Immigration Misallocation: Evidence from Australia

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This paper compares skilled immigration schemes in the Australian points-based system, finding that the employer-sponsored scheme substantially enhances the efficiency of migrant location decisions. We exploit differences in the impact of exogenous commodity price shocks on wages and salaries growth in Australia's five most populous states to illustrate labour market demand in period 2001-2011. Comparisons of flows of points-tested skilled-independent immigrants with skilled employer sponsored arrivals, provides estimates of the efficiency of Australia's selective immigration policies. We find that employer sponsored immigration increased in line with the growth of wages and salaries caused by fluctuations in commodity prices. In contrast, there is no evidence that skilled-independent immigrants migrated to states where salaries and wages grew faster.

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1. Introduction

How to distribute high-skilled immigrants to areas those have demand shortage in labour market is a key challenge to advanced economies. On the one hand, it is obvious that accessing to "the best and brightest" individuals is crucial to company's success (S. P. Kerr *et al.*, 2016; Parey *et al.*, 2015). In particular, talents contribute to host countries in innovating, patterning and scientific publishing (Hunt *et al.*, 2010; W. R. Kerr *et al.*, 2010; Moser *et al.*, 2014). It is also evident that high-skilled workers facilitate firm engages in international R&D collaboration (Foley *et al.*, 2013; Sari Pekkala Kerr *et al.*, 2015), and boost total factor productivity (Hornung, 2014; Peri *et al.*, 2015). On the other hand, critiques of the high-skilled immigration argue that they cause the displacement of native workers who are close substitutes (Borjas *et al.*, 2012, 2015; Cortes *et al.*, 2014; Glitz, 2012) and put downward pressure on wages (Borjas, 2003; C. Dustmann *et al.*, 2017; Christian Dustmann *et al.*, 2016). Obviously, the cost and benefit depends on the size of emigre' flows , immigrant characteristics, and vary over occupations (Christian Dustmann *et al.*, 2013; Peri *et al.*, 2009). To maximize net contribution, destination governments adopt selective policies to screen potential high-skilled candidates. Of which, two most dominant genres are employer nominated admission and points-based system. Investigating the efficiency of these policies in immigration allocation along with geographical wage shocks is subject to the work at hand.

Understanding the extent to which immigration schemes respond to labour market changes is essential for several reasons. First, it provides a proper evidence to destination countries to promote schemes which act in line with demand. As seen, anti-globalization and anti-immigration have been rising in developed countries in recent years. People put employers at centre stage and blame them for their recruitment policies. To react, governments are introducing plans to have more difficult barriers to curb companies hiring high-skilled foreigners. The United States, for example, is announcing a new order to restrict H1-B program[2]. Australia have put more restrictions on 457, its employer sponsored version[3]. On the contrary, points system is attracting admirers and the people[4], witness, supporters for Britain to leave the European Union promoted the idea for applying "Australian-style points

[2] https://www.whitehouse.gov/the-press-office/2017/04/18/presidential-executive-order-buy-american-and-hire-american

[3] https://www.border.gov.au/Trav/Work/457-abolition-replacement

[4] http://www.economist.com/news/international/21701753-countries-invented-points-based-immigration-systems-have-concluded-they-do-not

system"[5]. The question is, which scheme is more efficient? Common conjecture is that due to asymmetric information, government interventions might be less adequate than employer, leading to distortion in allocation quotas to occupations and sub-national regions which can utilise immigrant skills. The points based admission is, therefore, an ineffective instrument. Finally, it is a crucial step toward the evaluation whether requirements on labour market testing are necessary. Governments tend to ask companies prove that they would not be able to recruit suitably qualified natives prior to seeking to access employer nominated visa categories. The procedures, however, are criticized by businesses as they are time consuming and make narrowing the talent gap more difficult. It is obvious that if employer sponsored visa allocates immigrants to where jobs arise faster, labour market has justified to be an efficient and effective mechanism for adjusting immigration influx to fulfil demand shortage. Government interventions, in this case, might not be a sharp tool since they bring little benefit while cost is huge.

Despite the broad interest in this issue, the massive majority of literature have paid their attention on assimilation of immigrants or personal characteristics resulting from different policies. (Heather Antecol *et al.*, 2003), for example, estimates the difference in three main characteristics: English proficiency, schooling, and earnings of immigrants to the United States, Australia, and Canada. Moreover , H. Antecol *et al.* (2006) compares wages, employment, and income assimilation between these three countries over temporal dimension. However, there is very little research that assesses the performance of various skills-based immigration policies to distribute new migrants to meet the needs of the labour market.

To illuminate this debate, we evaluate high-skilled migrant's selections in two central policy designs: employer nomination and points-tested workers visas. Research on this contention might encounter at least two influential difficulties. The first is that endogeneity is likely to appear in Ordinary Least Square -OLS approaches because of the reversed effect of immigrants on wages. For example, immigrants might put pressure on the market equilibrium, thus, wages are likely to decrease. It might be the case that immigrants might increase productivity and lead to higher wage. Consequently, the sign of the bias is unclear. The second is that migration selection's studies have been relying on Roy's (1951) and Borjas's (1987) theoretical prediction for selection. This model has a crucial assumption that

[5] http://voxeu.org/content/refugees-and-economic-migrants-facts-policies-and-challenges

migration costs are constant. However, due to the differentials in economics conditions, fundamental respects, labour market policies and institutions, crossing-countries evidences are likely to cause violation on this presumption.

We unlock both of these concerns. Initially, by utilizing plausibly exogenous shock in wages and salaries, we can eliminate endogeneity problem. Furthermore, by exploiting the mentioned policy setups in a single country – Australia, we can wipe out any possible disparity in migration costs. Our approach is to utilize the commodity price fluctuations between 2001 and 2011 that influenced individual earnings differentially across five most populous states that vary in the original commodity contribution to the state economy. We spotlight on major cities to reduce the possibility of differential trends in earnings and immigration caused by unobservable factors. Our empirical identification is to leverage the interaction between state dummy variables and commodity prices as an instrument for fulltime worker earnings. We then distinctively estimate the effect of earnings on the scale of migration flows to different areas of two declared policies to verify whether migration expansions match with wage growths. We also perform several robustness checks to consolidate our findings.

Table 1 brightens state-level contribution of resources, agriculture, forestry and fishing in fiscal year 1999-2000, a year before our studied panel. As shown, Western Australia, where 24 per cent of its gross state product (GSP) was sourced from commodities, is the most reliant one. It is far larger than the second reliant state, Queensland, where the proportion was only 11 per cent. New South Wales, Victoria, and South Australia, in contrast, slightly relied on those goods with only 4 per cent, 5 per cent, and 7 per cent were relatively recorded. Therefore, price rocketing will affect different states at different levels leading to divergence in employee's compensation growths.

TABLE 1: INDUSTRY CONTRIBUTION TO TOTAL FACTOR INCOME 1999–2000.

	New South Wales	Victoria	Queensland	South Australia	Western Australia
Agriculture, forestry and fishing	2%	3%	5%	5%	4%
Mining	2%	2%	6%	2%	20%

Source: Australian Bureau Statistics, Australian National Accounts: State Accounts.

More informatively, Figures 1 illustrates the association between commodity prices fluctuation and average wages and salaries among Australia states. It shows a strong relationship between relative state average earning growths with their dependences on commodities. In particular, historical data indicates that index of commodity prices has quadrupled from 2001 to 2011, reaching its peak at 155 points. In responding to this shock, earnings in Western Australia (WA) had rocketed from third position to be the highest paying state in 2011. Meanwhile, New South Wales, Victoria, and South Australia have seen a similar change in average earnings. Queensland (QLD), has increased slightly faster than other locations. Our premise is that states, where pre-existing share of commodity to the economy is larger, will have higher wage growths leading to higher demand in high-skilled immigrants.

This paper employs unique and highly detailed data from several sources. Firstly, data on individual earnings and inequality are sourced from Household, Income, and Labour Dynamics in Australia Survey (hereafter, HILDA). This survey is collected annually and contains rich questionnaires on location and personal characteristics. To calculate real wages we deflated to Consumer Price Index –CPI which is obtained from Australia Bureau Statistics. Data on annual commodity prices are retrieved from Reserve Bank Australia (RBA). We use administrative data from Settlement Database to explore that patterns of immigrant adjustment to the earning shocks. The dataset contains information on: age on arrival; country of birth; English fluency; gender; first language; years of education; and visa sub-class -of permanent migrants in Australia since 1993. The regressions are robust to include variety of controls at regional levels which are extracted from Australia National Regional Profiles.

To summarize, our key findings can be concisely summarized as follows: we find that earning growths was significant higher for workers in states more dependent on commodity. Notably, every 10 points rise in the index of commodity prices (henceforth ICP) associated with a 0.96% and 0.38% higher wage growth in WA and QLD respectively. When we exclude immigrants, the statistics are only significant for WA with 0.62% earnings expansion. These elasticities are consistent with our hypothesis. Furthermore, our immigration estimates suggest that rising wages would be associated with employer sponsors. In particular, reduced-form regressions strongly suggest that WA saw a 5.68% increase in this type of visa for each 10 points rise in ICP. On the contrary, we do not have evidence that pointed-tests immigrants move more to this state. The findings highlight the efficiency of the

allocation of immigrants who are nominated by businesses. They also perform the mismatching of high-skilled independent migrants with the labour market demand. Perhaps, it is due to the asymmetric information when Australia government determine the quota for each occupation.

The remainder of the analysis is proceeded as follows: Section II briefly recaps the Borjas's (1987) theoretical framework, related empirical literature, and discusses special attributes of Australia economy and Australia immigrations systems. In section III, we highlight the descriptive statistics of data. In section IV, we present our empirical strategy, main results and robustness checks. Section V concludes. The appendix provides further explanations on data, research context, and empirical results.

