Earnings and immigrants' age at arrival: An Australian study

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Using an eleven year panel dataset, we examine the impact of age at arrival on earnings. Our base model results reveal that age at arrival matters; younger arrivals earn more relative to Australian-born workers, whereas older arrivals earn relatively less. There is nevertheless indicative evidence of earnings assimilation, with older arrivals catching up after spending approximately 6.6 years in Australia. Negative arrival age effects are stronger for immigrants from non-English speaking backgrounds (NESB). Cohort effects are also present and differ by country of origin. The evidence that age at arrival is an important factor affecting immigrant earnings suggests a need for a mechanism that favours migration applicants with young children, and a continuation of policies that attract young migrants. Labour market programs to ease the assimilation of older-aged new immigrants into the workforce are also recommended.

JEL Codes: C23; J15; J31

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I. Introduction

Australia is a nation of immigrants; recent census data reveal that almost a quarter of the nation's population were born overseas and, for the year ended 30 June 2013, net overseas migration contributed 60% of total population growth (Australian Bureau of Statistics, 2011, 2013). It is irrefutable that the contribution of immigrants to Australian society, culture and prosperity has been an essential element in shaping the nation. These immigrants, however, often face barriers to labour market success. This is most clearly illustrated by the fact that immigrants, particularly those emigrating from non-English speaking countries, often earn lower wages than Australian-born workers. This phenomenon has several possible causes, including a lack of international transferability of human capital (Chiswick and Miller, 2010), less recognition by employers of overseas qualifications and skills (Beggs and Chapman, 1991, Chapman and Iredale, 1993) and limited English language proficiency (Chiswick and Miller, 1995).

In his seminal work, Chiswick (1978), using data from the 1970 US census, shows that the significant earnings gap between natives and immigrants upon arrival tends to disappear over time as immigrants assimilate into the host society. According to the author, at the time of entry, immigrants have a relative earnings disadvantage because they lack host country specific human capital. However, after arrival immigrants begin to acquire host country specific human capital; and if immigrants acquire this capital more quickly than similar native workers, their earnings start to converge to those of natives.

The finding that the earnings of immigrants converge to those of US-born workers over time has subsequently been confirmed by, among others, Borjas (1982), Borjas and Tienda (1985), Carliner (1980), DeFreitas (1980) and Long (1980). As noted by Borjas (1985) however, estimates of the effect of time since arrival on earnings (a proxy measure of the rate of economic assimilation) may be biased because it is difficult to distinguish age

and cohort-effects in a cross-sectional research design. That is, unobserved heterogeneity across immigrant arrival cohorts can bias estimates of earnings assimilation. For example, if we assume that more recent immigrant cohorts have a lower unobserved ability relevant to the labour market than earlier immigrant cohorts, then the coefficient measuring assimilation from cross-sectional data is biased upward (Gundel and Heiko-Peters, 2007).

Another possible bias arises from a failure to control for age at arrival in the host country. The age at which an individual migrates to a host country is potentially an important factor in determining his/her success in the labour market. For example, immigrants who arrive as youths are expected to assimilate better than those who arrive in adulthood (Friedberg, 1992, Wilkins, 2003, Will, 1997). As noted by Friedberg (1992), to the extent that age at arrival negatively affects earnings, the failure to account for this variable will overstate the impact that years since arrival has on earnings due to the spurious negative correlation between age at arrival and years since arrival.

Available evidence on earnings assimilation in Australia is mixed. A number of studies suggest that immigrants' earnings converge to those of natives over time (cf. Breunig, Hasan and Salehin, 2013, Chiswick, Lee and Miller, 2005, Salehin and Breunig, 2012, Wilkins, 2003). These results are countered by findings that report no evidence of earnings assimilation (cf. Antecol, Kuhn and Trejo, 2006, Cobb-Clark, Hanel and McVicar, 2012, McDonald and Worswick, 1999). The studies by Salehin and Breunig (2012), Breunig, Hasan and Salehin (2013), Chiswick, Lee and Miller (2005) and Cobb-Clark, Hanel and McVicar (2012) all employ panel data estimates but fail to control for age at arrival. McDonald and Worswick (1999) control for age at arrival by making distinctions between immigrants who arrived as adults and immigrants who arrived as children. However they, along with Antecol, Kuhn and Trejo (2006), do not use true panel data; rather, they employ a quasi-panel or synthetic cohort approach. This can give a biased result

if there is selective out-migration. The only paper that explicitly examines the effect of age at arrival on earnings in Australia is written by Wilkins (2003), who finds that initial wages increase with age at arrival, while the rate of wage growth decreases with age at arrival. Wilkins' study, however, is limited by its reliance on cross-sectional data.

