915
langint	0.686	0.692	0.678	0.679	0.656
hfquAUS	0.038	0.193	0.296	0.068	0.141
qual_AUS	0.275			0.215	
Oved_cr	0.211	0.227	0.221	0.210	0.268
Nomm_cr	0.599	0.598	0.603	0.593	0.487
Unded_cr	0.189	0.174	0.175	0.198	0.244
Prev_ov	0.096			0.135	
Prev_ok	0.618			0.599	
Prev_un	0.285			0.266	
Car	0.783	0.861	0.921	0.587	0.679
Ch_res	1.62	1.54	1.43	1.65	1.56
Val_funds	27.4			42.1	

TABLE 2: TRANSITION MATRIX OF EDUCATION MISMATCH BETWEEN HOME COUNTRY AND 5 MONTHS AFTER ARRIVAL IN AUSTRALIA

Education mismatch in home country	Education mismatch in Australia – 5 months after arrival			
	Cohort 1			
	Over-educated	Correctly matched	Under-educated	Total
Over-educated	69.41%	30.59%	0.00%	100
Correctly matched	20.22%	76.40%	3.37%	100
Under-educated	5.42%	30.15%	64.43%	100
Total	21.09%	60.12%	18.79%	100

	Cohort 2			
	Over-educated	Correctly matched	Under-educated	Total
Over-educated	67.29%	32.24%	0.47%	100
Correctly matched	24.76%	71.83%	3.40%	100
Under-educated	6.14%	37.00%	56.86%	100
Total	24.20%	58.91%	16.89%	100

Education mismatch in home country	Education mismatch in Australia – 17 months after arrival			
	Cohort 1			
	Over-educated	Correctly matched	Under-educated	Total
Over-educated	75.37%	23.88%	0.75%	100
Correctly matched	16.54%	79.88%	3.59%	100
Under-educated	0.45%	18.92%	80.63%	100
Total	20.86%	58.78%	20.36%	100

	Cohort 2			
	Over-educated	Correctly matched	Under-educated	Total
Over-educated	70.93%	27.91%	1.16%	100
Correctly matched	25.64%	67.63%	6.73%	100
Under-educated	3.23%	27.10%	69.68%	100
Total	26.40%	50.09%	23.51%	100

TABLE 3: PROBABILITY OF IMMIGRANTS' EDUCATION-OCCUPATION MISMATCH IN AUSTRALIA DUE TO TIGHTER IMMIGRATION POLICIES – MARGINAL EFFECTS

	Over-education		Correctly matched		Under-education	
	Probit	Heckman	Probit	Heckman	Probit	Heckman
Cohort	-.182 (.304)	-.166 (.340)	-.041 (.716)	.107 (.701)	.238 (.948)	.187 (.919)
Over-educated at home	.417*** (.043)	.422*** (.045)				
Correctly matched at home			.400*** (.029)	.405*** (.029)		
Under-educated at home					.603*** (.037)	.601*** (.039)
Qualif. from AUS	.066** (.025)	.065*** (.025)	-.012 (.030)	-.006 (.031)	-.055*** (.015)	-.064*** (.018)
Qualif. Assessed AUS	.076*** (.024)	.082*** (.025)	.015 (.029)	.013 (.031)	-.069*** (.015)	-.078*** (.016)
Agemig	-.006 (.013)	-.007 (.013)	.014 (.018)	.015 (.019)	-.002 (.009)	-.002 (.011)
Agemigsq	.0001 (.0002)	.00001 (.0002)	-.0003 (.0002)	-.0003 (.0003)	.00002 (.0001)	.00002 (.0002)
Female	.061** (.025)	.065*** (.025)	-.091*** (.031)	-.099*** (.033)	-.004 (.019)	-.0004 (.023)
Marry	-.038 (.026)	-.057** (.028)	.027 (.033)	.042 (.034)	.016 (.018)	.023 (.022)
Nbhouse	.008 (.007)	.010 (.007)	-.009 (.010)	-.012 (.010)	-.00006 (.006)	.003 (.007)
Hope	.018 (.021)	.013 (.021)	-.007 (.028)	-.008 (.029)	-.018 (.017)	-.016 (.020)
Previs	-.127*** (.025)	-.127*** (.025)	.165*** (.030)	.165*** (.031)	.022 (.019)	.031 (.022)
t1d	-.0005** (.0002)	-.0005** (.0002)	.0002 (.0002)	.0002 (.0003)	.0003** (.0001)	.0004** (.0002)
t1d2	.000003*** (.0000)	.000003** (.0000)	-.000002 (.000002)	-.000002 (.000002)	-.000002* (.0000001)	-.000002* (.0000001)
Langint	-.011 (.017)	-.010 (.018)	.012 (.023)	.011 (.024)	-.003 (.015)	-.007 (.018)
Owned business at home	-.075** (.029)	.085 (.060)	.035 (.042)	.040 (.044)	.038 (.030)	.036 (.033)
COB: Europe/Russia	.148* (.086)	.216** (.011)	-.282*** (.108)	-.283** (.111)	.194** (.099)	.217* (.115)
COB: MEast, Africa	.167* (.100)	.279* (.156)	-.287*** (.110)	-.291*** (.114)	.251* (.149)	.283* (.165)
COB: East Asia	.315*** (.098)	.415*** (.134)	-.403*** (.101)	-.402*** (.105)	.134 (.101)	.133 (.107)
COB: Rest of world	.151 (.098)	.258* (.045)	-.254*** (.112)	-.269** (.114)	.161 (.121)	.179 (.136)
PARTICIPATION						
Owns car		-.025** (.011)		.002 (.011)		.005 (.008)
Children resident		-.017** (.008)		.002 (.009)		.001 (.002)
Value of funds		-.003 (.006)		.000006 (.000005)		.00003 (.001)
Observations	6,281	8,525	6,281	8,525	6,281	8,525
Censored obs		2,567		2,567		2,567
Wald chi2	807.1	667.1	978.1	873.3	1,524.1	1,492.4
Log likelihood	-2,700.6	-6,456.3	-3,504.2	-7,224.9	-1,515.0	-5,358.1
Pseudo-R ²	.1936		.1749		.4936	