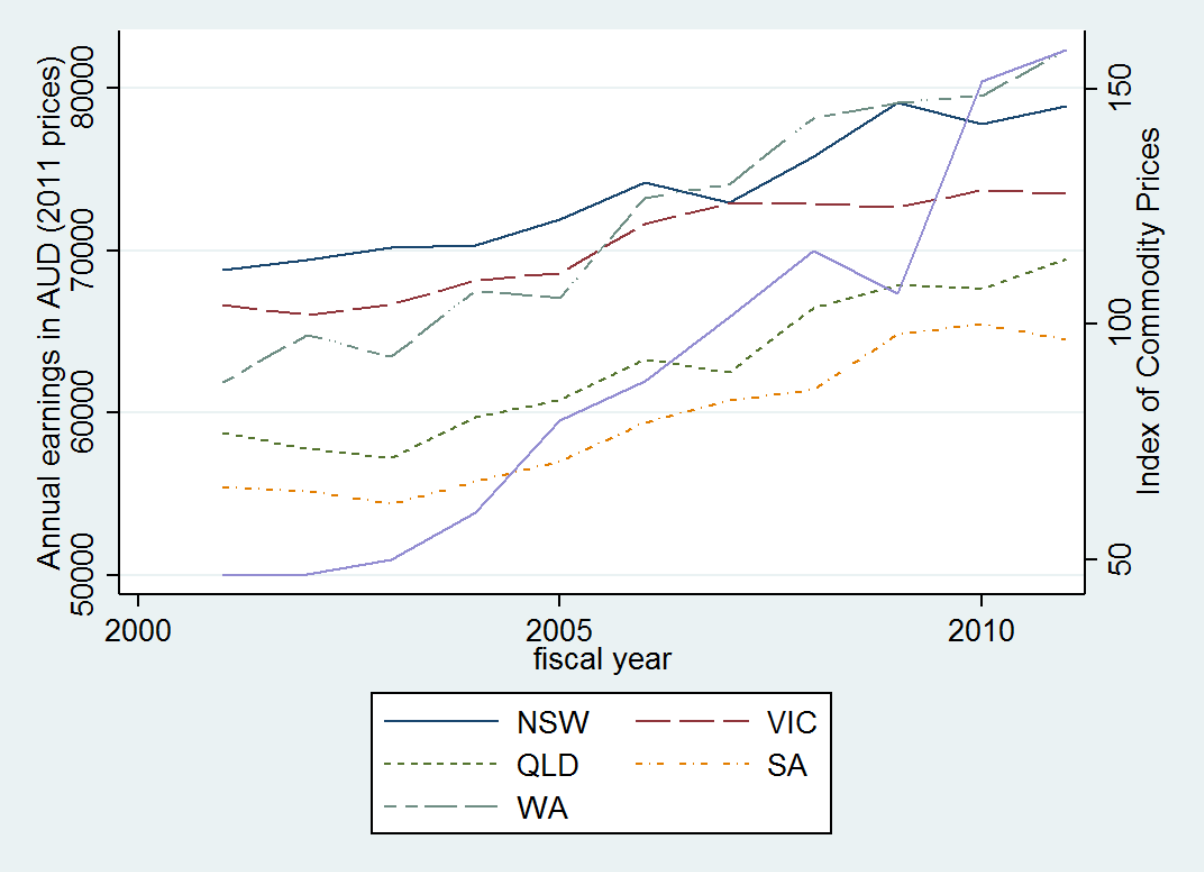

Figure 1: Relationship between index of commodity prices and state annual earnings.

2. Background

2.1. Roy/Borjas model

Building on the work of Roy (1951) and Sjaastad (1962), Borjas (1987, 1999) produced an income selection model which explains why people migrate from their home country. The author considers immigration as an investment activity. There are two countries: the origin country (0) and the host country (1). Individual earnings can be decomposed into observed part (ζ_j) and unobserved part (ε_j), where j =0 expresses the home country and j =1 expresses the host country:

$$\ln(w_0) = \zeta_0 + \varepsilon_0 \qquad (2.1)$$

$$\ln(w_1) = \zeta_1 + \varepsilon_1 \qquad (2.2)$$

Based on the work of Parey *et al.* (2015), we presume that the earning vector ($\zeta_0, \zeta_1, \varepsilon_0, \varepsilon_1$) is distributed normally with means ($\varphi_0, \varphi_1, , 0, 0$) and disturbances ($\sigma_{\zeta_0}^2, \sigma_{\zeta_1}^2, \sigma_{\varepsilon_0}^2, \sigma_{\varepsilon_0}^2$). In particular, base wage of the population at home and abroad are illustrated by φ_0 and φ_1 respectively. Meanwhile, $\sigma_{\zeta_0}^2$ and $\sigma_{\zeta_1}^2$ are variances and have correlation coefficient ρ_ζ.

Assuming that individuals are rational, they will make the decision to migrate to a different country if the wage in that country, net of mobility cost (MC), is greater than their wage at home country. In other words, residents will migrate if the sign of the index function is positive.

$$I = \ln\left(\frac{w_1}{w_0+MC}\right) \approx (\zeta_1 - \zeta_0 - \text{MC}/w_0) + (\varepsilon_1 - \varepsilon_0) > 0 \quad (2.3)$$

Let $\tau = \frac{\text{MC}}{w_0}$ be migration costs in time equivalent units and let v = $(\zeta_1 + \varepsilon_1) - (\zeta_0 + \varepsilon_0)$ be wage disparity between two countries that has disturbance σ_v^2, the emigration rate can be represented as:

$$P = \Pr((\varepsilon_1 - \varepsilon_0) > -(\zeta_1 - \zeta_0 - \tau))$$

$$= 1 - \Phi\left(-\frac{(\varphi_1 - \varphi_0 - \tau)}{\sigma_v}\right) = 1 - \Phi(Z) \qquad (2.4)$$

Where $\text{Z} = \left(-\frac{\varphi_1 - \varphi_0 - \tau}{\sigma_v}\right)$ and Φ is standard normal distribution function. It could be interpreted that the emigration rate would be a function of migration cost, base wage in destination and home

countries. From the property of truncated normal distribution (Greene, 2003), Borjas predicted how earnings of migrants differ from base wages at home and abroad as follows:

$$E(\zeta_0|\mathrm{I}>0) = E(\zeta_0|((\zeta_1+\varepsilon_1) > (\zeta_0+\varepsilon_0+\tau))$$

$$= \varphi_0 + \frac{\sigma_{\zeta_0}\sigma_{\zeta_1}}{\sigma_v}(\rho_\zeta - \frac{\sigma_{\zeta_0}}{\sigma_{\zeta_1}})\frac{\phi(Z)}{1-\Phi(Z)} \qquad (2.5)$$

$$E(\zeta_1|\mathrm{I}>0) = E(\zeta_1|((\zeta_1+\varepsilon_1) > (\zeta_0+\varepsilon_0+\tau))$$

$$= \varphi_1 + \frac{\sigma_{\zeta_0}\sigma_{\zeta_1}}{\sigma_v}(\frac{\sigma_{\zeta_1}}{\sigma_{\zeta_0}} - \rho_\zeta)\frac{\phi(Z)}{1-\Phi(Z)} \qquad (2.6)$$

Where $\lambda(z) = \frac{\phi(Z)}{1-\Phi(Z)}$ is the inverse Mills ratio, and $\phi(Z)$ is density function. Instead of focusing on the role of earnings inequality for the immigration selection generated from equations (2.5) and (2.6) as most previous literature did, we pay our attention to equation (2.4). More specifically, we estimate response emigration rates with changes in base wages of different destinations. In our setup, we investigate how different selective policies influence on migration flows.

2.2. Empirical Evidence

In recent decades, applied economists have typically estimated the models discussed above. Examples relating to the income selection model include: Borjas *et al.* (1992); Clark *et al.* (2007); Macphee *et al.* (1990); Mayda (2010); Ruyssen *et al.* (2014). These papers employ Ordinary Least Square regression to estimate the effect of income on migration. In particular, Borjas *et al.* (1992) test the effect of wages on the U.S. interstate migration between 1979 and 1986. Using the U.S. National Survey of Youth, they found that the wage dispersion amongst states is one of the main causes of internal migration. Using the same approach as Borjas *et al.* (1992), Macphee *et al.* (1990) investigate the determinants of immigration for the United States. They found evidence, which suggests that the higher U.S. growth rate of real GDP had a positive impact on the number of immigrants from 18 developing countries into the U.S.

One common criticism of these studies is the lack of explanatory variables, i.e. they only include wage and education on the right hand side of the regressions. To address this issue, Clark *et al.* (2007) and Mayda (2010) include distance from host to home country and language difference to control for migration costs. Despite the fact that they apply similar explanatory variables, the two studies are quite different in their objectives. The former study looks at the "push" factors from origin countries. The estimation employed a fixed-effect estimator and found that if the home country's GDP per capita increases by 10%, it causes a negative impact of 4.4%

on migration rate. This evidence is based on the sample of outmigration from 81 countries to the US in the period from 1971-1998. In contrast, the latter study examines the "pull" attractors from host countries by utilizing the first differenced generalized method of moment (GMM) to eliminate the causality problem of immigration and host country income, which may be present in the first study. It is also the first examination of 14 countries within the OECD. The study found that when GDP per capita increases by 10% in the host country, it is likely to lead to an increase of 2.6 immigrants per 100,000 citizens in the home country. However, Ruyssen *et al.* (2014) point out that this finding may not be robust since the instrumental variable used in the GMM approach may not be strong enough due to the small sample size. To mitigate this issue, Ruyssen *et al.* (2014) enhance the sample size to 19 OECD countries in the period 1998-2007 and utilized a bootstrap approach to simulate more observations. As a result, the study was able to assign a small bias with a relatively small standard error. They found that a 1% enhancement of income per capita in the destination country leads to a 2.54% increase in immigrants from developing countries. As seen, previous studies in North America and OECD countries have consistently found that income in the destination country is a key factor in the migration decision.