This paper seeks to redress many of the limitations of earlier studies and fill an important research gap. Specifically, we employ panel data from the first 11 waves of the HILDA survey to provide evidence about the effect age at arrival has on initial earnings and earnings growth.[2] In contrast to Wilkins (2003), our results indicate that age at arrival has a negative effect on immigrant initial earnings; those who arrive before the age of 15 earn 4.1% more than the Australian-born, whereas those who arrive after the age of 34 earn 5.9% less. Our results also suggest, however, that the rate at which earnings grow with years since arrival increases with age at arrival. For example, those who arrive after the age of 24 experience a 0.9% increase in earnings for each additional year in Australia, whereas no significant increase is found for those aged 15-24 years and only a 0.5% increase for those aged less than 15 years. Age at arrival is particularly important for the initial earnings of non-English speaking background (NESB) immigrants. For example, those who arrive after the age of 34 earn 13.7% less than the Australian-born. While this gap diminishes over time, it takes approximately 11 years for these workers to 'catch up'.

Further analysis is undertaken to estimate the earnings profile for different arrival

[2] The primary limitation of this study is that it does consider out-migration. Like most studies on immigrant assimilation, this study is based on immigrants that live in the host country at the time the survey is conducted. There is the suggestion that successful immigrants stay in the host country, whereas those who are unsuccessful leave. This implies that immigrants' re-migration decisions are non-random; studies that do not consider out-migration of unsuccessful immigrants, therefore, tend to overestimate the effect of years since arrival on earnings (Borjas, 1989, Lubotsky, 2007). In defence of this approach, in their study on immigrant wage gaps and assimilation in Australia, Breunig, Hasan and Salehin (2013) state that selective out-migration does not appear to be a major issue in the Australian context, as Australia is a final destination for most immigrants and re-migration decisions seem to be random. Further, in its social trends article, the Australian Bureau of Statistics (2012) reports that there are many reasons why immigrants decide to leave Australia permanently, including feelings of homesickness, retirement, family formation and dissolution, successful employment and increased wealth, and improvement in economic and/or political conditions in their home country (most departing immigrants from Australia return to their country of birth).

cohorts. For immigrants as a whole, arrival cohort has no significant effect on initial earnings; however, the rate at which earnings grow with years since arrival is higher for more recent arrivals. The impact of arrival cohort on initial earnings is more visible when separate analyses are done for each immigrant group, with English-speaking background (ESB) migrants arriving between 2000 and 2011 earning 5.6% more than the Australian born, and NESB migrants arriving between 1990 and 1999 earning 5.5% less, although this gap does disappear within a decade.

This paper proceeds as follows. The next section describes data and preliminary evidence, while the following section presents the econometric model and estimation strategy. Results are then reported and discussed, before conclusions are drawn.

II. Data and Preliminary Evidence

Data are obtained from the first eleven waves (2001–2011) of the Household, Income and Labour Dynamics in Australia (HILDA) survey. The HILDA survey began in 2001 and collects information about economic and subjective well-being, labour market dynamics and family dynamics. The survey provides a rich source of information on labour market outcomes and performance. There is information on occupation and industry type, qualification levels attained and, of particular interest to this paper, years since arrival, age at arrival and earnings.[3]

We have restricted our sample to employees between 16 and 64 years of age. Those employed in family businesses and those who are self-employed are excluded from the sample. After checking for inconsistencies in the data and removing individuals with

[3] A common problem with panel data is attrition. Panel attrition may bias the estimation results if the probability of leaving the sample is systematically related to labour market outcomes (Fertig and Schurer, 2007). For the data employed in this study, Breunig, Hasan and Salehin (2013) compare education levels between those who stay in the survey and those who drop out of the survey, and find that the differences are fairly small with likely minor implications. There are claims that in a regression attrition is likely to affect intercept terms, but has relatively little impact on the slopes of key coefficients (Fitzgerald, Gottshalk and Moffitt, 1998).

incomplete responses, our sample provides 51,914 person-year observations. Of these, 41,729 are Australian-born and 10,185 are immigrants. Of the immigrants, 4,998 are from ESB countries and 5,187 are from NESB countries.[4] The full set of variables utilised in this study is available in the Appendix.

As shown in Table 1, on average, immigrants earn more than their Australian-born counterparts, earning an hourly wage of $22.63 compared to $20.68.[5] This does not, however, imply that immigrants necessarily earn more than Australian-born workers from the moment they arrive. On average, immigrants in the sample have lived in Australia for almost 24 years and were approximately 19 years old at the time of arrival. Immigrants that arrived at a very young age are likely to have acquired their skills in Australia and, given the finding that immigrants earn more than Australian-born workers, there may be a negative correlation between age at arrival and earnings. A positive relationship, however, is expected to exist between years since arrival and earnings, as immigrants are able to assimilate over time by acquiring relevant labour market experience in the host country.

