

NATIONAL VOCATIONAL EDUCATION  
AND TRAINING RESEARCH PROGRAM

## RESEARCH REPORT

# Incentives for relocating to regional Australia: estimates using a choice experiment

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Australian Government  
Department of Industry





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# About the research

## *Incentives for relocating to regional Australia: estimates using a choice experiment*

Aaron Nicholas, Deakin University; Chandra Shah, Monash University

Inter-regional migration plays an important role in regional labour markets; for instance, by moving labour from a region with high unemployment to a region where there are unfilled vacancies.

The study uses a discrete choice experiment to investigate the willingness to move for work of a sample of individuals from New South Wales and South Australia, states which have had pockets of relatively high unemployment, to Karratha (Western Australia) and Emerald (Queensland), two regional centres with relatively high demand for labour in 2012. The aim is to understand how individual and job characteristics are related to the willingness to move.

The study is unique, in that it estimates the monetary value of the incentives required for individuals to accept job offers in a region different from that in which they currently live.

This paper reports on one of three topics that comprise a three-year program of work: 'Geographical dimensions of social inclusion and VET in Australia'.

## Key messages

- Some groups are more prepared to move than others. In particular, individuals who are looking for work (both employed and unemployed) indicate a strong willingness to relocate for work.
- Individuals are more willing to move for jobs that: are ongoing or longer-term rather than fixed-term; provide training; or involve a fly-in/fly-out contract rather than permanent relocation.
- Some groups require wage incentives to accept a job in a regional location but others require no such incentives.
  - The size of the incentive depends on individual characteristics as well as on the job conditions being offered; for example, the preference for fly-in/fly-out and training provision in the job contract reduces the size of any wage incentive that needs to be offered.

This study suggests that policies promoting geographical labour mobility are more likely to succeed if job offers include upskilling and reskilling opportunities and contracts that are not short-term.

Addressing the demand-side factors, such as matching job seekers' skills and experience to employer requirements, can also improve labour mobility.

Rod Camm  
Managing Director, NCVET

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# Executive summary

Unemployment varies across the regions of Australia. Inter-regional migration has an important but variable adjustment role across these regional labour markets. If, by offering incentives, individuals can be encouraged to move from regions with high unemployment to regions where there are unfilled vacancies, then there is the potential for improving social inclusion.

Wages generally rise in a sector that is profitable and which is having difficulty attracting labour, with possible spillover effects in complementary sectors in the same region. If labour from other regions, especially those with high unemployment, does not move to take advantage of these opportunities, then it could either mean that the applicants lack the appropriate skills and experience that employers require; or that individuals with the appropriate skills and experience are unwilling to move without additional incentives or they lack information about the job opportunities. This study is about the latter, with a focus on willingness to move for work.

The study investigates the incentives, in wage-equivalent terms, for individuals from New South Wales and South Australia, states which have had pockets of relatively high unemployment, to accept jobs in Karratha in Western Australia and Emerald in Queensland, two regional centres with relatively high demand for labour in 2012.

The importance of this research is underscored by the often ad hoc nature of policies seeking to move people for work from one location to another. By estimating the monetary value of an individual's willingness to move, we would know whether such policies are economically feasible and for what kind of worker.

The study uses a discrete choice experiment to collect data on individuals' intentions to relocate for work, if offered jobs with certain characteristics. The technique is suitable for investigating individual preferences, which are otherwise difficult to identify, measure and compare. In particular, we are able to estimate the relative importance of the various job characteristics that influence the job choices of workers in wage-equivalent terms. Such information can be useful for developing policies on recruitment and retention in locations with skill-shortage problems.

In this study, a sample of people in the labour force in New South Wales and South Australia who are aged 18–64 years and who are not studying full-time are offered hypothetical jobs in either Karratha in Western Australia or Emerald in Queensland, two regional locations where there have been high rates of job vacancies.

Each individual in the sample is presented with hypothetical scenarios, from which they are asked to make a choice of one of two job offers or, alternatively, reject both job offers. The job offers in each scenario vary by the wage being offered, the type of relocation involved (fly-in/fly-out from Brisbane or Perth or permanent relocation to the region) and the type of contract (six months fixed-term without training; ongoing with training; or ongoing without training). In the contract with training, the first three months involves on-the-job and off-the-job training, during which period the worker receives only half their wages.

The analyses of the data from the experiment show that the typical person most likely to move for work is young, male, single, not born in Australia, looking for a new job, knows people other than family at the location where the job is offered and does not own a house. Unlike other studies, we do

not find education background to be a significant factor in this decision, possibly because we directly control for the labour demand factors through the design of the choice experiment.

The distance between where the person currently lives and where they are offered a job is not a significant factor in the decision to move. This is because travel to and from these locations is likely to be by air and individuals probably perceive distance in flying time. Individuals consider flight times to these locations as being not significantly different.

The amount in wage-equivalent terms that a person is willing to forgo (or trade off) for a particular job attribute is calculated as the marginal willingness to pay (MWTP). For example, if a person is willing to forgo \$1000 in wages for a job that includes training compared with a similar job that does not include training, then the marginal willingness to pay for training is \$1000. A negative MWTP reflects the compensation (or wage premium) expected for accepting a job with that particular attribute.

The marginal willingness to pay for a fly-in/fly-out over a permanent relocation contract is about \$10 504. While this could be related to the non-pecuniary benefits of living in Brisbane or Perth compared with living in the two regional locations, the trade-off is relatively small when the savings from accommodation and meals provided while rostered for work on a fly-in/fly-out contract are factored into the calculation.

The marginal willingness to pay for an ongoing contract over a six-month temporary contract is equivalent to \$11 236 per year, which reflects the higher risks of short-term contracts, in terms of periods of unemployment and/or possible relocation costs after the contract expiry.

Individuals are willing to trade off \$6902 in wages to secure a job that offers training compared with a job that does not. The training decision can be viewed as an investment in human capital as individuals are prepared to forgo short-term loss, in terms of a 50% cut in wages in the first three months, for higher wages in the long-term.

A wage premium is required to attract women (\$29 004); married people (\$19 206); people who are not studying (\$25 736); people who own their house (\$25 552); and individuals who do not know people at the destination (\$43 884) to accept jobs in the two regional locations.

The wage premium required for a person who is not looking for work to relocate is \$72 148 more than for a person who is unemployed, and it is \$60 760 more than for a person who is employed but looking for work.