2.3. Australia Economy and Immigration Policy

This section introduces an overview of Australia geography, economy, and immigration policy. Commonwealth of Australia's 7.69 million square kilometres make it larger than all but 5 countries in landmass (Russia, Canada, the United States, China, Brazil). The country consists of six states: New South Wales (NSW), Victoria (VIC) , Queensland (QLD), South Australia (SA), Western Australia (WA), and Tasmania (TAS), and two major mainland territories: the Australian Capital Territory (ACT) and the Northern Territory (NT). Moreover, five most populous states (NSW, VIC, QLD, SA, and WA) accounts for 95.2 per cent of total population[6] , and 71 per cent of residents are living in large-scale urban centres. For example, the census 2016 reveals that total population of five leading capital cities Sydney, Melbourne, Brisbane, Perth, and Adelaide are 5,005,358, 4,641,636, 2,496,990, 2,066,564, and 1,326,354, respectively.

Given the huge area, Australia Bureau of Statistics creates Remoteness Index to classify regions which share common factors of remoteness. The Remoteness Index is a geographic classification which is created as a one kilometres grid screening Australia. Each grid point is weighted based on the score of road distances to service centres. Figure 2 illustrates the

[6] http://www.abs.gov.au/AUSSTATS/abs@.nsf/mf/3101.0

distribution of five main categories: major cities of Australia, inner regional Australia, outer regional Australia, remote Australia, and very remote Australia. In general, all sizable cities but Canberra are concentrating in five largest states. To reduce unobserved heterogeneity, and because major cities of five most crowded states have been attracting vast majority of immigrants, we only focus on this division in this research.

Australia has been one of the world's major destinations for immigrants since the arrival of the first fleet in 1788. Furthermore, the levels of immigration to Australia have widely fluctuated followings policy changes. Since the abandonment of the White Australia policy in 1966, many non-Europeans have sought to migrate to Australia. Furthermore, during the period 1970-1990, around 120,000 asylum seekers from South East Asia have migrated to the Australia. Australia's immigration policy currently relies on a grade point system (Miller, 1999). This system allows Australia to open its borders to high-skilled immigration while restricting the flow of low skilled immigrants. Following this, thousands of high skilled workers have sought to migrate to Australia, with India and China accounting for the largest proportions migrants. H. Antecol *et al.* (2006) show that approximately 50% of immigrants have come to Australia under the high skilled policy, compared to only 8.2% for the U.S. in 1990. The structure of Australia is therefore not surprisingly different with other lands of immigration.

From the Settlement Database, 26.7% of Australian citizens were born overseas in 2011. The country and Canada are the most hospitable to migrants among western civilizations (Markus, 2014). As exposed in figure 3, skilled, family re-union, and humanitarian are three crucial streams of immigration. . Looking even further, the increase in the total immigrants over the 1995-2006 period was 139k residents – approximately 245%. The skilled migrants has tripled in size during these eleven years– accounted for 67.5% of the overall expansion. On the contrary, family and humanitarian streams have taken only 23.4% and 2.5% of this upturn, correspondingly. This simple statistic reflects government efforts have been made to afford the Skill stream larger proportion.

Skilled immigration stream is dominated by two backbone sub-classes: point-based skilled scheme and permanent employer sponsored programme. The former selects workers on the basis of their skills, youth, education, experience and fluency in English so they are in a position to benefit Australia in medium or long term strategy. Immigrants are not backed by an employer or family member in Australia. Would-be immigrants who rank highest by points score will be invited to apply for the relevant visa. Furthermore, number of issued

invitations are limited and based on the government forecast for labour market demand. Meanwhile, the latter provide employers with ability to nominate foreign candidates for permanent residence to fill vacancies they have been unable to find from local job market. This scheme is similar to H1-b admissions in the United States.

According to the Settlement Database, between 2000 and 2011 the number of Australian visas granted due to job offers accelerated six-fold, from 5,166 to 30,929. In terms of geographical distribution, 33.64% workers are recruited by businesses located in the state of NSW. In the corresponding period, the state of VIC accounted for 23% of total offers; following by the state of WA with 20.32%; and QLD and SA recorded 19.09 and 1.53% respectively. Additionally, the number of Australian visas granted on the basis of grade points rose 3-fold, from 14k to 37.5k workers. Independent skilled migrants prefer to select populous states as their destinations with NSW and VIC report 35.3% and 26.63% of total candidates; while the relative proportions of QLD, WA, and SA are 15.94%, 15.77% and 4.12% appropriately.

The detail of data allows us compare migrant inflows to specific local government areas under given sub-classes in response to wage increase. As a result, we can evaluate the effectiveness of each program. In the next section, we discuss data source that we use for our estimations.

3. Data Sources

3.1. Data on Earnings and Inequality

Our main source of data on Australia's individual income is Household, Income, and Labour Dynamics in Australia Survey (hereafter, HILDA). The HILDA survey, which is Australia inaugural nationally representative household-based longitudinal survey, is annually collected by the Melbourne Institute of Applied Economic and Social Research on behalf of the Department of Social Services. The panel is consisting of 15 waves. Wave 1, which was conducted in 2001, included 7,682 households and 19,914 individuals. Those respondents are being pursued in each following wave. They survey has been continuously expanded to comprise any new household members emerging from changes in the composition of the initial households. Those respondents and original ones constitute the Continuing Sample Members (CSMs). The Survey is ideal for our analysis because of two reasons. First, HILDA allows us tracking individual over a long period. Second, the survey provides rich information on the lives of Australian inhabitants on broad range of social-demographics,

employment, income, health, life satisfaction. The latest wave was released in December 2015.

In fifteen waves, the total number of observations is 200,311 (28,794 distinct individuals). On average, each individual is being interviewed 6.9 times. We focus on the period of 9 years from 2003 to 2011 to match with the resources boom period. In addition, we restrict the sample to individuals who are full-time employed. Furthermore, we restrict the panel to working-age individuals (from 18 to 64). We remove observation whose negative wage. In our panel, full-time employment is approximately 54.75%. After all, we have a sample of 41,832 observations (11,471 distinct individuals). In particularly, there were 4242, 4228, 4408, 4479, 4494, 4584, 4674, 4692, and 6031 respondents in response to 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, and 2011 cohorts.

The Hilda survey does not have commodity prices. We therefore combined HILDA survey with Reserve Bank Australia (RBA) index of commodities price (ICP) (http://www.rba.gov.au/statistics/), which is a Laspeyres index. The ICP is the weighted arithmetic mean of recent variations in commodity prices, where the input to the ICP given to each commodity takes into account its contribution to the total commodity export values in a base period. Currently, those commodities are rural commodities (Wool ,Beef and veal ,Wheat ,Barley ,Canola ,Sugar ,Cotton ,Lamb and mutton), base metals (aluminium , lead , copper , zinc , nickel), bulk commodities (iron ore , metallurgical coal , thermal coal) , other resources (LNG , crude oil , alumina , gold , copper ore) (see appendix table A.3 for detailed contribution of each commodity to ICP). The base-period is regularly updated by the RBA. In the latest update (2016), the 2014/15 average takes value of 100.

Furthermore, in HILDA data, the annual wages and salaries are normal values. To calculate the real values, we link HILDA data with Consumer Price Index (CPI) provided by the Australia Bureau of Statistics (ABS- http://www.abs.gov.au/). Given that Australia's landmass is large, the CPIs might vary over states and territories. Thus, we use the CPI capital cities (Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart, Darwin, and Canberra) as the proxy for CPI of each state or territory respectively. Summary statistics of the variables used in the estimations are provided in Table 1. Detailed definitions are showed in table A.2 (Appendix).

In our sample, 38 per cent of observations are female. The education qualification is followed the broader category of Australian Standard Classification of Education (ASCED[7]). In our data, 5 per cent have postgraduate degree, 7 per cent have graduate diploma and graduate certificate, 18 per cent bachelor degree, 10 per cent have advanced diploma and diploma, 25 per cent have certificate, 16 per cent have year 12 of education as their highest education level achieved. In Australia, at secondary education level, there are three main types of school: government, Catholic, and other non-government school (private). The proportions of individuals enrolled in Catholic and non-government schools are 16% and 8%, correspondingly. Meanwhile, 18 per cent did last year of school overseas and 11 per cent were born in non-English speaking countries (countries are not outside in group of Australia, Canada, the U.K, the U.S, New Zealand, and Singapore). On average, interviewees have 9.18 years in current occupation and age 38.58. About 49 per cent are legally married. Mean of annual wages and salaries are 51,666.53 Australian Dollar in 2013 prices. In our data, 14 per cent declared that they have long-term health condition, impairment or disability. Regarding to family background, people have average 2.7 siblings, 10 per cent have their parents got divorced or separate, and 17 per cent have kids under 6 year-old. The union members account for 30 per cent of the sample. The distributions of interviewees who are living in major cities, inner regional area, outer regional areas, and remote areas are 66, 22, 10, and 2 per cent, respectively.

[7] ABS, Australian Standard Classification of Education (ABS Cat. No. 1272.0), ABS, Canberra, 2001

3.2. Data on Immigration

Data on immigration decisions for 2003-2011 at local government areas (hereafter, LGAs) level are sourced from Settlement Database (SDB), an administrative data source. This dataset, which is provided by the Australia Department of Social Services (DSS), archives information on permanent and some categories of temporary settlers who have migrated to Australia since 1991 (more than 2 million observations). The database is freely available for researchers. It combines monthly data from the Department of Immigration and Border Protection (DIBP) and several other sources such as Medicare Australia. This source is pivotal for understanding the key drivers of immigration since it contains information on key relevant variables such as: age at arrival, calendar year of arrival, country of birth, citizenship, gender, education, English proficiency, LGA of residence, visa sub-class, religion, and statistical sub-division. The English proficiency is categorized at three levels: poor, good, and very good, while the education is measured in years of schooling.