Table 1 also shows that immigrants are better educated, have more tenure with respect to occupation and have more years of work experience compared to Australian-born workers. In contrast, immigrants have less tenure with employer, have been unemployed for more years and have spent more years out of the labour force. These results largely hold whether comparing immigrants as a single block, or whether the immigrants are split by ESB/NESB status. The one exception to this is in regards to hours worked; ESB migrants, on average, work longer hours than Australian-born workers, NESB migrants work shorter hours.

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[4] ESB migrants are defined as those who were born in the UK, Ireland, NZ, Canada, USA, South Africa or Zimbabwe. All other migrants are defined as being NESB immigrants.

[5] Unless otherwise stated, all figures are in AUD. As at 10 December 2014: 1 AUD = 0.83 USD; 0.67 EUR; 0.53 GBP.

In unreported results, a comparison is also made between the hourly wages of Australian-born workers and immigrants, with immigrants grouped according to age at arrival (less than 15 years old, 15-24 years old, 25-34 years old and over 34 years old). The results indicate that immigrants earn significantly more in all age groups, except for those who arrive between the ages of 15 and 24 (no significant difference in hourly wages could be found for this group). Thus, irrespective of age at arrival, immigrants appear to earn more than Australian-born workers.

[Place Table 1 here]

III. Econometric Method

To empirically examine the earnings effect of both years since arrival and age at arrival, we use a random effects generalised least squares (GLS) model with Mundlak (1978) corrections. The econometric model used in this study extends the Mincer-type earnings function (Mincer, 1974). The economic analysis of how immigrant earnings respond to the assimilation process and age at arrival can be modelled in the following form:

$$LHW_{it} = \alpha + \beta\beta_{it} + \gamma_1 Imm_i + \gamma_2 YSA_{it} + \gamma_3 AAA_i + \varepsilon_{it}, \quad i = 1,...,N, \; t = 1,....,11 \qquad (1)$$

where *i* denotes individuals (employees) and *t* time. The *i* subscript, therefore, denotes the cross-sectional dimension whereas *t* denotes the time-series dimension. The dependent variable, LHW_{it} , is the natural logarithm of the hourly wages of employee *i* at time *t*; α is a scalar, β is *K* x 1 and X_{it} is the *i*th observation on *K* explanatory variables containing individual and work-related characteristics. Imm_i is a dummy variable, equalling 1 if the individual is an immigrant and 0 otherwise; YSA_{it} captures the effect of number of years since arrival (*YSA* = 0 for Australian-born workers); and AAA_i is a series

of dummy variables indicating approximate age at arrival.[6]

In the model, γ_1 measures the differential between immigrant and Australian-born earnings upon arrival in Australia, γ_2 measures how immigrant earnings vary with the length of time spent in Australia, and γ_3 measures initial earnings differences between immigrants in each age at arrival category and Australian-born workers. The expected sign for λ_2 is positive, because assimilation causes the earnings of immigrants to grow over time; whereas for the age at arrival dummies, it depends on the immigrant group. A positive sign is expected for all ESB immigrants and for those NESB immigrants who arrive at a young age, mainly because of English language proficiency and skill transferability due to cultural similarities. In this paper, interaction terms between years since arrival and each age at arrival category are created to measure the age at arrival effect on the rate at which earnings grow with years since arrival.

In this paper, we use a one-way error component model for the disturbances with $\varepsilon_{it} = u_i + v_{it}$, where u_i represents the unobservable individual-specific effect and v_{it} denotes the remainder disturbance (i.e. the idiosyncratic error tem). In our model, u_i is time-invariant and accounts for any individual-specific effect that is not included in the regression. The rest error term, v_{it}, varies with individuals and time. The random effects model assumes that: the expected value of the unobserved individual-specific effect and the idiosyncratic error is zero ($E(u_i) = E(v_{it}) = 0$); both components are homoscedastic $(Var(u_i) = \sigma_u^2 ; Var(v_{it}) = \sigma_v^2)$; the two components are independent ($E(u_i, v_{it}) = 0$); there is

[6] In separate analyses the dummy variable Imm_i is further broken down into ESB and NESB sub-categories. Unlike other assimilation models, our econometric model excludes the quadratic term for *YSA* because it was insignificant. Thus, fitting the model without the quadratic term provides a more accurate estimate for the coefficient on *YSA*.

no serial correlation in the idiosyncratic errors ($E(v_{it} v_{js}) = 0 \ \ if \ t \neq s \ or \ i \neq j$); the u_i are independent of each other for all *i* and *t* ($E(u_i, u_j) = 0$); and the explanatory variables included in the model are independent of the u_i and v_{it}, for all *i* and *t*.