ρ	.609*	-.032	-.171
	(.336)	(.161)	(.245)

Note: The base group for “Country of birth” (COB) is “Oceania”.

TABLE 4: DIFFERENCE-IN-DIFFERENCE ESTIMATORS FOLLOWING TIGHTER IMMIGRATION POLICY

	Over-education		Correctly matched		Under-education	
	Probit	Heckman	Probit	Heckman	Probit	Heckman
Cohort	.859 (3.94)	.662 (3.88)	.580 (3.82)	.776 (3.89)	-.069 (6.82)	.128 (6.92)
Over-educated at home	.193 (.502)	.329 (.502)				
Correctly matched at home			.366 (.394)	.418 (.405)		
Under-educated at home					1.84** (.800)	1.95** (.823)
Qualif. from AUS	-1.265** (.531)	-1.341*** (.520)	1.34*** (.507)	1.477*** (.523)	.512 (.970)	.469 (.972)
Qualif. Assessed AUS	-.733* (.397)	-.841** (.389)	.505 (.379)	.576 (.388)	.196 (.606)	.062 (.624)
Agemig	.072 (.213)	.062 (.210)	-.181 (.207)	-.196 (.210)	.075 (.354)	.081 (.357)
Agemigsq	-.002 (.003)	-.001 (.002)	.003 (.003)	.003 (.003)	-.002 (.005)	-.003 (.005)
Female	-.746** (.377)	-.638* (.372)	.967*** (.360)	.908** (.368)	-1.43** (.613)	-1.39** (.608)
Marry	-.037 (.425)	-.002 (.422)	.067 (.402)	.050 (.410)	.824 (.657)	.971 (.681)
Nbhouse	-.167 (.121)	-.197* (.120)	.141 (.114)	.137 (.116)	-.003 (.208)	.107 (.200)
Hope	.758* (.448)	.753* (.434)	-.551 (.414)	-.461 (.424)	-.181 (.719)	-.419 (.718)
Previs	.261 (.387)	.087 (.393)	-.131 (.371)	-.080 (.387)	-1.037 (.667)	-1.04 (.682)
t1d	-.0005 (.006)	.0004 (.006)	.003 (.006)	.003 (.005)	-.005 (.010)	-.006 (.010)
t1d2	.000003 (.000009)	.000001 (.000009)	-.00005 (.00009)	-.000005 (.000009)	.00004 (.00003)	.00005 (.00002)
Langint	-.026 (.339)	.206 (.341)	-.038 (.323)	-.121 (.334)	-.109 (.597)	-.119 (.614)
Fmabizm	.924 (.617)	1.065* (.606)	-.382 (.551)	-.464 (.559)	-1.43 (1.05)	-1.41 (1.05)
COB: Europe/Russia	-1.719** (.917)	-1.40 (.915)	1.10 (.905)	1.04 (.929)	.705 (1.72)	.642 (1.73)
COB: MEast, Africa	-.887 (.995)	-.292 (1.002)	.506 (.981)	.469 (1.01)	1.09 (2.04)	.657 (2.06)
COB: East Asia	-1.487* (.923)	-1.025 (.925)	.696 (.918)	.604 (.945)	2.18 (1.73)	1.96 (1.76)
COB: Rest of world	-.109 (.921)	.121 (.915)	-.045 (.929)	-.083 (.952)	.963 (1.91)	.754 (1.91)