3.3. Data on Regional Profile

Turning to the data in National Regional Profile (NRP), this dataset is sourced from a broad range of collections. The data include socio-economic and environmental characteristics of regions; for example, LGA housing affordability (housing price, number of dwelling units, proportion of residential house, number of private house), age structure (deaths and births). Moreover, in the census years (2001 and 2006), data are extended to include education (number of persons who have postgraduate, graduate diploma/certificate, bachelor, advance diploma/certificate, certificate, number of earners who pay tax), occupation structure of the community (proportion of managers, professionals, and labourers). One difficulty arises when we combine panel data 2001-2010. The local government areas boundaries changed in 2006, therefore, we had to concord the LGA codes of years 2001 and 2006 with the codes for 2011. This dataset allows us control for time-variant characteristics which might affect immigration decision.

4. Empirical Analysis

4.1. Effect of Commodity Boom on Individual Earnings

We commence our empirical analysis by estimating the effect of commodity prices shock on employees' annual earnings in states of Australia. Our baseline specification can be written as follows:

$$\ln(W_{i,s,t}) = \alpha_i + \gamma_s + \lambda_t + \sum_{s \subset N} \beta_s \times (D_s \times ICP_t) + \theta \times \ln(X_{ist}) + \varepsilon_{lst} \quad (4.1)$$

Where the dependent variable is log gross financial year wages and salaries (AUD, 2011 prices) of individual *(i)* in state (*s)* at year (*t).* Meanwhile, the $\alpha_i s$ are individual fixed effects, measuring personal time-invariant characteristics. The γ_ss are state fixed effects, capturing any time-invariant differences across different states. The $\lambda_t s$ are year fixed effects, controlling for any common changes in wages and salary each year to all states. D_s is dummy variable which take value of 1 for state (s) and take value of 0 otherwise, and ICP_t is index of commodity prices. X_{ist} is a vector of other covariates. X_{ist} contains covariates that capture gender, employment status (union membership, experience, age), education, family background, country of birth and language, long term health status and geography . ε_{lst} is a random error term. The coefficients of interest are β_s, the impact of commodity prices shock on annual earnings in state (s) . As a basic effort to consolidate comparability across regions and reduce potential disparity trends, our baseline analysis focuses on the metro cities of five most populous states (New South Wales- NSW, Victoria-Vic, Queensland-QLD, South Australia-SA, and Western Australia- WA)., which contains about 60% of the total Australia population. Our baseline specification focuses on the period 2001 to 2011, which experienced the sharp increase of commodity prices. In our estimation, we take major cities of New South Wales as benchmarks. In our regression results, we denotes the interaction of $D_s and\ ICP_t$ is the "effect on state (*s)"*.

Our results are provided in Table 1. The left hand side variable in all columns is log of annual individual's real wages and salaries in 2011 prices. The first column contains the estimated impact using pooled OLS regression. The coefficient of effect on WA is 0.0105 indicates that after removing state fixed effects and common years effects, every ten points increased in ICP led to annual earnings grew by approximately 1.05 per cent more in Western Australia than in remained states. This impact is significant at 1 per cent level. The coefficients of effect on QLD and effect on SA are 0.0037 and 0.005 suggest that the average annual earnings in those states gained 0.37 per cent and 0.5 per cent for each ten points ICP increase relatively. These impacts are only significant at 10 per cent level, however. To explore whether the estimate is driven by time variant personal characteristics, we control for richer set of covariates, including gender, union member, quadratic experience, quadratic age, individual highest qualification (postgraduate, graduate diploma/ certificate, bachelor, advanced diploma/diploma, certificate), type of high school they individual attended

(catholic high school, private high school), individual family background (parents ever get divorced, have kid under 6 year-old, number of siblings, marriage status), language proficiency (whether first language is English, not born in English speaking countries), and long term health condition and disability. In general, the estimates of vector of control covariates are in line with previous literature, for example, female earned 20 per cent less than male; union members earned 5.26 per cent higher than non-union individuals. Moreover, the F-test of the hypothesis is 346 that states null hypothesis is strongly rejected by the data. Adjusted R square is 28.47 which is relatively high for wage decomposition function.

The pooled OLS regression, however, fails to address the concern that the individual unobservable characteristics could be correlated with our key variables of interest which could lead to the imprecision in our estimates. This concern is reasonable since the contribution of commodity to the economy of SA is significant lower than in QLD and just as equal as in VIC and NSW; but SA workers have gained 0.5 per cent for each 10 points increase in ICP. To address this issue, in column (2), we add individual fixed effects in our specification. Interestingly, the result is very similar to column (1) for the effect on WA. On the contrary, point estimate on effect on SA is turned out to be not statistically significant while the effect on QLD is significant at 1 per cent. To check the robustness of our results, we include time-variant characteristics in column (3), the result is stable. It appears that the individual fixed effects matters.

We provide robustness checks of the results by estimate the panel fixed effects specification on two separate sub-samples: native and immigrants. Outcomes are correspondingly found in the last two columns. In general, every ten point growth in ICP led to 0.62 per cent gain in earnings of WA native workers. The figure is 1.76 per cent for WA citizens who born overseas. In contrast, effect of ICP on QLD native workers is statistically insignificant; while QLD immigrants got 0.77 per cent more in their earnings for each 10 points ICP increase. In general, we found a strong positive correlation of ICP with earnings growth WA where contribution of resources goes much further than remained states. In addition, the effect on QLD exist but more moderate. These results are not surprising. In fact, they are consistent with Acemoglu *et al.* (2013) who find a positive and strong evidence that economic subregions of the (southern) United States with greater oil intensity witness larger changes in income in correspond to oil price variations than areas with less oil. In next section, we investigate how this disparity gain affect immigration decision under different immigration policies.

4.2. Immigration Misallocation

The structural model explaining the impact of annual earnings on immigration inflows is based on panel data regressions and takes the following form:

$$\ln(W_{s,t}) = \gamma_s + \lambda_t + \sum_{s \subset N1} \beta_s \times (D_s \times ICP_t) + \theta \times X_{st} + \varepsilon_{st} \quad (4.2)$$

$$\ln(Y_{l,s,t}) = \gamma'_l + \lambda'_t + \sum_{s \subset N1} \tau_s \times \ln(W_{s,t}) + \zeta \times X_{st} + \sigma \times X_{lst} + \varepsilon'_{lst} \quad (4.3)$$

Here the equation (4.2) is the aggregate form at state level of equation (4.1). By insert equation (4.2) to equation (4.3), we have reduced-form of immigration decision specification.

$$\ln(Y_{l,s,t}) = \gamma'_l + \lambda'_i + \sum_{s \subset N1} \tau_s \beta_s \times (D_s \times ICP_t) + (\zeta + \tau_s \theta) \times X_{st} + \sigma \times X_{lst} + \varepsilon_{lst} \quad (4.4)$$

Where $\lambda'_t s$ are defined similarly to the $\lambda_t s$ in equation (4.1). Outcome variables $Y_{l,s,t}$ are number of independent skilled visas, number of employer sponsored visas, number of skilled visa, or number of family visa arrivals to LGA (l) of state (s) in year (t) depending on the context. X_{st} and X_{lst} are vectors of other time-variant characteristics at state and LGA levels respectively. $\gamma'_l s$ are region fixed effects controlling for any time invariant differences across the different local government areas. ε_{st} and ε'_{lst} are error terms. Again, in our result tables, interaction of $D_s$and ICP_t is denoted by "effect on sate s".

Previous studies preferred using OLS to estimate the earnings elasticity of immigration in equation (3). However, OLS approach might have a potential endogeneity issue. Endogeneity bias might appear because of the effect of immigrants on wages. For example, immigrants might put pressure on the market equilibrium, thus, wages are likely to decrease. It might be the case that immigrants might increase productivity and lead to higher wages. Consequently, the sign of the bias on τ_s is unclear. To deal with this issue, we instrument for variations in area worker earnings by utilizing the differential effect of fluctuations in ICP across states of Australia in which commodity production plays a more or less significant role in the local economy. The first phase of our analysis strategy has been demonstrated in section 4.1 which we confirmed the effect of ICP shocks on earnings of WA and QLD workers. Our underlying assumption is that removed ICP changes, immigration inflows in geographic units with different commodity proportions would have increased at similar rates. This assumption makes sense since both global ICP and the initial contribution

of commodity to local economy are not correlated with changes in an area's immigration ratio or with error term in the explanatory equations. Moreover, as confirmed in section 4.1, the global ICP is highly correlated with the increase of earning in WA where commodity plays a dominant role in the economy, therefore, we have strong first stage. Naturally, LGAs in states with different fractions of commodity contribution may differ in ways that could impact immigration influxes. Any such time-invariant disparities will be controlled by the LGA fixed effects (the $\gamma'_i s$) in equations (4.3) and (4.4).

Table 4 and table 5 look at measures of immigration changes and their association to annual earnings. The left hand side variable in table 4 is log of number of employer sponsored immigrants, in table 5 is log of number of independent skilled workers. In the two tables, the first two columns show the results from estimating equation (4.3). Columns (3) and (4) show the findings from reduced form corresponding to equation (4.4). The last two columns illustrate the outcomes from structural form corresponding to a system of equations (4.3) and (4.4) in which we instrument annual earnings by interaction of initial contribution of commodity to local economy and ICP. In odd columns (1, 3, and 5), there are no vector of time variant covariates X_{st} and X_{lst}. In even columns (2, 4, and 6), we add various controls, for example, housing affordability (log number of dwelling units, log housing price, quadratic of log housing price, proportion of private houses, percentage of residential houses), age structure (log of number of deaths and log of number of births), population size (log of number of tax payers – earners and its quadratic). All our results assign to the 2001–2011 period and refer to 148 LGAs in major cities.