In a random effects model, the presence of u_i makes the ε_{it} to be serially correlated across time. As a result, we have:

$$\begin{aligned} cov(\varepsilon_{it}, \varepsilon_{is}) &= \sigma_v^2 + \sigma_u^2 \quad for \ t = s \\ &= \sigma_u^2 \qquad for \ t \neq s \\ cov(\varepsilon_{it}, \varepsilon_{js}) &= 0 \qquad for \ all \ t, s \ if \ i \neq j \end{aligned}$$

This also means that the correlation coefficient between ε_{it} and ε_{is} is:

$$corr(\varepsilon_{it}, \varepsilon_{is}) = \sigma_u^2 \Big/ (\sigma_u^2 + \sigma_v^2) \quad for \ t \neq s$$

Under such conditions, the pooled OLS can give consistent estimators of the parameters, however, the estimates will be inefficient and will lead to incorrect test statistics because the standard errors ignore the fact that the ε_{it} are serially correlated across time. To solve the serial correlation problem, we have to use GLS.[7]

Random effects estimators are inconsistent if the assumption of independence between the explanatory variables and the unobservable individual-specific effect does not hold. Usually, this assumption is unlikely to hold and thus, to overcome the issue, we apply Mundlak (1978) corrections by including the individual means for each of the time-varying explanatory variables within the random effects model.[8]

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[7] The GLS transformation that eliminates serial correlation in the errors can be derived using matrix algebra. For more information on this refer to Wooldridge (2010).

[8] Actually, a fixed effects approach is considered as a more convincing estimation tool because it allows arbitrary correlation between the unobserved individual-specific effect and the explanatory variables. However, a fixed effects approach is inconsistent when t (in our case, the number of waves) is not large. Besides, in this

One of the main assumptions for making inference using the random effects approach is the assumption of no serial correlation in the idiosyncratic errors. However, the inference cannot be robust if this assumption is arbitrarily violated. In this paper, we compute a cluster robust statistics after random effects estimation so as to acquire estimates that are inference robust to serial correlation and heteroscedasticity.

IV. Results and Discussion

This section presents the results of estimating a random effects GLS model. In column (1) of Table 2, a dummy variable for being an immigrant is entered along with years since arrival. After controlling for gender, education level, English language proficiency and work-related variables, the coefficient for years since arrival shows that the effect of a year since arrival on wages is an increase of 0.6%. After including the age at arrival dummy variables, the regression reported in column (2) shows that immigrants aged less than 15 years of age upon arrival earn 4.1% more than Australian-born workers, whereas those aged over 34 years on arrival earn 5.9% less. Results of the interaction terms presented in column (3) indicate that the effect of years since arrival on earnings tends to increase with increasing age at arrival. Specifically, each additional year in Australia is associated with a 0.5% increase in earnings for immigrants aged under 15 years at arrival, and a 0.9% increase in earnings for those in both the 24-34 and over 34 years of age at arrival categories. This result suggests that the earnings of immigrants aged over 34 years at arrival converge to that of Australian-born workers after 6.6 years in Australia.

[Place Table 2 here]

Table 3 separates immigrants by country of origin. Results presented in column (1) reveal that after controlling for gender, education level, English language proficiency and

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paper some of our key explanatory variables are constant over time and thus we cannot use fixed effects to estimate their effect on the dependent variable.

work-related variables, upon arrival ESB immigrants earn 5% more, whereas NESB immigrants earn 4.3% less than Australian-born workers; this earnings gap disappears after living in Australia for 8.6 years. As shown in column (2), upon arrival ESB immigrants who are 25-34 years of age earn 7.4% more Australian-born workers. In regards to NESB immigrants, those who arrive under the age of 15 earn 5.6% more, whereas those aged 34 years and over earn 13.7% less. As shown in column (3), ESB migrants who are under 15 years of age at arrival experience a 0.5% increase in earnings for each additional year in Australia, those aged 15-24 years at arrival experience a 0.7% increase, and those aged 25-34 experience a 1.4% increase. For NESB immigrants, those who are under 15 years of age at arrival experience a 0.6% increase in earnings for each additional year in Australia, those aged 25-34 experience a 0.5% increase, and those aged over 34 experience a 1.2% increase. For the latter, this suggests earnings converge with Australian-born workers after 11.4 years in Australia.

[Place Table 3 here]

Overall, the results presented in Tables 3 reveal that, upon arrival, NESB immigrants earn less than Australian-born workers; however this earnings gap largely dissipates after residing in Australia for less than a decade. Further, consistent with Wilkins (2003), our results confirm that age at arrival clearly matters, both for initial earnings differences with the native-born and also with catch-up growth. However, the direction of the relationships we find are contrary to Wilkins (2003). In our study, initial earnings decrease with age at arrival, whereas the rate of earnings growth increases with age at arrival.