From a policy perspective it is useful to know the total, in wage-equivalent terms, that a particular type of person is willing to forgo, or requires compensation, for accepting a specific job. This is called total willingness to pay (TWTP). A positive value for it indicates the amount individuals are willing to forgo and a negative value indicates the amount they have to be compensated. The results show that 14% of the total sample required no wage premium to accept a job.

For illustrative purposes, we calculated the average total willingness to pay for three groups for accepting jobs that are ongoing, without training and require permanent relocation to Karratha or Emerald. The three groups are:

- young: single, unemployed or looking for work and under 30 years of age
- old: married, employed and not looking for work, own a house and over 40 years of age
- the rest: neither young nor old.

The results show that about 75% of the 'young' group is willing to accept such job offers without a wage premium. Among the 'old' group none is willing to accept a job offer without a wage premium.

As a number of people are willing to accept such job offers without a wage premium, it makes sense from the perspective of developing policy that seeks to use incentives to encourage labour mobility to exclude them from the calculations of the level of incentives to offer. Thus, for example, an offer of a wage premium of \$3720 is likely to encourage 25% of the remainder of the young group to accept a job offer.

The main finding of the research is that there is a strong willingness to relocate for work by people who are searching for new jobs. Some people are willing to trade off wages to secure an ongoing job that includes a training component. While there is a preference for fly-in/fly-out contracts over permanent relocation to the regional locations, the net trade-off in wages is relatively small.

The unemployed is one group with a high willingness to move for work and, therefore, labour-mobility policies targeting this group have the highest potential to improve social inclusion. At the same time, programs such as Move 2 Work and Connecting People with Jobs have had only limited success. The analysis in this report suggests the reason for the limited success of these programs could be less related to the willingness to move for work and more to the labour demand-side factors, such as the skills and experience that employers need.

Policies promoting geographic labour mobility are more likely to succeed if the employment contracts include upskilling or reskilling opportunities and the job offered is not short-term. Choice experiments in which job offers are varied by demand-side factors, for example, by offering jobs with training and in non-matching occupations, could provide insights into the effectiveness of subsidising training in alternative areas. Future work may also look at the extent of the mismatch between actual labour demand and the skills of those who are the most willing to move.

# Introduction

This paper reports on one of three topics that comprise a three-year program of work: ‘Geographical dimensions of social inclusion and VET in Australia’. The paper investigates the monetary value of incentives, if any, to offer individuals to move from one region to another for work. If, by offering incentives, individuals can be encouraged to move for work from regions with high unemployment to regions where there are unfilled vacancies, then there is the potential for improving social inclusion. The paper provides policy-makers with quantitative estimates of the relative importance of the different job characteristics influencing the choice of workers to move to work in regional Australia. In this introductory section we:

- present some background on regional differences in employment performance in Australia recently and labour-mobility policies and practice for reducing regional disparity
- provide an outline of this study
- provide an overview of the contents of this report.

## Background

Regional disparities in employment performance exist in many Organisation for Economic Co-operation and Development (OECD) countries; labour and skills shortages in some regions coexist with high unemployment in other regions (OECD 2005). Using the Australian census data for 1986 and 1996, Lawson and Dwyer (2002) show divergence in the performance of regional labour markets in Australia, with regional migration playing a dominant, but variable, adjustment role. From 2000 to 2012, when unemployment generally fell, except for the brief period following the Global Financial Crisis, the average unemployment dispersion in Australia narrowed (Gruen, Li & Wong 2012).

Despite this, the impact of the most recent resources boom, notwithstanding the recent slowdown, has been a shortage of skilled labour in some regions, such as parts of Western Australia, Queensland and the Northern Territory, coexisting with pockets of high unemployment or underemployment in other parts of the country, such as Tasmania and a number of metropolitan areas in other states such as South Australia and New South Wales. Unlike previous booms, the most recent boom was accompanied by high levels of both resource investment as a proportion of gross domestic product (GDP) and high levels of terms of trade (Gregory & Sheehan 2011).<sup>1</sup> The high levels of terms of trade pushed the Australian dollar to record highs against all major currencies. This had an adverse impact on the trade-exposed non-resource sectors of the economy. The result has been described as a ‘two-speed’ economy.

A range of policy options can be implemented to alleviate persistent disparities in regional employment or specific skill shortages when there is a market failure. Active labour market policies that increase the demand for labour in regions where unemployment is high are often adopted by governments to reduce the disparity in the regional imbalance in employment opportunities (OECD 2005). Such policies are often part of the social inclusion agenda. However well intentioned the policies are, they have the potential to perpetuate locational disadvantage by concentrating people with disadvantage in deprived areas.

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<sup>1</sup> In the past Australia has been considered to be experiencing a resource boom if either of these two variables has been at high levels.

Policies promoting geographic labour mobility, on the other hand, move people away from areas that are characterised by poor socioeconomic outcomes, thus potentially avoiding the consequences of residing in areas of entrenched deprivation. They allow the individual to transcend 'locational disadvantages' such as unemployment and the poor opportunities and quality of life associated with a particular area (Ryan & Whelan 2010). However, as Adam Smith wrote in *The wealth of nations*: 'After all that has been said of the levity and inconstancy of human nature, it appears evidently from experience, that man is, of all sorts of luggage, the most difficult to be transported' (p.67, Smith 1776 [2005]). On the other hand, a high level of job mobility also has the potential to inhibit social cohesion and the building of community capacity (Shah et al. 2012).

As the populations of major cities grow, path-dependent effects may widen the divide between urban and rural areas by decreasing the willingness of individuals to move *from* urbanised regions while increasing the willingness of individuals to move *to* urbanised regions (Krugman 1991). The attractiveness of urban areas increases at an exponential rate as a function of the population of the city due to network effects, the size of the market and reductions in transport costs. As more people move to a city, the more attractive that city becomes. Similarly, as more people leave a rural location, the less attractive this location becomes. The gap in the attractiveness between a rural and urban location increases exponentially over time when there is a high degree of mobility.

Moving labour to locations where many of Australia's resource projects are located is a particularly difficult issue. The distance from major population centres, the harsh climate, the lack of infrastructure, the boom and bust cycles of the resources sector, and the generally narrow economic base where the projects are located have generally meant that viable and sustainable communities are difficult to establish in these locations. One solution to this problem has been the use of the fly-in/fly-out model. The drive-in/drive-out model is also used where distances are relatively shorter. The adoption of these models has been facilitated by improved and lower costs of communication and transport, and the preference for metropolitan over rural living by many workers and their families (Storey 2001). Fly-in/fly-out arrangements, however, have the tendency to weaken the bonds of collectivism both at work and in the local communities (Ellem 2003).