Table 4, column 1 shows positive impact of annual earnings on employer sponsored migration at different levels in four states in comparison with NSW. In particular, 1 per cent higher earnings led to an increase of 3.4 per cent in the type of migration to WA, 2.3 per cent to QLD, 1.4 per cent to SA, and 1.18 per cent to VIC, and these estimates are statistically significant at the 99 per cent confidence level. Apparently, the order of magnitudes of the effect are reasonable as WA leads the group, follows by QLD, while effects on VIC and SA are similar. However, section 4.1 shows no difference in earnings of workers in VIC and SA with NSW. It is therefore surprising that coefficients of VIC and SA are statistical significant. This inaccuracy might come from time variant characteristics. In column (2), we add other covariates. In this case, the coefficient of WA remans significant at 99 per cent and the magnitude becomes smaller at 2.67 per cent, while the coefficients of QLD, VIC, and SA are no longer statically significant. This is confirmed by results in columns 3-7. Column (4)

shows that WA witnessed an approximate employer nomination migration expansion of 5.68% for each 10 points ICP appreciates with t statistic is 6.4. In addition, our estimates in column (6) suggest that 1 per cent increase in the annual earnings led over the period studied to a 2.57 per cent decline in migration. These results make sense. The rise in immigration only appears that LGAs in WA where initial contribution of resource and agriculture is huge. Moreover, we note that the OLS estimates in absolute magnitude are similar to in the IV estimates. According to Christian Dustmann *et al.* (2013), this is what we should expect if immigrants were allocated to regions which experienced positive economic shocks.

On the contrary, table 5 demonstrates that independent skilled migrants were not moving in line with wage distributions. More specifically, column (1) indicates that VIC and SA attracted higher levels over period 2001-2011 than other states, while WA and QLD saw the lowest ratios. After controlling other covariates in column (2), the magnitudes of point estimates become smaller but the ranks and confidence levels remain constant. Results from reduced form (columns 3-4) and structural form (columns 5-6) estimations are similar.

Our next tasks are to check the robustness of these findings to a number of other specifications and to verify several placebo tests.

4.3. Robustness Checks

In this section, we provide further robustness checks.

5. Conclusion Remarks

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Tables and Figures

Table 2: Descriptive Statistics For Australia Full Time Worker Wages And Salaries

	Full Sample		Major Cities	Born in Australia	Born in Overseas
	Mean	SD	Mean	Mean	Mean
Income					
Gross financial year wages and salaries (AUD, 2011 prices)	64964.41	42361.90	67925.14	64096.03	68557.05
Gender					
Female	0.38	-	0.39	0.38	0.38
Employment Status					
Union member	0.30	-	0.28	0.30	0.29
Experience	9.18	9.55	8.98	9.00	9.91
Age	38.58	11.73	38.44	37.65	42.43
Education					
Postgraduate	0.05	-	0.07	0.04	0.09
Graduate diploma/graduate certificate	0.07	-	0.07	0.06	0.08
Bachelor	0.18	-	0.21	0.17	0.22
Advanced diploma/diploma	0.10	-	0.11	0.10	0.11
Certificate	0.25	-	0.22	0.26	0.20
Year 12	0.16	-	0.16	0.16	0.15
Catholic school	0.16	-	0.17	0.17	0.12
Other non-government school	0.08	-	0.08	0.09	0.03
Last school year Overseas	0.18	-	0.21	0.08	0.60
Family Background					
Parents have ever got divorced or separate	0.10	-	0.10	0.10	0.10
Have kid(s) under 6 year-old	0.17	-	0.17	0.17	0.17
Siblings	2.70	1.83	2.63	2.62	3.02
Married	0.49	-	0.49	0.47	0.60

Country of birth and language					
First language	0.08	-	0.11	0.00	0.43
Not born in English speaking countries	0.11	-	0.14	0.00	0.55
Health Status					
Long term health condition or disability	0.14	-	0.14	0.15	0.13
Geography					
Live in outer regional Australia	0.10	-	0.00	0.11	0.05
Live in inner regional Australia	0.19	-	0.00	0.21	0.09
Live in remote Australia	0.02	-	0.00	0.02	0.01
Live in NSW	0.29	-	0.30	0.28	0.33
Live in QLD	0.22	-	0.20	0.24	0.17
Live in VIC	0.25	-	0.27	0.24	0.25
Live in SA	0.08	-	0.09	0.09	0.06
Live in WA	0.09	-	0.10	0.08	0.12
Observations	41832		29112	33689	8143

Table 3: Effect of Commodity Prices Shock on Annual Earnings in Different States

	Dependent variable is Gross financial year wages and salaries (AUD, 2011 prices)				
	Full Sample			Born in Australia	Born in Overseas
	Pooled OLS (1)	Panel FE - Baseline (2)	Panel FE with controls (3)	Panel FE (4)	Panel FE (5)
Effects of commodity prices on annual earnings					
Effect on VIC	0.0009	0.0014	-0.0006	-0.0006	-0.0004
	(0.4)	(0.8)	(-0.4)	(-0.3)	(-0.1)
Effect on SA	0.0050^{+}	-0.0001	-0.0004	-0.0012	0.0015
	(1.8)	(-0.0)	(-0.2)	(-0.4)	(0.2)
Effect on QLD	0.0037^{+}	0.0059**	0.0038*	0.0027	0.0077^{+}
	(1.7)	(2.9)	(2.0)	(1.2)	(1.7)
Effect on WA	0.0105**	0.0090**	0.0096**	0.0062*	0.0176**
	(4.0)	(3.7)	(4.1)	(2.2)	(3.8)
Gender					
Female	-0.2089**				
	(-33.0)				
Employment Status					
Union member	0.0526**		0.0480**	0.0492**	0.0498**
	(7.7)		(5.3)	(4.7)	(2.7)
Experience	0.0235**		0.0108**	0.0097**	0.0141**
	(23.3)		(10.3)	(7.9)	(6.6)
Experience Square	-0.0005**		-0.0003**	-0.0002**	-0.0004**
	(-17.2)		(-8.3)	(-6.3)	(-5.5)
Age	0.0806**		0.1645**	0.1731**	0.1325**
	(40.1)		(17.1)	(15.7)	(6.6)
Age Square	-0.0009**		-0.0014**	-0.0015**	-0.0011**
	(-35.3)		(-32.4)	(-30.3)	(-11.5)
Education					
Postgraduate	0.5227**		0.1178*	0.0649	0.3223*
	(36.8)		(2.2)	(1.1)	(2.6)
Graduate diploma/certificate	0.4487**		0.1578**	0.1515**	0.2245^{+}
	(32.7)		(3.1)	(2.6)	(1.9)
Bachelor	0.4044**		0.0902^{+}	0.0699	0.1904^{+}
	(39.5)		(1.9)	(1.3)	(1.7)
Advanced	0.2452**		0.1403**	0.1451**	0.1369

diploma/diploma					
	(20.8)		(3.3)	(3.1)	(1.3)
Certificate	0.1404**		0.1391**	0.1507**	0.0781
	(14.4)		(4.6)	(4.5)	(1.1)
Year 12	0.1318**		0.0086	0.0072	0.0315
	(12.3)		(0.2)	(0.2)	(0.3)
Catholic school	0.0404**				
	(5.0)				
Other non-government school	0.0649**				
	(5.8)				
Last school year	-0.0414**				
Overseas					
	0.0404**				
Family Background					
Parents ever get divorced	-0.0147				
	(-1.5)				
Have kid under 6 year-old	0.0214*		-0.0358**	-0.0412**	-0.0213
	(2.5)		(-3.9)	(-4.0)	(-1.1)
Siblings	-0.0107**				
	(-6.3)				
Married	0.0975**		0.0052	0.0043	0.0049
	(14.3)		(0.5)	(0.4)	(0.2)
Country of birth and language					
First language	-0.0852**				
	(-4.8)				
Not born in English speaking countries	-0.0684**				
	(-4.2)				
Health Status					
Long term health condition or disability	-0.0976**		-0.0174*	-0.0062	-0.0532**
	(-11.1)		(-2.0)	(-0.6)	(-2.9)
Constant	8.9944**	11.2304**	6.7932**	6.6816**	7.3128**
	(230.8)	(512.1)	(17.5)	(15.5)	(8.4)
Time FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes
Individual FE	No	Yes	Yes	Yes	Yes
N	34927	34927	34927	26513	8414
R^2	0.284335	0.740132	0.755102	0.758575	0.745248

F	346.5072	148.2373	143.1933	121.9996	23.2210

t statistics in parentheses $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table 4: Impact of Earnings on Employer Sponsor Visa Migration