Initial earnings advantage is likely to be associated with the fact that immigrants arriving at an early age receive most or all of their education in Australia and learn the host country language almost automatically. Our dataset shows that around 73% of NESB

immigrants aged under 15 at arrival have completed their highest educational qualification in Australia, whereas this is true for only 16% of those who were over 34 years of age at arrival.

A potential explanation for the positive relationship between age at arrival and the rate at which earnings grow with time spent in Australia is the existence of immigrant overeducation. Immigrants, especially NESBs, who lack host country specific skills or face difficulty in getting their qualification recognised by employers, are more likely to become overeducated and thus receive a wage penalty (Green, Kler and Leeves, 2007, Kler, 2006, Kler, 2007). This wage penalty for being overeducated, however, can be compensated by better promotion prospects once those skills have been acquired.[9]

Another relevant question is whether or not there are cohort-specific effects in regards to initial earnings or earnings growth over time. Cohort effects might be expected due to substantial changes in Australia's immigration policies, with greater emphasis on skilled migration recently, as well as changes in socioeconomic, political and labour market conditions in both sending and receiving countries; thus altering the composition of immigrants that Australia receives.

To explore this issue we re-estimate the earnings equation with the inclusion of four immigrant arrival cohort dummy variables (CO_i). Each arrival cohort dummy measures the effect on earnings of immigrants belonging to a particular cohort relative to the Australian-born.[10] The first cohort (CO1) includes immigrants who arrived before 1980. The second cohort (CO2) is comprised of immigrants who arrived between 1980 and 1989. Immigrants arriving between 1990 and 1999 are the third cohort (CO3). The fourth cohort (CO4) is

[9] Such an explanation is related to the career mobility theory. For more information refer to Sicherman and Galor (1990), Sicherman (1991) and Linsley (2005).

[10] Note that $CO_i = 0$ for Australian-born workers.

comprised of immigrants who arrived between 2000 and 2011. Of all immigrants in the sample, 40% arrived before 1980, 27% arrived between 1980-89, 23% arrived between 1990-99, while 10% arrived from 2000 onwards.

As seen in column (1) of Table 4, the cohort dummies are all insignificant, implying that arrival cohort does not affect the initial earnings of immigrants. The coefficient on YSA remains stable, indicating a 0.6% earnings increase for each additional year the immigrant resides in Australia. However, the inclusion of age at arrival dummy variables as well as interaction terms between YSA and arrival cohort dummies (see column (2)), show that upon arrival, immigrants whose age at arrival was over 34 years earn 9.7% less than Australian-born workers, although the rate of earnings growth with time in Australia is relatively higher for more recent arrival cohorts. Specifically, each additional year in Australia is associated with a 0.5% increase in earnings for immigrants who arrived before 1980, a 0.4% increase for those arriving in the 1980s, a 0.7% increase for immigrants arriving in the 1990s and a 1.9% increase for those most recently arrived.

Columns 3 and 4 replicate the aforementioned by country of origin. Column (3a) suggests that, unlike the aggregated immigrant results, recently arrived ESB immigrants are having their initial earnings at arrival inflated by their arrival years. This is unsurprising, given the greater emphasis on skills based migration in recent years (Productivity Commission, 2006). For NESB immigrants, the only significant result shows an initial earnings penalty for those who arrived in the 1990s. Whilst a puzzling result, a potential explanation may lie in the findings of Green, Kler and Leeves (2007), Kler (2006) and Kler (2007). These authors note that a tightening of welfare benefits for immigrants in that period was associated with a rise in overeducation and a greater discrepancy in earnings between ESB and Asian NESB immigrants. Thus, it is possible that NESB immigrants arriving in that period were under greater pressure to accept any employment (thus making

them more prone to overeducation than before), with its associated wage penalty. The subsequent increase in skills requirement would then show up in the 2000-2011 cohort with no initial earnings penalty, as they have skills more suited to the Australian labour market. Overeducation is less likely to affect ESBs who have skills and cultural traits more closely related to Australia; thus the wage penalty would also be smaller. Finally, we note (see paragraph below) that this penalty disappears once the cohort is interacted with years since arrival.

The results presented in columns (4a) and (4b) show that age at arrival has no effect on the initial earnings of ESB immigrants, whereas on arrival NESB immigrants earn less than Australian-born workers if they were 25-34 years old (6.3% less) or over the age of 34 (16.8% less). In regards to the cohort effect on earnings growth interacted with years since arrival, the results suggest that for ESB immigrants the rate of earnings growth increases for more recent cohorts, from 0.5% for the earliest cohort up to 2.4% for the most recent cohort. For NESB immigrants, this is only evident for the two most recent cohorts, rising by 0.6% annually for the 1990-99 cohort, and up to 1.5% annually for the 2000-2011 cohort.