While the fly-in/fly-out model addresses labour-shortage problems in remote regions, it does not necessarily solve the problem of excessive unemployment of other regions because the model does not target its recruitment effort in these regions. Thus there is always a risk that such internal migration simply moves workers from one sector of labour undersupply to another. This can happen because many workers have skills that overlap across the many industries with high demand for skilled labour. Offering training as an additional incentive could encourage more people from high unemployment areas to consider moving location for work.

From time to time governments in Australia have developed policies to encourage both interstate and international migration to regional areas. In 2006 and 2008, the Australian Government provided additional assistance for unemployed job seekers who were willing to relocate from parts of regional New South Wales and northern Adelaide to regions with stronger labour markets, such as Western Australia (Australian Government 2010). While few people took up the opportunity offered by the program, there were some successful employment outcomes. Similarly, after the floods in Queensland in late 2010, financial incentives, of \$6000 for an individual and \$9000 for a family, were offered under the Connecting People with Jobs initiative to assist eligible unemployed Australians to relocate to Queensland to take up employment opportunities in flood-affected areas (Australian Government 2011). Once again, the initiative had limited success (Karvelas 2012). The

Australian Government's Move 2 Work initiative offers similar incentives for workers to relocate for work under certain conditions.<sup>2</sup>

Decentralisation and regional development plans are also about moving people but they have a much longer horizon. A major initiative was the Albury-Wodonga Development Plan in 1973. The plan was to develop these twin cities to be a home for 300 000 people by the turn of the century. Despite being in the middle of the road-and-rail corridor linking the two biggest cities in Australia, the combined population of the twin cities is currently less than a third of that planned. This demonstrates the difficulty in resisting the global trend in the movement of populations from rural and regional areas to mega cities. Despite this, the Western Australian Government has determined that the longer-term solution to the supply of skilled labour for the resources sector in the state requires the development of regional centres (Regional Development Australia 2010). It has developed an ambitious Pilbara Cities plan, which includes the creation by 2020 of cities of 50 000 residents in Port Hedland and Karratha, and a further 15 000 residents in Newman.

Removing the differences in interstate taxation laws and the stamp duties associated with real estate may encourage worker mobility (Murdoch 2011). The offer of direct incentives such as lump sum payments or subsidy on travel costs could also be helpful in this regard.

There is however a clear gap in the research on the optimal incentives to offer workers to relocate for work. Even in the European Union – where labour mobility is a salient issue<sup>3</sup> – increases in labour mobility arise primarily as a 'by-product' of other policies (Bonin et al. 2008). Providing mobility allowances, which is a monetary subsidy to move, is the only known policy directly targeting mobility. As with the Australian policies just discussed, the key question is: what is the 'right amount' to offer to move for work.

## This study

If in a region a sector is expanding and it is largely profitable, then wages should rise in the sector to attract labour to the region, with spillover effects in complementary sectors. However, if the region is unable to attract the labour it needs, especially from regions experiencing high unemployment, then this suggests:

- Employers are unwilling to hire because applicants lack the appropriate skills and experience – labour demand-side factors.
- Individuals with the necessary skills are unwilling to move to where the jobs are without additional incentives, or do not have information about the opportunities that exist there – labour supply-side factors.

This study is about the supply side, particularly, the willingness to move for work. It investigates the types of incentives, in wage-equivalent terms, to offer individuals from New South Wales and South Australia, states with pockets of relatively high unemployment, to take up jobs in Karratha in Western Australia and Emerald in Queensland, two regional centres with relatively high demand for labour in 2012.

Individuals with the appropriate skills may choose not to move for a variety of reasons, including differences in the costs of living, such as housing, and the difficulty in moving the family. The

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<sup>2</sup> <<https://deewr.gov.au/information-job-seekers-about-move-2-work>>.

<sup>3</sup> For example, the European Commission declared 2006 as the 'European Year of Workers' Mobility'.

difference in the standard of living between the origin and destination can also be an important factor in the willingness to move. While the method adopted in this report is suited to measuring the unobservable values of different aspects related to the standard of living, our focus is more about job-related, rather than location-related, characteristics.

Designing worker mobility schemes requires an understanding of the factors that motivate workers to relocate. Inferring the influence of such factors through the use of observed migration behaviour is limiting because, at any given time, the number of people who migrate and the number who do not is a function of both labour demand and the supply conditions and, therefore, identifying whether the observed behaviour of an individual is due to supply- or demand-side factors can be difficult. For example, in observing the migration of a large number of engineers to Western Australia it is tempting to perhaps wrongfully conclude that engineers are willing to move, a purely supply-side factor, when in fact the driving force behind the migration could be the increased demand for engineers in the state.

In this study we use discrete choice experiments to investigate the factors that influence an individual's willingness to move for work. The experiments allow us to investigate whether distance to job matters; whether fly-in/fly-out contracts are more attractive than permanent relocation contracts; whether initial job training is valued by job seekers; and how individual characteristics, such as being married, affect willingness to move. The experimental design allows the relative importance of these factors to be estimated in wage-equivalent terms.

The importance of this research is underscored by the often ad hoc nature of policies seeking to move people from one location to another. By estimating the monetary value of an individual's willingness to move, we would know whether such policies are economically feasible and if they are, for what kind of worker and for what kind of job offer.

## Overview of contents

The next section provides a brief review of the literature on regional labour mobility. The third section includes a general non-technical description of discrete choice experiments, the design of this study and a description of the data. The fourth section discusses the results of fitting various econometric models to the data. The final section offers some concluding comments.

# Previous studies

The study of geographical labour mobility, which includes international and internal migration, often uses *revealed* preference data. Revealed preference is based on the premise that an individual's preference can be inferred from their actions. A person who takes up a job offer in another region and moves there is therefore revealing their preference to move. Some such studies use gross or net flows data (OECD 2005; Lawson & Dwyer 2002; Huber 2004; Bonin et al. 2008) and others use cross-sectional and panel microdata (Machin, Salvanes & Pelkonen 2012; Bover & Arellano 2002; Tatsiramos 2009; Carlsen, Johansen & Stambøl 2013).