Variables	Panel Fixed Effects		Panel Fixed Effects Reduced form		Panel Fixed Effects Structural form	
	(1)	(2)	(3)	(4)	(5)	(6)
Annual earnings in VIC	1.1846^{+}	-0.0363			1.0273	-0.4912
	(1.9)	(-0.1)			(1.5)	(-0.7)
Annual earnings in QLD	2.3606**	-0.7279			2.3163**	-1.0723
	(3.3)	(-0.9)			(3.0)	(-1.2)
Annual earnings in SA	1.4444**	0.6264			1.4258**	0.5076
	(2.9)	(1.2)			(2.7)	(0.9)
Annual earnings in WA	3.4317**	2.6760**			3.3962**	2.5763**
	(12.2)	(7.6)			(11.2)	(6.6)
log dwelling units		0.0250		0.0381		0.0281
		(0.7)		(1.1)		(0.8)
log housing price		2.1758**		2.4326**		2.1861**
		(5.5)		(6.2)		(5.4)
log housing price square		-0.2012**		-0.2197**		-0.2021**
		(-6.0)		(-6.5)		(-5.9)
log no. earners		-1.1254		-0.4805		-1.2285
		(-1.1)		(-0.5)		(-1.2)
log no. earners square		0.0596		0.0286		0.0658
		(1.2)		(0.6)		(1.3)
log no. deaths		0.0852		0.1065		0.0907
		(0.7)		(0.9)		(0.8)
log no. births		0.5253**		0.5376**		0.5257**
		(3.2)		(3.3)		(3.2)

Variables	Panel Fixed Effects		Panel Fixed Effects Reduced form		Panel Fixed Effects Structural form	
	(1)	(2)	(3)	(4)	(5)	(6)
log no. private houses		0.0770*		0.0831*		0.0762*
		(2.1)		(2.3)		(2.1)
residential		-0.0002		-0.0002		-0.0002
		(-0.3)		(-0.2)		(-0.3)
Effect on VIC			0.0104	-0.0050		
			(1.5)	(-0.7)		
Effect on QLD			0.0381**	-0.0161		
			(3.0)	(-1.1)		
Effect on SA			0.0237**	0.0057		
			(2.7)	(0.6)		
Effect on WA			0.0815**	0.0568**		
			(11.1)	(6.4)		
Constant	-11.9182**	-9.1004	2.7792**	-6.7296	-11.3657**	-6.9661
	(-4.8)	(-1.6)	(72.4)	(-1.2)	(-4.2)	(-1.1)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
LGA Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	1480	1480	1480	1480	1480	1480
R^2	0.926963	0.932705	0.925825	0.932073		

t statistics in parentheses $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Table 5: Impact of Earnings on Independent Skilled Visa Migration

Variables	Panel Fixed Effects		Panel Fixed Effects Reduced form		Panel Fixed Effects Structural form	
	(1)	(2)	(3)	(4)	(5)	(6)
Annual earnings in VIC	3.6035**	2.9559**			3.5569**	2.6305**
	(6.4)	(5.2)			(5.7)	(4.1)
Annual earnings in QLD	-0.2891	-1.8374*			-0.3549	-2.1130*
	(-0.5)	(-2.4)			(-0.5)	(-2.5)
Annual earnings in SA	2.6637**	1.7754**			2.5701**	1.5082**
	(6.2)	(3.9)			(5.5)	(3.0)
Annual earnings in WA	-0.6071*	-1.5092**			-0.6728*	-1.7229**
	(-2.4)	(-4.8)			(-2.5)	(-4.8)
log dwelling units		0.0354		0.0255		0.0398
		(1.1)		(0.8)		(1.3)
log housing price		1.9375**		1.8269**		2.0245**
		(5.4)		(5.1)		(5.5)
log housing price square		-0.1762**		-0.1701**		-0.1830**
		(-5.8)		(-5.6)		(-5.9)
log no. earners		1.1501		0.9409		1.3106
		(1.3)		(1.1)		(1.4)
log no. earners square		-0.0359		-0.0266		-0.0422
		(-0.8)		(-0.6)		(-0.9)
log no. deaths		-0.1913+		-0.1986+		-0.1878+
		(-1.8)		(-1.9)		(-1.8)
log no. births		0.1323		0.1513		0.1249
		(0.9)		(1.0)		(0.9)

Variables	Panel Fixed Effects		Panel Fixed Effects Reduced form		Panel Fixed Effects Structural form	
	(1)	(2)	(3)	(4)	(5)	(6)
log no. private houses		0.0350		0.0328		0.0372
		(1.1)		(1.0)		(1.1)
residential		-0.0005		-0.0005		-0.0005
		(-0.5)		(-0.5)		(-0.6)
Effect on VIC			0.0361**	0.0272**		
			(5.7)	(4.2)		
Effect on QLD			-0.0058	-0.0329*		
			(-0.5)	(-2.5)		
Effect on SA			0.0425**	0.0273**		
			(5.5)	(3.3)		
Effect on WA			-0.0162*	-0.0368**		
			(-2.5)	(-4.6)		
Constant	-7.4976**	-14.6866**	4.0707**	-7.5846	-7.0437**	-14.0237*
	(-3.4)	(-2.8)	(120.3)	(-1.5)	(-2.9)	(-2.5)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
LGA Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	1495	1495	1495	1495	1495	1495
R^2	0.932581	0.935777	0.931900	0.935037		

t statistics in parentheses $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Table 5: Impact of Earnings on Skilled Visa Migration

Variables	Panel Fixed Effects		Panel Fixed Effects Reduced form		Panel Fixed Effects Structural form	
	(1)	(2)	(3)	(4)	(5)	(6)
Annual earnings in VIC	2.4312**	1.6394**			2.6862**	1.5798**
	(5.9)	(4.1)			(5.9)	(3.5)
Annual earnings in QLD	1.7805**	-0.1942			1.9847**	-0.1849
	(3.8)	(-0.4)			(4.0)	(-0.3)
Annual earnings in SA	4.5352**	3.6097**			4.8347**	3.9280**
	(14.5)	(11.3)			(14.3)	(11.2)
Annual earnings in WA	2.0448**	1.0256**			2.3625**	1.4859**
	(11.2)	(4.6)			(12.1)	(5.9)
log dwelling units		0.0567*		0.0534*		0.0511*
		(2.5)		(2.4)		(2.3)
log housing price		2.0271**		1.9278**		1.7994**
		(8.0)		(7.7)		(6.9)
log housing price square		-0.1739**		-0.1673**		-0.1570**
		(-8.1)		(-7.8)		(-7.2)
log no. earners		0.8109		0.5427		0.0768
		(1.3)		(0.9)		(0.1)
log no. earners square		-0.0207		-0.0137		0.0122
		(-0.7)		(-0.4)		(0.4)
log no. deaths		0.1679*		0.1781*		0.1669*
		(2.3)		(2.4)		(2.3)
log no. births		-0.1117		-0.0395		-0.0856
		(-1.1)		(-0.4)		(-0.8)

Variables	Panel Fixed Effects		Panel Fixed Effects Reduced form		Panel Fixed Effects Structural form	
	(1)	(2)	(3)	(4)	(5)	(6)
log no. private houses		0.0815**		0.0786**		0.0733**
		(3.6)		(3.4)		(3.2)
residential		-0.0013*		-0.0012*		-0.0013*
		(-2.2)		(-2.0)		(-2.1)
Effect on VIC			0.0272**	0.0161**		
			(5.9)	(3.5)		
Effect on QLD			0.0327**	-0.0008		
			(4.0)	(-0.1)		
Effect on SA			0.0799**	0.0635**		
			(14.4)	(11.1)		
Effect on WA			0.0568**	0.0337**		
			(12.1)	(5.9)		
Constant	-13.6941**	-19.3999**	5.0869**	-5.7749+	-15.6843**	-16.1930**
	(-8.5)	(-5.3)	(209.0)	(-1.7)	(-8.8)	(-4.2)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
LGA Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	1496	1496	1496	1496	1496	1496
R^2	0.955195	0.959800	0.955463	0.959762		

t statistics in parentheses $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Table 6: Impact of Earnings on Family Visa Migration

Variables	Panel Fixed Effects		Panel Fixed Effects Reduced form		Panel Fixed Effects Structural form	
	(1)	(2)	(3)	(4)	(5)	(6)
Annual earnings in VIC	1.8204**	1.1009**			1.9484**	0.9777**
	(6.0)	(3.8)			(5.8)	(3.0)
Annual earnings in QLD	1.3979**	-0.4580			1.5106**	-0.5140
	(4.1)	(-1.2)			(4.1)	(-1.2)
Annual earnings in SA	2.8292**	2.0696**			2.9512**	2.1503**
	(12.3)	(9.0)			(11.9)	(8.5)
Annual earnings in WA	1.4377**	0.5093**			1.5726**	0.6704**
	(10.8)	(3.2)			(11.0)	(3.7)
log dwelling units		0.0335*		0.0322*		0.0321*
		(2.1)		(2.0)		(2.0)
log housing price		1.6068**		1.5776**		1.5214**
		(8.8)		(8.8)		(8.2)
log housing price square		-0.1384**		-0.1368**		-0.1321**
		(-9.0)		(-8.9)		(-8.4)
log no. earners		0.8972*		0.8370+		0.5959
		(2.0)		(1.9)		(1.2)

Variables	Panel Fixed Effects		Panel Fixed Effects Reduced form		Panel Fixed Effects Structural form	
	(1)	(2)	(3)	(4)	(5)	(6)
log no. earners square		-0.0272		-0.0272		-0.0135
		(-1.2)		(-1.2)		(-0.6)
log no. deaths		0.1450**		0.1509**		0.1455**
		(2.7)		(2.8)		(2.7)
log no. births		0.0808		0.1173		0.0912
		(1.1)		(1.6)		(1.2)
log no. private houses		0.0689**		0.0680**		0.0655**
		(4.2)		(4.1)		(4.0)
residential		-0.0006		-0.0005		-0.0005
		(-1.3)		(-1.1)		(-1.2)
Effect on VIC			0.0198**	0.0100**		
			(5.8)	(3.1)		
Effect on QLD			0.0249**	-0.0070		
			(4.1)	(-1.0)		
Effect on SA			0.0488**	0.0349**		
			(11.9)	(8.5)		
Effect on WA			0.0378**	0.0153**		
			(10.9)	(3.8)		