[Place Table 4 here]

V. Conclusion

This paper has studied the link between immigrants' earnings and age at arrival by utilising a panel dataset that, unlike cross-sectional studies, controls for unobserved heterogeneity. Our results indicate that age at arrival has a negative effect on initial immigrant earnings, thus favouring younger immigrants. Nevertheless, the rate at which earnings grow with years since arrival increases with age at arrival, indicating that 'catch-up' does occur for older arrivals. As an example, an NESB immigrant arriving at age 34 or older earns 13.7% less than the Australian-born. This gap diminishes over time, though it

takes approximately 11 years for these workers to ‘catch up’.

Cohort effects on initial earnings at arrival are not apparent for the aggregated immigrant group, and only show country of origin divergence for latter cohorts. Earnings growth however, suggests that ESB immigrants of all cohorts enjoy positive growth, whereas for NESB immigrants this is only the case for those arriving in 1990 or later. This could be indicative of greater skills requirements for latter cohorts, which may negate some of the cultural and language dissimilarities between Australia and NESB immigrants.

Our main finding that age at arrival matters for subsequent earnings suggests a need for a system that favours migration applicants with young children, as well as a strengthening of the current system that favours young skilled migrants. No points are currently available for having dependent children in a migrant application. A system that awards additional points to skilled migration applicants with young children might improve the welfare of young immigrants, especially NESB immigrants. A similar suggestion is made by Guven and Islam (2013), who find that age at arrival is critical for immigrant integration. We also suggest that further assistance be made available for older, particularly NESB, immigrants to integrate faster into the Australian labour market. This could take the form of remedial English language classes, training on assimilating into Australian workplaces and also providing discounted courses to better smooth the integration of holding foreign qualifications and experiences within the Australian context. This does of course impact the government budgetary situation, but the gains in long-term greater productivity and earnings that potentially accrue suggests that the short-term financial cost should be viewed as an investment in human capital rather than as a financial impost with no returns.

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Table 1. Summary statistics

Variables	Australian born	Immigrants	ESB	NESB
Hourly wage	20.68	22.63***	23.55***	21.73***
	(9.81)	(11.36)	(11.90)	(10.74)
Years since arrival (YSA)		23.57	25.55	21.66
		(13.66)	(13.64)	(13.41)
Age at arrival[11]				
Mean age at arrival		18.85	17.74	19.91
		(11.97)	(12.07)	(11.77)
Proportion arriving at less than 15 years of age		0.39	0.45	0.34
		(0.49)	(0.50)	(0.47)
Proportion arriving between 15 and 24 years of age		0.25	0.23	0.28
		(0.43)	(0.42)	(0.45)
Proportion arriving between 25 and 34 years of age		0.26	0.23	0.28
		(0.44)	(0.42)	(0.45)
Proportion arriving at greater than 34 years of age		0.10	0.09	0.10
		(0.30)	(0.28)	(0.31)
Female	0.49	0.48	0.47**	0.50
	(0.50)	(0.50)	(0.50)	(0.50)
Highest level of education				
Masters or PhD	0.04	0.08***	0.06***	0.10***
	(0.18)	(0.27)	(0.24)	(0.30)
Postgraduate	0.06	0.08***	0.08***	0.07***
	(0.25)	(0.27)	(0.28)	(0.26)
Degree	0.16	0.21***	0.18***	0.25***
	(0.37)	(0.41)	(0.38)	(0.43)
Diploma	0.09	0.10***	0.11***	0.10
	(0.29)	(0.30)	(0.31)	(0.30)
Certificate	0.26	0.20***	0.23***	0.17***
	(0.44)	(0.40)	(0.42)	(0.37)
Year 12	0.16	0.16	0.15**	0.16
	(0.37)	(0.36)	(0.35)	(0.37)
Year 11	0.23	0.17***	0.19***	0.15***
	(0.42)	(0.38)	(0.39)	(0.36)

[11] Following Wilkins (2003), the age at arrival variable is categorised into four groups: immigrants aged under 15 years at arrival (AAA1); immigrants aged 15-24 years at arrival (AAA2); immigrants aged 25-34 years at arrival (AAA3); and immigrants aged over 34 years at arrival (AAA4). Australian-born workers are the omitted category. Due to a limited number of observations, the range for the fourth age at arrival dummy (AAA4) is wide.