Increasingly, researchers are using stated preference data. A stated preference is what individuals say they would do in a given context, for example, the intention to move under certain hypothetical circumstances. In some instances the data on stated preferences are collected using a single question embedded in a general survey (Drinkwater & Ingram 2009; Fouarge & Ester 2007); in other instances discrete choice experiments, in which respondents are presented with a series of hypothetical scenarios, are used for the purpose (Scott et al. 2012; Lagarde & Blaauw 2009). Although intention to move is not a perfect predictor of actual mobility, it has been shown to be a strong predictor of future behaviour (Böheim & Taylor 2002; Gordon & Molho 1995). One important advantage of using stated preference data is that the data include information on those who intend to move as well as those who do not, which then limits the problem of self-selection in the estimation (Bonin et al. 2008).

Anh, de la Rica and Ugidos (1999) examined unemployed workers' willingness to move for work and its relationship with their unemployment duration in Spain using a single question in the Spanish Labour Force Survey: 'Would you accept a job offer which implied a change of residence?' This is an example of a stated preference. The study found that family responsibilities, age and education were important factors explaining individuals' willingness to move, but duration of unemployment was not. Workers' willingness to move however increased substantially after their unemployment benefits were exhausted, suggesting that economic incentives could play an important role in the decision to move.

Tatsiramos (2009) examined the relationship between unemployment insurance and geographic labour mobility in five European countries, albeit using revealed preference data. According to him, the common view that the generous provision of unemployment benefits accounts for the low mobility in Europe ignores the fact that the generous benefits might also have a positive effect by relaxing liquidity constraints in the presence of mobility and search costs. His analysis showed that receiving benefits was not associated with lower mobility, and that the effects varied, depending on the institutional characteristics and the incentive structure of the unemployment insurance system of each country.

Drinkwater (2003) used data from the 1995 British Social Attitudes Survey to study willingness to move among Britons. Direct questions were asked of respondents to ascertain whether they were willing to move away from their neighbourhood, town/city, county, country and Europe if their living or working conditions could be improved. The study found that willingness to move declines with the distance of the move. Personal characteristics were found to be important determinants of the willingness to move, with the lowest-educated the least willing and recent migrants the most willing to move. It also found that more-educated people were more willing to move longer distances, whereas there was less variation across qualifications over shorter distances. Overall, the paper found a lack of a desire for people to move from the less prosperous parts of Britain.



In a follow-up study, Drinkwater and Ingram (2009) report a cross-country analysis of willingness to move using data from the 1995 International Social Survey Programme. They found that the willingness to move was only higher in a few other countries, including the United States, than in Britain. Willingness to move was found to be much lower in Eastern European countries and in several other European Union member states. While compositional effects, such as age and education, were generally important in explaining a large part of the variation in attitudes to willingness to move in Britain, structural effects such as institutions, history and culture tended to play a more dominant role in explaining differences in countries in Central and Eastern Europe.

Fidrmuc and Huber (2007) used data from the 1998 Survey on Economic Expectations and Attitudes conducted in the Czech Republic to examine the willingness of the Czech population to move. Respondents to the survey were asked the following hypothetical question: 'If you did not have a job but were offered one, together with accommodation in a flat, in another municipality, would you be willing to move?' The study found that personal and household characteristics were significant factors in explaining the intention to move, but regional characteristics and amenities were of little significance. The least willing to migrate were found to be family-house owners, the less-educated and the elderly, as well as those living in regions with above-average unemployment rates. Improving the efficiency of the housing market and addressing the problems of peripheral regions could improve labour-market adjustment through migration, but the authors warn that such policies are unlikely to yield rapid results, since the willingness to move of all subgroups analysed, except for the less-educated, reacts only weakly to regional labour market incentives and amenities.

Fouarge and Ester (2007) is another European-based study that examined intentions to move. It used data from the 2005 Eurobarometer Survey, which covered EU25 countries.<sup>4</sup> The question on intention to move was structured to obtain information on mobility at various levels – within same city/town/village, intra-region, inter-region, across borders within the EU and across borders outside the European Union. The findings from the study suggest that most Europeans have little inclination for inter-regional or international migration in the next five years – 8.6% intend to move to another region in their own country and 5.4% intend to move to another country. The intention to move was, however, higher in the new member states but even within these countries the level of intention varied. In common with many other studies, the highly-qualified and the young were more likely to consider moving, as were people who had been mobile in the past. Interestingly, even the prospect of higher pay was insufficient to motivate the lesser-qualified to consider a move. A possible explanation of such behaviour is that the less-educated are more strongly rooted in local communities and families.

The use of stated preference data to study human resources issues has been more common in the health workforce than in other sectors. Lagarde and Blaauw (2009) provide a review of ten studies, from developed and developing countries, which used discrete choice experiments to investigate the job preferences of health workers. A number of these, especially studies from developing countries, provided information on the locational preferences of workers. The overall results from the review demonstrate the relative importance of both pecuniary and non-pecuniary incentives, with the latter sometimes more powerful as determinants of preferences.

Among other issues, Lievens et al. (2010) investigated the willingness among medical and nursing students in Rwanda to practise in rural areas. They found the willingness to work in rural areas varied, with medical students less inclined than nursing students to consider the option. However, all students were willing to consider the option early in their career. A simple simulation showed that to

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<sup>4</sup> The 25 countries in the European Union.

get 80% of nursing students to take up a rural post the current average salary would need to increase by 80%. The study also reported that 24% of nursing students were willing to take up a rural post for a salary below the current starting salary. The reservation wages<sup>5</sup> were found to be lower for students whose first reason for taking up the rural post was to 'help the poor'.

Scott et al. (2012) is one of a very few Australian studies that has used a discrete choice experiment to investigate the willingness to move for work. They looked at general practitioners' preferences for moving to a rural location. The discrete choice experiment was conducted as part of the Medicine in Australia: Balancing Employment and Life (MABEL) survey, a longitudinal survey of general practitioners. In the experiment, respondents were presented with a number of scenarios from which they had to choose between two job options or to stay at their current job. The locational alternatives provided in the scenarios ranged from an inland town with a population of fewer than 5000 to a city or large regional centre with more than 20 000 people. Only a third of some 3700 respondents were found to be willing to move. An incentive of \$116 000, which is equivalent to 64% of average annual earnings, was estimated for encouraging a GP to accept a job with 'reasonable'<sup>6</sup> other conditions in a small inland town. The corresponding incentive for accepting a similar job in a medium inland town was estimated to be \$68 000. The least attractive rural package required incentives equivalent to 130% of annual earnings. Thus both location and job characteristics were found to be important in the decision to relocate.

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<sup>5</sup> Reservation wages is the level of wages below which jobs are not accepted.

<sup>6</sup> These include hours of work, on-call arrangements, practice team and arrangements for getting a locum on short notice.