Variables	Panel Fixed Effects		Panel Fixed Effects Reduced form		Panel Fixed Effects Structural form	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-7.2139**	-13.6625**	5.8264**	-6.4172*	-8.1169**	-11.9657**
	(-6.1)	(-5.2)	(324.5)	(-2.6)	(-6.2)	(-4.3)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
LGA Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	1496	1496	1496	1496	1496	1496
R^2	0.974274	0.977981	0.974143	0.977810		

t statistics in parentheses $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$. Dependent variable is log annual number of family visa arrivals to Australia

Table 7: Effect of Earnings on different migration schemes After Aggregating Data to Two Period

Variables	Log skilled independent visa		Log employer sponsor visa		Log family visa	
	(1)	(2)	(3)	(4)	(5)	(6)
Effect on VIC	0.0508**	0.0364*	0.0176	-0.0025	0.0258**	0.0138+
	(3.7)	(2.6)	(1.2)	(-0.2)	(3.0)	(1.8)
Effect on QLD	0.0118	-0.0236	0.0582*	-0.0161	0.0369*	-0.0130
	(0.5)	(-0.8)	(2.2)	(-0.6)	(2.4)	(-0.7)
Effect on SA	0.0701**	0.0403*	0.0181	-0.0066	0.0617**	0.0413**
	(4.2)	(2.2)	(1.0)	(-0.4)	(5.8)	(4.0)
Effect on WA	-0.0165	-0.0434*	0.1027**	0.0972**	0.0424**	0.0231*
	(-1.2)	(-2.3)	(6.6)	(5.6)	(4.8)	(2.2)
log dwelling units		0.0857		-0.0058		0.0222
		(0.9)		(-0.1)		(0.4)
log housing price		1.2277		2.8623**		0.5922
		(1.1)		(2.7)		(0.9)
log housing price square		-0.1201		-0.2848**		-0.0638
		(-1.2)		(-3.0)		(-1.1)
log no. earners		2.5301		-1.5295		0.8487
		(1.1)		(-0.7)		(0.7)
log no. earners square		-0.1233		0.0222		-0.0506
		(-1.1)		(0.2)		(-0.8)
log no. deaths		-0.3753		0.1450		0.0301
		(-1.3)		(0.6)		(0.2)
log no. births		0.4041		0.7080*		0.4658*
		(1.2)		(2.3)		(2.5)

Variables	Log skilled independent visa		Log employer sponsor visa		Log family visa	
	(1)	(2)	(3)	(4)	(5)	(6)
log no. private houses		0.0354		0.1549*		0.0729
		(0.4)		(2.0)		(1.6)
residential		-0.0046+		-0.0045*		-0.0021
		(-1.9)		(-2.0)		(-1.6)
postgraduate		-0.1230*		-0.0411		-0.0424
		(-2.0)		(-0.7)		(-1.2)
graduate diploma/certificate		0.0618		-0.3398**		-0.0351
		(0.5)		(-3.1)		(-0.5)
bachelor		0.1314**		0.1563**		0.0246
		(2.7)		(3.5)		(0.9)
advance diploma/certificate		0.0543		0.0527		0.0665+
		(0.9)		(0.9)		(2.0)
certificate		0.0283		0.1542**		0.0622*
		(0.6)		(3.7)		(2.5)
managers		-0.0396		-0.0098		0.0289
		(-0.8)		(-0.2)		(1.0)
professionals		-0.0506		0.0267		-0.0066
		(-1.3)		(0.7)		(-0.3)
laborers		0.0054		-0.0097		0.0238
		(0.1)		(-0.2)		(0.8)
Constant	4.3685**	-13.1367	3.2093**	-0.9560	6.0871**	-4.0206
	(96.0)	(-1.0)	(63.9)	(-0.1)	(210.7)	(-0.5)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
LGA Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	272	272	272	272	272	272

Variables	Log skilled independent visa		Log employer sponsor visa		Log family visa	
	(1)	(2)	(3)	(4)	(5)	(6)
R^2	0.976732	0.982866	0.975854	0.987652	0.987930	0.993170

t statistics in parentheses $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