Hours worked	38.19	38.13	38.80***	37.48***
	(12.94)	(11.96)	(12.21)	(11.67)
Tenure in current occupation	8.87	9.69***	10.26***	9.14*
	(9.33)	(9.82)	(10.20)	(9.41)
Tenure in current employer	6.79	6.42***	6.77	6.07***
	(7.87)	(7.09)	(7.53)	(6.61)
Years worked	18.20	21.32***	22.99***	19.71***
	(11.55)	(11.48)	(11.37)	(11.36)
Years unemployed	0.50	0.57***	0.47	0.67***
	(1.33)	(1.72)	(1.15)	(2.12)
Years out of the labour force	2.26	2.85***	2.59***	3.10***
	(4.30)	(4.26)	(3.93)	(4.54)
English language proficiency				
Excellent	1.00	0.88***	1.00**	0.77***
	(0.03)	(0.32)	(0.00)	(0.42)
OK	0.00	0.09***	0.00**	0.18***
	(0.03)	(0.29)	(0.00)	(0.38)
Poor	0.00	0.03***	0.00	0.05***
	(0.01)	(0.16)	(0.00)	(0.22)
Observations	41729	10185	4998	5187

Note: ***, ** and * denote 1%, 5% and 10% level of significance respectively. Standard deviations are in brackets. This significance refers to statistical difference between immigrant, ESB immigrant and NESB immigrant groups relative to Australian-born.

Table 2. Base model results

Selected variables	(1)	(2)	(3)
Imm	-0.001		
	(0.012)		
YSA	0.006***	0.006***	
	(0.001)	(0.001)	
AAA1		0.041***	0.033
		(0.020)	(0.026)
AAA2		0.019	0.025
		(0.015)	(0.019)
AAA3		0.018	0.014
		(0.014)	(0.021)
AAA4		-0.059**	-0.041
		(0.024)	(0.042)
YSA*AAA1			0.005***
			(0.002)
YSA*AAA2			0.003
			(0.002)
YSA*AAA3			0.009***
			(0.002)
YSA*AAA4			0.009**
			(0.004)
Observations: 51914			

Note: ***, ** and * denote 1%, 5% and 10% level of significance respectively. Robust standard errors are in brackets.

Table 3. Base model plus ESB/NESB status results

Selected variables	(1)	(2)	(3)
ESB	0.050***		
	(0.017)		
NESB	-0.043***		
	(0.016)		
ESB*YSA	0.007***	0.007***	
	(0.002)	(0.002)	
NESB*YSA	0.005***	0.005***	
	(0.002)	(0.002)	
ESB*AAA1		0.029	-0.012
		(0.027)	(0.040)
ESB*AAA2		0.035	0.045
		(0.022)	(0.029)
ESB*AAA3		0.074***	0.108***
		(0.020)	(0.029)
ESB*AAA4		0.023	0.043
		(0.035)	(0.052)
NESB*AAA1		0.056**	0.067**
		(0.026)	(0.034)
NESB*AAA2		0.003	0.012
		(0.019)	(0.026)
NESB*AAA3		-0.031	-0.061**
		(0.019)	(0.029)
NESB*AAA4		-0.137***	-0.132**
		(0.032)	(0.066)
ESB*YSA*AAA1			0.005*
			(0.002)
ESB*YSA*AAA2			0.007**
			(0.003)
ESB*YSA*AAA3			0.014***
			(0.003)
ESB*YSA*AAA4			0.006
			(0.006)
NESB*YSA*AAA1			0.006**
			(0.003)
NESB*YSA*AAA2			0.001
			(0.003)
NESB*YSA*AAA3			0.005**
			(0.003)
NESB*YSA*AAA4			0.012***
			(0.004)
Observations: 51914			

Note: ***, ** and * denote 1%, 5% and 10% level of significance respectively. Robust standard errors are in brackets. A full set of results is available on request.

Table 4. Base model plus immigration cohort results

Selected variables	(1)	(2)	(3a) ESB	(3b) NESB	(4a) ESB	(4b) NESB
YSA	0.006***		0.007***	0.005***		
	(0.001)		(0.002)	(0.002)		
CO1	-0.062		-0.085	-0.061		
	(0.036)		(0.051)	(0.051)		
CO2	-0.036		-0.037	-0.047		
	(0.023)		(0.034)	(0.031)		
CO3	-0.021		0.037	-0.055**		
	(0.017)		(0.026)	(0.022)		
CO4	0.010		0.056**	-0.036		
	(0.016)		(0.022)	(0.023)		
YSA*CO1		0.005**			0.005*	0.004
		(0.002)			(0.003)	(0.003)
YSA*CO2		0.004*			0.006**	0.002
		(0.002)			(0.003)	(0.003)
YSA*CO3		0.007***			0.010**	0.006**
		(0.003)			(0.005)	(0.003)
YSA*CO4		0.019***			0.024***	0.015**
		(0.005)			(0.007)	(0.006)
AAA1		0.000			-0.037	0.022
		(0.026)			(0.038)	(0.034)
AAA2		-0.019			-0.027	-0.028
		(0.021)			(0.032)	(0.028)
AAA3		-0.021			0.009	-0.063**
		(0.021)			(0.032)	(0.028)
AAA4		-0.097***			-0.037	-0.168***
		(0.028)			(0.040)	(0.037)
Observations: 51914						