# Method

## Discrete choice experiment

The discrete choice experiment is a technique for investigating individual preferences that are otherwise difficult to identify, measure and compare. In the context of this study, the method allows the valuation of different factors that influence job choices. The technique is attractive to researchers and policy analysts alike, because it provides quantitative information on the relative importance of the various job characteristics that influence the job choices of workers; the trade-offs between these characteristics; and the probability of take-up of specific jobs. It provides quantitative information, which is beyond the traditional qualitative or ranking and rating assessments, to better guide the adoption of the most appropriate policies for recruitment and retention in locations with skill-shortage problems (World Health Organization 2012).

Discrete choice experiments are used in many disciplines, including health economics (de Bekker-Grob, Ryan & Gerard 2012; Ryan, Gerard & Amaya-Amaya 2010; Scott 2001; Kolstad 2011) marketing and consumer choice (Revelt & Train 1998), transport economics (Louviere, Hensher & Swait 2000a) and valuation of non-market goods such as environmental assets (Alpizar, Carlsson & Martinsson 2003; Rolfe & Windle 2011). With the exception of Scott et al. (2012), who used discrete choice experiments to study general practitioners' willingness to move to regional Australia for work, the technique has seldom been used in Australia to study an individual's willingness to move for work.

The technique combines random utility theory with consumer theory, experimental design and econometric analysis (Thurstone 1927; Marschak 1960; McFadden 1974; Manski 1977). The concepts underlying these theories and how they are combined in a discrete choice experiment are difficult to explain in a report whose audience includes many policy analysts. For this reason, we provide below only a simple description of the method by way of an example. For the interested reader, further details are provided in appendix A and in Hanneman (1999).

First we introduce some terminology. Typically, a discrete choice experiment is conducted on a representative sample of individuals in the population of interest. Individuals are presented with a set of hypothetical scenarios or *choice sets*. In each choice set, individuals are offered the choice of several *alternatives*, from which they have to select one. Each alternative is generally characterised by a number of *attributes* and *levels* of those attributes.

Assuming that individuals behave rationally, in the sense that they make consistent choices, the data from the experiment allow an analyst to infer an individual's otherwise unobservable preferences.

In a discrete choice experiment on the willingness to pay for housing, for instance, the *alternatives* are houses. The *attributes* of the houses could be the construction material of the house, the number of rooms in the house and its price. The *levels* of the construction material could be bricks or wood; the number of rooms could range from two to six; and price could range from \$300 000 to \$700 000 in \$100 000 increments. Different combinations of attribute levels define an alternative.

By choosing one alternative over all others from a choice set, the respondent is revealing their willingness to trade off the various attributes associated with the alternatives. In the case of the house, for example, an individual may choose a wooden house with five bedrooms costing \$400 000 over a brick house with four bedrooms costing \$500 000, thus implicitly revealing a preference for an additional bedroom and a wooden house. By observing the same individual's choice over many

different choice sets, we can statistically pin down the monetary value of each attribute (see appendix A for further details).

In the choice experiment, the individuals taking part are typically presented with a number of choice sets, with the alternatives varying by level from set to set. Econometric methods are then used to analyse all the responses of all the individuals in the sample. The results provide estimates of, for instance, the average value placed on an additional room in a house or the difference in the value placed on a brick compared with a wooden house. Ultimately the aim is to estimate the relative value of each attribute.

The advantage of a choice experiment over asking a direct question, such as asking a person the amount they would be willing to pay for a brick house with five rooms, is that it allows an estimation of the relative value of each level of an attribute. Individuals generally have difficulty placing a value on a level of an attribute because it is not natural to consider an attribute in isolation from other attributes. In a choice experiment this problem is overcome by an appropriate design and the use of appropriate statistical methods for the analyses.

The following section outlines the design of the discrete choice experiment to investigate the willingness to move location for a job.

## Selection of experimental design and construction of choice sets

The aim of this study is to provide policy-makers with quantitative measures of the relative importance of the different job characteristics that influence the choice of workers to move to work in those areas of regional Australia where there have been reports of skill shortages and high levels of job vacancies. We consider the willingness to move for work of people living in New South Wales and South Australia, two states which at the time of the study had pockets of high unemployment. Each person in the experiment is offered a choice of jobs in just *one* of two regional locations: Karratha in Western Australia or Emerald in Queensland. This will allow us to determine whether the location is a factor in the willingness-to-move decision.

The study is designed to investigate:

- How wage incentives to accept a job in one of these locations vary with individual characteristics.
- How individuals value, in wage-equivalent terms, the relative importance of the different job characteristics? We focus on the following job characteristics:
  - geographical location of work
  - fly-in/fly-out versus permanent relocation
  - ongoing versus fixed-term contract
  - an initial training requirement versus no training requirement.

The job characteristics given above are some of the most important in the context of where jobs are offered, and to whom, in this study. For instance, Bahn, Yap and Barratt-Pugh (2012) reported ‘a genuine reluctance by skilled and experienced workers to move from Australia’s east to remote locations in Western Australia’. As already discussed, fly-in/fly-out contracts are frequently used in the resources sector but they have become a cause of concern lately in terms of the risk they pose for the sustainability of regional communities (House of Representatives Standing Committee on Regional Australia 2013; Barclay 2011; Buchanan, Baldwin & Wright 2011). The inclusion of initial training as a

job characteristic is to investigate whether training is important for job seekers, especially for workers who may be changing industry sector.

In the experiment, each person is asked to complete a two-part survey. The first part includes questions designed to collect data on individual characteristics, employment status and factors that are known to influence decisions on (internal) migration such as house ownership and past migration experiences.

The second part of the survey is the discrete choice experiment. Here each respondent is sequentially presented with five choice sets relating to jobs offers in one of the two regional locations. They are also presented with background information about the regional location (see appendix B for details). While the two locations differ to a small extent in the social, retail, education and health services they offer, by design the cost of renting or buying a house is the same in both locations. This allows us to control for the major part of the cost-of-living effects. People who have previously visited either of these two locations may perceive the information we provide differently from those who have never been to these two locations. However, the former can be identified from the first part of the survey and any bias due to differences in perception of the location can be detected.

In each choice set, the respondent is asked to choose one of two jobs offered. If they wish they may decline both job offers. An example of a choice set is shown in box 1. It shows the descriptions of two job offers – Job A and Job B.

The job offers in each choice set vary according to three attributes:

- wage
- relocation type
- type of contract.

The possible levels of each of these attributes are shown in box 2, with further details in appendix B.