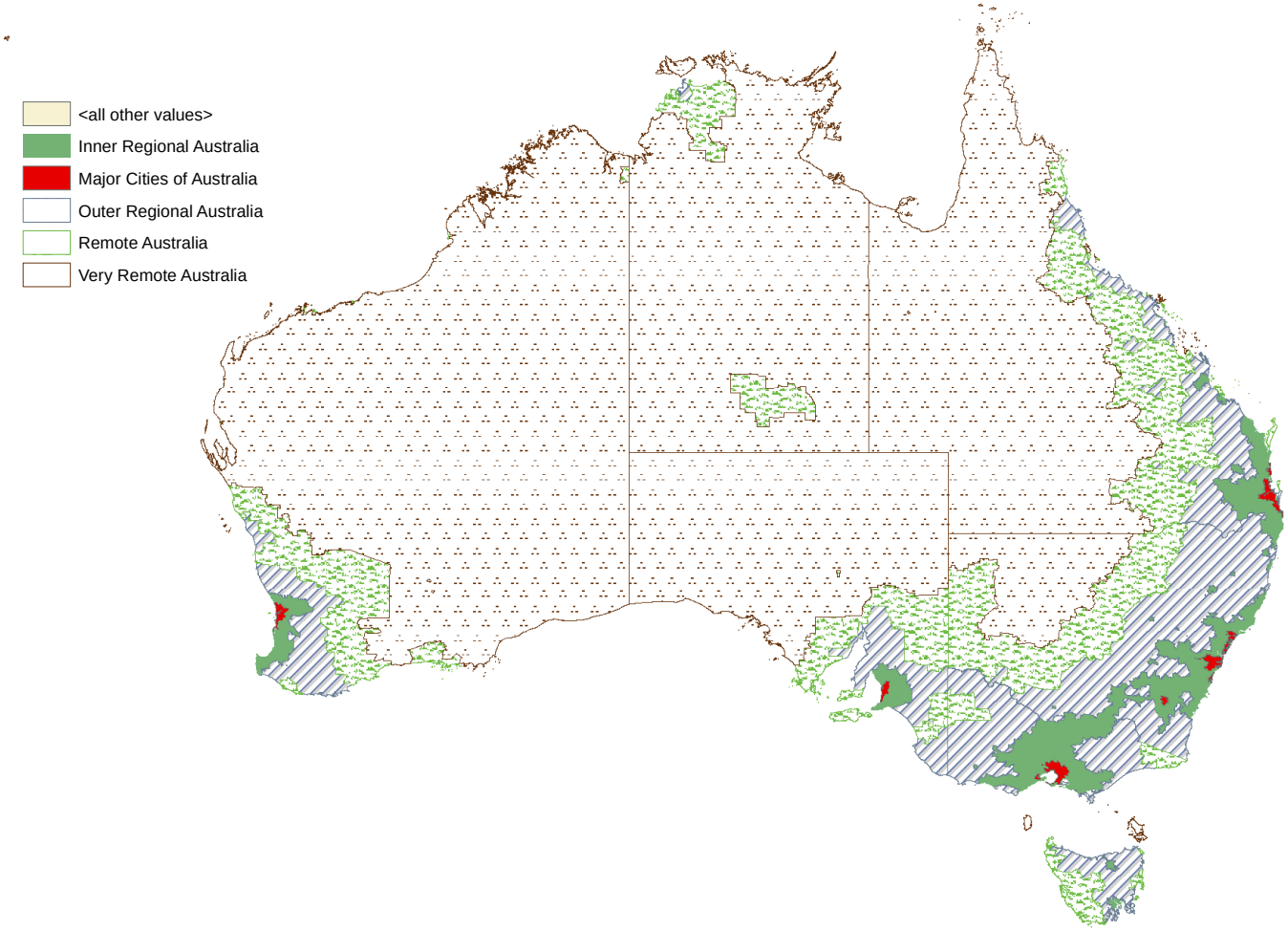

Figure 2: Remoteness Areas of Australia

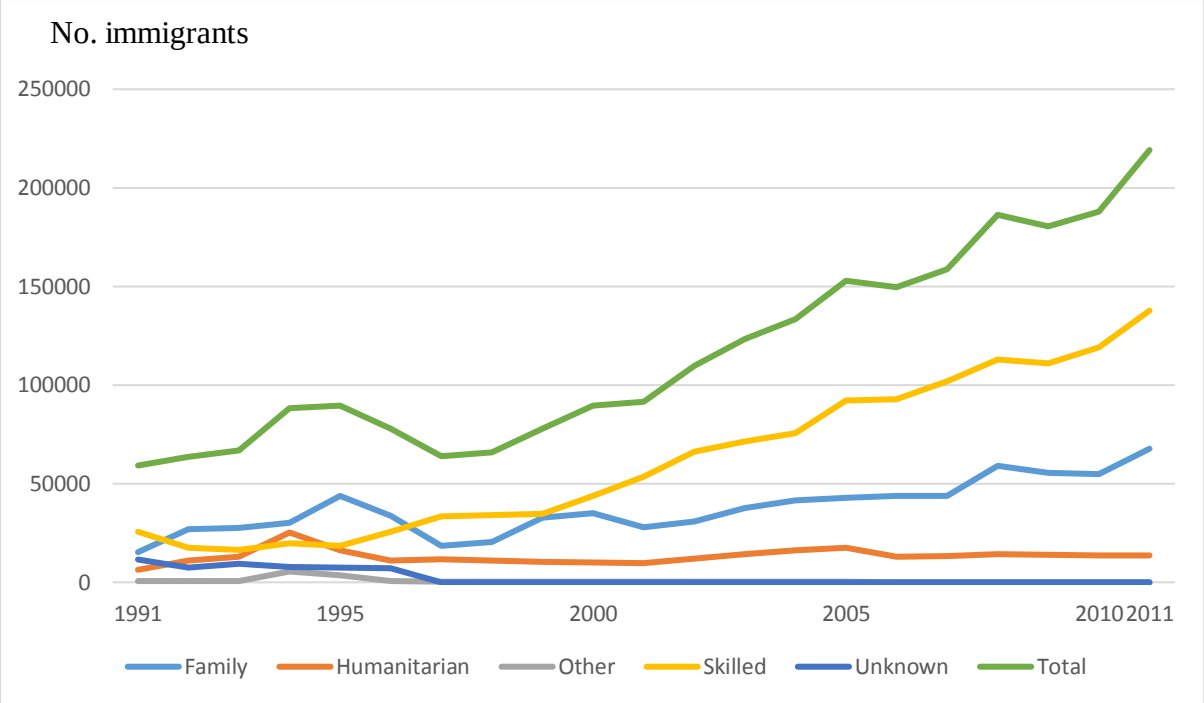

Figure 3: Number of immigrants who arrived to Australia between 1991 and 2011

Appendix

Table 8: ICP Components

		Weight	
		From 1 April 2016	1 April 2015 – 31 March 2016
Rural Commodities		*13.4*	*12.6*
	Wool	1.3	1.2
	Beef and veal	4.1	3
	Wheat	3.1	3.4
	Barley	0.9	0.8
	Canola	0.8	1
	Sugar	0.8	0.7
	Cotton	1	1.3
	Lamb and mutton	1.4	1
Base metals		*5.3*	*5.1*
	Aluminium	2.1	2
	Lead	0.5	0.5
	Copper	1.9	1.8
	Zinc	0.5	0.5
	Nickel	0.3	0.4
Bulk commodities		*54.4*	*55.5*
	Iron ore	33.9	34.7
	Metallurgical coal	11.9	12.1
	Thermal coal	8.6	8.7
Other resources		*26.9*	*26.8*
	LNG	8.8	8.1
	Crude oil	4.9	5.3
	Alumina	3.5	3.1
	Gold	7.1	7.6
	Copper ore	2.8	2.8
Total		*100*	*100*

Table 9: Definition, Measurement And Sources of Variables

Variable	Definition	Source
Income		
Gross financial year wages and salaries (AUD, 2011 prices)	Gross financial year wages and salaries (AUD, 2011 prices)	HILDA, ABS
Gender	***Gender***	
Female	Dummy variable: = 1 if interviewee is female, = 0 if otherwise	HILDA
Employment Status	***Employment Status***	
Union member	Dummy variable: = 1 if interviewee belong to a trade union or employee association, =0 if otherwise	HILDA
Experience	Years worked in current occupation	HILDA
Age	Age (years)	HILDA
Education		
Postgraduate	Dummy variable: =1 if Postgraduate (Doctoral Degree Level, Master Degree Level) is highest education qualification achieved, =0 if otherwise.	HILDA
Graduate diploma/graduate certificate	Dummy variable: =1 if graduate diploma or graduate certificate (Doctoral Degree Level, Master Degree Level) are highest education qualification achieved, = 0 if otherwise.	HILDA
Bachelor	Dummy variable: =1 if Bachelor degree is highest education qualification achieved, = 0 if otherwise.	HILDA
Advanced diploma/diploma	Dummy variable: =1 if advanced diploma and diploma is highest education qualification achieved, = 0 if otherwise	HILDA
Certificate	Dummy variable: =1 if Certificate (Level 1, 2, 3,4) is highest education qualification achieved, = 0 if otherwise	HILDA
Year 12	Dummy variable: =1 if year 12 is highest education qualification achieved, = 0 if otherwise	HILDA
Catholic school	Dummy variable: =1 if attended Catholic school, = 0 if otherwise. (government school is base group)	HILDA
Other non-government school	Dummy variable: =1 if attended Other	HILDA

	non-government school, =0 if otherwise.	
Last school year Overseas	Dummy variable: =1 if country of last school year is not Australia, =0 if otherwise.	HILDA
Family Background		
Parents ever get divorced	Dummy variable: =1 if Parents have ever get divorced or separate, = 0 if otherwise.	HILDA
Have kid under 6 year-old	Dummy variable: =1 if interviewee has kid under 6 year-old, = 0 if otherwise.	HILDA
Siblings	Number of siblings.	HILDA
Married	Dummy variable: =1 if legally married, =0 if otherwise.	HILDA
Country of birth and language	***Country of birth and language***	
First language	Dummy variable: =1 if English was not the first language learned, =0 if otherwise.	HILDA
Not born in English speaking countries	Dummy variable: =1 not born in English speaking countries (The United States, The United Kingdom, Australia, New Zealand, Singapore, Ireland), =0 if otherwise.	HILDA
Health Status	***Health Status***	
Long term health condition or disability	Dummy variable: =1 if has long term health condition, disability, or impairment, =0 if otherwise.	HILDA
Geography	***Geography***	
Live in outer regional Australia	Dummy variable: =1 if live in outer regional Australia, =0 if otherwise.	HILDA
Live in inner regional Australia	Dummy variable: =1 if live in inner regional Australia, =0 if otherwise.	HILDA
Live in remote Australia	Dummy variable: =1 if live in remote Australia, =0 if otherwise.	HILDA
Live in NSW	Dummy variable: =1 if in NSW, =0 if otherwise.	HILDA
Live in QLD	Dummy variable: =1 if in QLD, =0 if otherwise.	HILDA
Live in VIC	Dummy variable: =1 if live in VIC, =0 if otherwise.	HILDA
Live in SA	Dummy variable: =1 if live in SA, =0 if otherwise.	HILDA
Live in WA	Dummy variable: =1 if live in WA, =0 if otherwise.	HILDA

Key variables to estimate effects of commodity prices on earnings		
Index of Commodity Prices	Index of Commodity Prices	RBA
Effect QLD	Interaction of "Live in QLD "with Index of Commodity Prices.	HILDA/RBA
Effect VIC	Interaction of "Live in VIC "with Index of Commodity Prices.	HILDA/RBA
Effect SA	Interaction of "Live in SA "with Index of Commodity Prices.	HILDA/RBA
Effect WA	Interaction of "Live in WA "with Index of Commodity Prices.	HILDA/RBA

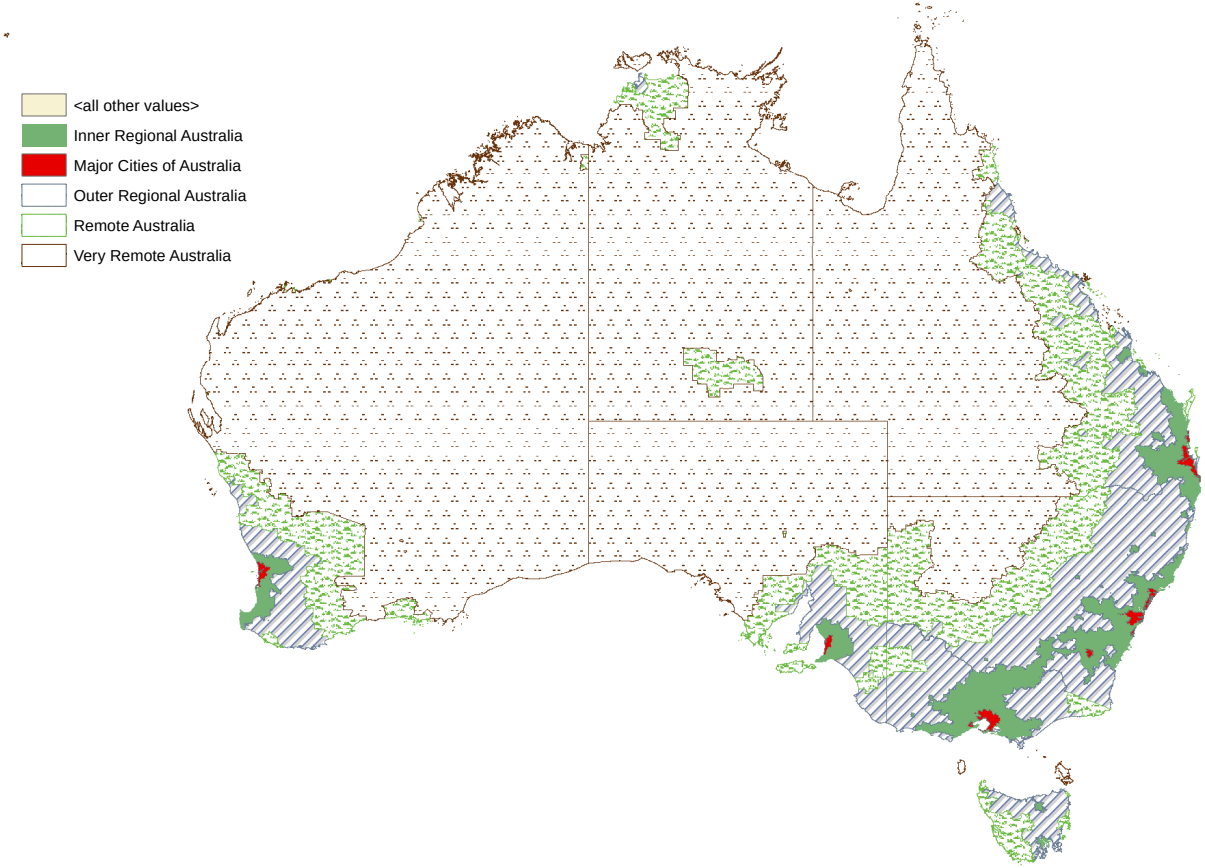
<all other values>
Inner Regional Australia
Major Cities of Australia
Outer Regional Australia
Remote Australia
Very Remote Australia

Figure 4: Number of immigrants who arrived to Australia between 1991 and 2011