Note: ***, ** and * denote 1%, 5% and 10% level of significance respectively. Robust standard errors are in brackets. Results presented in columns (3a) and (3b) are not from separate regressions for ESB and NESB immigrants, rather they are from a single regression where the Imm variable is broken down by immigrant group. The same also applies to results presented in columns (4a) and (4b). A full set of results is available on request.

Appendix Table A1. Model variables

Variable name	Description
Personal characteristics	
Imm	Individual is an immigrant
ESB	Individual is an English Speaking Background immigrant
NESB	Individual is a Non-English Speaking Background immigrant
ABR	Individual is Australian-born resident (omitted category)
YSA	Years since first entry into Australia as an immigrant
CO1	Immigrant arrived to Australia in 1979 or earlier
CO2	Immigrant arrived to Australia between 1980-89
CO3	Immigrant arrived to Australia between 1990-99
CO4	Immigrant arrived to Australia between 2000-11
AAA1	Immigrant arrived aged less than 15 years
AAA2	immigrant arrived aged 15-24 years
AAA3	Immigrant arrived aged 25-34 years
AAA4	Immigrant arrived aged over 34 years of age (omitted category)
Female	Individual is a female
Couple	Individual is either married or in a *de facto* relationship
Kids	Have (a) child(ren) living at home
Tenure: Occupation	Tenure (in years) in current occupation
Tenure: Employer	Tenure (in years) with current employer
Years worked	Years worked since finishing full-time education for the first time
Years unemployed	Years spent looking for work since finishing full-time education for the first time
Years out of the labour force	Years out of the labour force since finishing full-time education for the first time
Wage and hours of work	
Log of Hourly Wage	The log of hourly wage in real terms in 2001 dollars
Hours worked	Number of hours worked in a week
Education	
Masters and PhD	Individual highest qualification level attained – Masters or Doctorate
Post graduate Diploma and Certificate	Individual highest qualification level attained – Post-Graduate Diploma or Certificate
Degree	Individual highest qualification level attained – Degree
Diploma	Individual highest qualification level attained – Diploma
Certificate	Individual highest qualification level attained – Certificate
Y12	Individual highest qualification level attained – Completed

	Year 12 in high school (omitted category)
Y11	Individual highest qualification level attained – Completed Year 11 or less
English-Excellent	Individual is either a native speaker or speaks English very well
English-OK	NESB category only: Individual speaks English well
English-Poor	NESB category only: Individual does not speak English well (omitted category)
Workplace characteristics	
Union	Individual is a union member
Supervise	Individual has a supervisory role at work
Small	Employed in firm with <20 employees
Mid	Employed in firm with 20-99 employees
Big	Employed in firm with 100 or more employees (omitted category)
Geographical location	
City	Individual lives in an urban area
Regional	Individual lives in a regional area (omitted category)
Remote Area	Individual lives in a remote area
Industry	
Agriculture	Individual employed in the agriculture, forestry and fishing industry
Mining	Individual employed in the mining industry
Manufacturing	Individual employed in the manufacturing industry
Power	Individual employed in the electricity, gas, water and waste industry
Construction	Individual employed in the construction industry
Wholesale trade	Individual employed in the wholesale trade industry
Retail trade	Individual employed in the retail trade industry
Hospitality	Individual employed in accommodation and foodservices industry
Transport	Individual employed in the transport, postal and warehousing industry
Communication services	Individual employed in the information media and telecommunications industry
Finance	Individual employed in the finance and insurance industry
Property	Individual employed in rental, hiring and real estate industry
Technical	Individual employed in the professional, technical and scientific services
Administration	Individual employed in the administrative and support services

Public services	Individual employed in the public administration and safety industry (omitted category)
Education	Individual employed in the education and training industry
Health	Individual employed in the health care and social assistance industry
Arts	Individual employed in the arts and recreation services
Other services	Individual employed in the other services
Occupation	
Managerial	Individual is employed as a manager
Professional	Individual is employed as a professional (omitted category)
Technical trade	Individual is employed as technician or trade worker
Personal services	Individual is employed as a community or personal service worker
Clerical	Individual is employed as a clerical or administrative worker
Sales	Individual is employed as a sales worker
Machinery	Individual is employed as a machinery operator or driver
Labour work	Individual is employed as a labourer