The wage for each respondent is set at 40, 90 or 140% higher than the respondent's current wage. The wage offers for those who are looking for work, regardless of whether they are currently employed or not, are based on their expected wage. The information on expected wage is obtained in the first part of the survey.

An individual not currently looking for work is offered jobs in the same occupation they are currently in; otherwise, they are offered jobs in the occupation for which they have indicated a preference in the first part of the survey. This ensures that job offers are consistent with the skills and expectations of the individual.

Based on the number of alternatives, attributes and levels, 153 possible choice sets can be presented to each individual. This is clearly impractical to implement and, therefore, in the actual experiment only five choice sets are presented to each person. The choice of these sets is made in such a way as to maximise statistical efficiency (D-efficiency), although other criteria may also be used for the selection (World Health Organization 2012).

**Box1 An example of a choice set**

Attribute	Alternative		
	Accept Job A	Accept Job B	Reject A and B (status quo)
Wage (before taxes)	140% more than current/ expected wages	40% more than current/ expected wages	
Relocation	Full relocation	Fly-in/fly-out	Reject both job offers and stay with current employment situation
Contract	Fixed six months, no training	Ongoing with training	
<b>Your choice (tick one box)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Box 2 Attributes and their levels**

Attribute	Level
Wage (before tax)	40% above current wage
	90% above current wage
	140% above current wage
Relocation	Full relocation
	Fly-in/fly-out
Contract	Fixed-term, six months with no training
	Ongoing with training
	Ongoing without training

**Data**

We used an online survey to conduct the discrete choice experiment. This was undertaken between May and July 2012 by Pure Profile, a market research company with experience in discrete choice experiments. The company’s Australian database contains about 300 000 registered members in Australia. Our survey was restricted to people from this panel who were aged 18–64 years, in the labour force, not studying full-time and resident in New South Wales or South Australia.<sup>7</sup> Quotas were imposed to ensure that the final sample of responses reflected each state’s demographic profile in terms of age, gender, region and labour force status. One-third of the quota was reserved for respondents from South Australia and the rest for respondents from New South Wales. Although this leads to over-sampling from South Australia, it does ensure that the estimates are reliable.<sup>8</sup>

Using their panel-filtering software, Pure Profile ensured that the stipulated quotas were approximately achieved. Of the 3185 completed responses, 243 were considered unreliable because the respondents took fewer than five minutes to complete the survey.<sup>9</sup> Individuals who reported

<sup>7</sup> Pure Profile pays each respondent to the survey a flat fee of approximately \$6 for a completed survey.

<sup>8</sup> The population of South Australia is less than a quarter that of New South Wales.

<sup>9</sup> The average time to complete the survey was 15 minutes and five minutes or fewer is considered too short a time to complete and provide ‘considered’ responses.

earning less than \$24 000<sup>10</sup> or more than \$300 000 per annum were removed from the analysis, as were those individuals who reported working fewer than 30 hours per week. A similar exclusion rule, based on expected earnings and expected hours of work, was applied to those who were looking for work. The final usable sample consisted of 2331 individuals.

Table 1 shows selected characteristics of the final sample of respondents. These are generally consistent with the study's design criteria. In other words, the profile of the respondents in the sample reflects the population with respect to state, gender, labour force status and region. For instance, the 2011 census shows the 18 to 64-year-old cohort in the labour force in Australia to be:

- 40 years old (average age)
- 53% male
- 95% in employment
- 68% living in capital cities.

Our sample also roughly reflects the Australian population in 2011 in terms of the proportion who is married, including in a de facto relationship, (64%) and the proportion born overseas (29%).

People without qualifications (38%); people with less than Year 12 completion (37%); and people who are not studying (93%) in the population are, however, under-represented in the sample. While the proportion holding a bachelor or higher degree is much higher in our sample than in the general population, the proportion holding advanced diploma or lower-level qualifications is about the same.

Finally, about a third of all respondents in the survey, including all who were unemployed, were looking for a new job and just over a quarter were looking for a job interstate.

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<sup>10</sup> The \$24 000 figure was achieved by using the minimum wage of \$15.51 per hour at the time of the survey and a 30-hour working week.

**Table 1 Selected characteristics of respondents**

Characteristic	% of respondents	Characteristic	% of respondents
State of residence		Highest qualification	
New South Wales	71	Bachelor or higher	47
South Australia	29	Advanced diploma/diploma	14
Region		Certificate III/IV	16
Metropolitan	72	Certificate I/II	4
Non-metropolitan	28	No qualification	19
Sex		Highest level of schooling	
Male	57	Year 12	79
Female	43	Year 11 or lower	21
Average age (years)	39	Currently studying	
Country of birth		Yes	15
Australia	72	No	85
New Zealand	2	Labour force status	
Other	26	Employed	94
Marital status		Unemployed	6
Married/de facto	66	Looking for new job	
Single	34	Yes	32
Have children		No	68
Yes	51	Seeking work outside state	
No	49	Yes	28
Ever lived outside state		No	72
Yes	47	Average hours of work/week <sup>1</sup>	41
No	53	Average annual wage (\$) <sup>1</sup>	69,927
Permanent resident		Sample size	2,331
Yes	98		
No	2		
House ownership			
Yes (outright)	14		
Yes (mortgaged)	49		
No	37		

Note: <sup>1</sup> Excluding respondents who were unemployed.



# Results

## The effect of location and destination

The discrete choice experiment was designed so that one-half of the sample in each state is offered jobs in Karratha and the other half in Emerald. Each person in the survey was presented with five choice sets of job offers.

Pooling job acceptances across the entire sample and across all five choice sets provides a summary measure of the willingness to move (see table 2). There was a higher acceptance of job offers to work in Karratha by people in New South Wales than by people in South Australia, although the acceptance rates to work in Emerald were similar for the two states. Considering that New South Wales and Karratha are the furthest apart of all origin/destination combinations, the results suggest that the distance-to-work location is not particularly important in the decision to accept or reject a job offer.

A simple test of proportions suggests that people from New South Wales have a slightly higher willingness to move than people from South Australia. Overall, more than half of the people are willing to move for work if offered appropriate incentives. These results are more positive than those reported by Bahn, Yap and Barratt-Pugh (2012), who concluded ‘a genuine reluctance by skilled and experienced workers to move from Australia’s east to remote locations in Western Australia’.

**Table 2 Percentage of all job offers accepted (distance<sup>1</sup> to destination), pooled responses**

State of origin	Destination	
	Karratha (Western Australia)	Emerald (Queensland)
New South Wales	67 (5147 km)	64 (1444 km)
South Australia	60 (3762 km)	63 (2117 km)

Note: <sup>1</sup> Land distance from the capital city of the state.

## Determinants of willingness to move

This section reports on the effects of personal, educational and labour force characteristics, home-ownership status and social connectedness on an individual’s willingness to move for work. In other words, it is their willingness to accept a job offer in two locations. Responses from all five choice sets are pooled for this analysis. The pooling of responses increases the size of the sample, but it also raises the possibility of the correlation of responses due to unobserved factors. If for instance a person has a disability, which is not observed in our sample, then they may never choose to move, irrespective of the scenario presented to them. To account for this, we fit a random effects probit model to the data (Maddala 1987).<sup>11</sup> The dependent variable in this model takes the value 1 if the individual indicated they were willing to accept a job offer and it takes the value 0 otherwise. The explanatory variables and their associated marginal effects are included in table 3.

The results show no significant difference between willingness to move for jobs in Karratha and Emerald after controlling for the factors mentioned above. In a way this result is not surprising, as any relocation is equally ‘far away’ as any other, and distance is probably conceived in flying time in the

<sup>11</sup> In this model the dependent variable is binary with a value of 1 if a job offer is accepted and a value of zero if it is rejected.

decision-making process. Also, there is no significant difference in the willingness to accept a job if the person is a resident of South Australia or New South Wales.

Our results on the effects of individual characteristics on willingness to move largely confirm what has already been reported in the literature on labour mobility (Huber 2004; Bover & Arellano 2002; Tatsiramos 2009; Drinkwater & Ingram 2009; Böheim & Taylor 2002; Bonin et al. 2008; Fidrmuc & Huber 2007; Fouarge & Ester 2007).

Older people are less willing to move for work – for every one-year increase in age, the probability of accepting a job offer drops by 0.4%. The result is consistent with the human capital theory on migration decisions as proposed by Sjaastad (1962), which views migration as an investment in which costs are borne initially and returns accrue over time. In this respect, the time available to accrue the benefits diminishes with age and consequently so do the rates of return. The non-pecuniary costs of moving also tend to be higher for older people because of the loss of social capital that has been accumulated over time (Drinkwater & Ingram 2009).

The probability of a male accepting a job offer is 15% higher than a female. In the context of this study, the decisions of females may be affected by their perception of the two job locations, both of which are in remote regions with resource extraction, which as the dominant industry in the area traditionally has male-dominated employment practices.

Single people are significantly more willing to move for work than married people. Families generally have higher moving costs. The additional costs are not just financial but also social, as all members of the family unit have to adjust to life in a new location and break with already established employment, family and social networks. The insignificance of the effect of additional dependents, however, suggests that the most important cost may indeed be that of the partner being unable to find suitable work at the destination. This then is another form of moving cost (Bonin et al. 2008). These days, as family budgets are often based on two incomes, employment policies that hire couples, or offer ‘top-up’ premiums to partners for jobs in the local community may be one way to overcome this problem.<sup>12</sup> Overseas-born people are more likely to accept job offers than people born in Australia. This is consistent with research from the United States, which suggests that immigrants are more mobile across regions, industries and occupations than native-born workers (Borjas 2001; Orrenius & Zavodny 2009; Kochhar, Espinoza & Hinze-Pifer 2010). The overseas-born also have a lower opportunity cost in terms of an accumulated stock of social capital in moving (Hagan, MacMillan & Wheaton (1996).

The employment status of a person has a significant effect on their willingness to accept a job offer. We consider three labour force states for this variable – unemployed, employed and looking for work, and employed and not looking for work. A person who is unemployed has a 17% higher probability of accepting a job offer than a person who is employed and not looking for work. The corresponding probability for a person who is employed and looking for work is 21%. This suggests that those who want to change jobs are more willing to move than those who are unemployed.

Contrary to previous research on labour mobility, which shows mobility increasing with the level of education (Machin, Salvanes & Pelkonen 2012; Carlsen, Johansen & Stambøl 2013), in our analysis we find the level of education not significant in explaining the decision to move to a regional location for a job. Unlike most other studies on mobility, however, we control for the labour-demand factors through the design of the choice experiment, whereby each person is offered a job in their current

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<sup>12</sup> As suggested by a referee to this report.

occupation, thus matching labour demand to labour supply. Therefore, regardless of their education level, all individuals may be equally willing to move, but other constraints external to their willingness to move, such as a matching demand for their skills, may prevent them from actually moving. Bonin et al. (2008) also found no difference in the mobility of Europeans with different levels of education, except for the least-educated. As their model included industry sector and occupational dummies, most variation due to education is probably accounted for.<sup>13</sup>

Individuals are significantly more likely to accept a job offer if they are currently studying. The current study mode will generally be part-time, as full-time students are excluded from the sample.

People owning their own house, and especially if the house is under mortgage, are significantly less likely to accept a job offer than those who are renting. The result reflects the potential housing-related costs of moving and perhaps also the level of inefficiency in the housing market. Also in many European countries house owners and social housing renters are reluctant to accept jobs which require them to change residence (Barceló 2003; Huber 2004; Fidrmuc & Huber 2007; Bonin et al. 2008).

Knowing people at the location where the job is offered has a significant positive influence on the decision to accept a job offer, although, and surprisingly, having relatives at the location is not a significant factor. These are 'pull' factors not dissimilar to those that also drive international migration (Hatton & Williamson 2003, Massey et al. 1993; Massey, Goldring & Durand 1994; Fouarge & Ester 2007). Knowing people at the destination provides access to networks and plays an important role in the transfer of social capital and settlement information.

Finally, a person who has frequent social contact with others outside the home is significantly more likely to accept a job offer than others, which suggests that extrovert individuals are risk takers and more willing to move for work.

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<sup>13</sup> We also estimated a model that included occupation dummy variables in the specification, but found their effect to be statistically insignificant.

**Table 3 Probit estimates of willingness to accept job offers in Karratha and Emerald**

Explanatory variable	Marginal effect	P-value
Basic demographics		
Age <sup>1</sup>	-0.004	0.01
Male (Base category: Female)	0.146	0.00
Born in non-English speaking country (Base category)		
Born in Australia	-0.071	0.04
Born in New Zealand	0.055	0.52
Born in English-speaking countries excluding New Zealand	-0.042	0.60
Permanent resident (Base category: Not permanent resident)	0.059	0.55
Single (Base category: Not single)	0.072	0.03
Number of dependents <sup>1</sup>	0.009	0.47
Number of parents living in same state <sup>1</sup>	-0.003	0.53
Ratio of number of siblings living in same state to number of siblings <sup>1</sup>	0.032	0.36
Resident in South Australia (Base category: Resident in New South Wales)	0.012	0.70
Living in metropolitan area (Base category: Living in non-metropolitan area)	0.014	0.65
Education and employment		
Employed and not looking for work (Base category)		
Unemployed	0.169	0.00
Employed and looking for work	0.205	0.00
Number of years of schooling <sup>1</sup>	0.019	0.24
No qualification (Base category)		
Degree or higher	0.010	0.78
Advanced diploma/diploma/certificate III/IV	0.040	0.29
Certificate I/II or other certificates	0.001	0.95
Studying (Base category: Not studying)	0.093	0.01
Home ownership		
Do not own house (Base category)		
Own house	-0.087	0.08
Own house under mortgage	-0.088	0.01
Social connectedness		
Have been to destination (Base category: Not been to destination)	0.075	0.13
Know people at job location (Base category: Don't know people at job location)	0.134	0.01
Never lived outside state (Base category: Have lived outside state)	0.030	0.36
Have relatives at job location (Base category: Don't have relatives at job location)	0.016	0.43
Not involved with local community (Base category: Involved with local community)	0.017	0.54
Frequency of social contact <sup>1</sup>	0.039	0.03
Opinion on current neighbourhood <sup>1</sup>	-0.030	0.2
Opinion on current accommodation <sup>1</sup>	-0.053	0.02
Karratha (Base category: Offer to move to Emerald)	0.025	0.35
Block 1 <sup>2</sup>	-0.008	0.75

Notes: Total sample size 2331.

1 Non-dummy variable.

2 Experiment design variable.

## Estimates of marginal willingness to pay

The marginal rate of substitution between wages and an attribute is referred to as the marginal willingness to pay (MWTP), as it reflects the amount in wage-equivalent terms that a person is willing to forgo for the attribute. For example, if a person is willing to forgo (or trade off) \$1000 in wages for a job that includes training compared with a similar job that does not include training, then the marginal rate of substitution between wages and training is \$1000. A negative MWTP is the compensation (or wage premium) a person expects to receive for accepting a job with that attribute.

When combined with the information on the cost of altering each job attribute, the MWTPs have important policy implications, as they inform the development of the most cost-effective policies for attracting workers to regions experiencing high labour demand.

Monetary valuations for individual characteristics can also be calculated. Although the marginal rate of substitution between wages and an individual characteristic is also referred to as the MWTP, its interpretation is a little different because individuals cannot choose their own characteristics, at least not directly. In this case a positive value for MWTP can be interpreted as the amount in wage-equivalent terms that a person with a particular characteristic is willing to forgo to accept a job offer compared with a person without the characteristic. Alternatively, it is the amount a person without the characteristic has to be compensated to accept the job offer.

We use a mixed multinomial logit model (Revelt & Train 1998), which is a variant of McFadden's conditional logit model (McFadden 1974), to estimate the effects of the job attributes on the probability of accepting job offers.<sup>14</sup> First we discuss two issues with the potential to introduce bias in the results if they are not taken into account in the model specification. Wage offers in the discrete choice experiment were in terms of a multiple of the individual's current (expected) wage, which means that the higher the current (expected) wage, the higher was the amount offered in absolute terms. This has the potential to introduce bias in the results.<sup>15</sup> The problem is overcome by including the individual's current (expected) wage as an explanatory variable in the model specification.

The second issue relates to the wage expectation of people who are employed but who are looking for work. This group generally expects to earn more in the new job, although there may be individuals who wish to change jobs for non-pecuniary reasons. Based on the sample responses, this group on average expects to earn \$5119 more in a new job. As individuals in this group were offered wages based on their expected rather than actual wages in the choice sets, it may be difficult to know if the decision to accept a job offer was based on the higher wage offer or if it was on the basis of a genuine desire to change jobs. To account for the possible bias from this, we include the difference in the expected and current wage as an explanatory variable in the model specification.

As the level of complexity of the mixed multinomial logit model is much higher than the model estimated in the previous section, we use a more parsimonious specification by including only variables which were significant at 10% or lower level in the earlier model. The results from estimating this

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<sup>14</sup> The mixed multinomial logit model allows some coefficients to vary across individuals (as opposed to being fixed for all individuals), thereby minimising one of the most common issues with cross-sectional analyses, which is the correlation between unobserved and explanatory variables. A further advantage of this model is that it allows us to relax the Independence of Irrelevant Alternatives (IIA) and the Independent and Identically Distributed (IID) assumptions as well as accounting for the panel nature of the data.

<sup>15</sup> A priori it is unclear whether it is the absolute or relative wages that are more influential in the individual's decision-making.

model are in table C1 in Appendix C.<sup>16</sup> These results allow us to estimate the marginal willingness to pay, which is our primary focus in this section.<sup>17</sup> The results on MWTP are presented in table 4.

The MWTP estimates relating to the job attributes show that individuals are willing to trade off \$10 504 in wages to relocate to either Brisbane or Perth and secure a fly-in/fly-out contract rather than permanently relocate to one of the two regional locations where the jobs are offered. As all job offers require relocation by the worker from their current state of residence, accepting a job offer incurs the non-monetary costs of moving away from family, friends and familiar surroundings.<sup>18</sup> The fly-in/fly-out option, however, has two distinct advantages. First, both Brisbane and Perth have advantages with respect to climate and amenities (for example, choice of schools, health providers, housing and entertainment) that Karratha and Emerald are unlikely to be able to match. Second, there are savings in terms of the accommodation and meals provided while rostered for work.<sup>19</sup> A combination of both these factors may explain why individuals place a slightly higher value on the fly-in/fly-out option than on the permanent relocation to one of the regional locations.

An offer of a temporary job entails only six months of work and, therefore, the wage increase is effectively halved. Taking this into account, the results suggest that, on average over the six months of the contract, individuals require compensation of \$5618 to accept a temporary contract over an ongoing contract. Short-term contracts can generally incur additional costs to the worker in terms of the risk of periods of unemployment between jobs and/or possible relocation costs after the contract ends.

A contract that includes training incurs a wage penalty of 50% for the first three months, which is equivalent to a reduction in wages in the first year of, on average, \$9298. Despite the fact that, as far as possible, the job offers are matched to the individual's skill level, the results show individuals are willing to trade off \$6902 in annual wages for a contract which includes training. Training is thus considered a human capital investment and individuals are prepared to trade off wages in the short term with the expectation of higher wages later. It is possible that those who have a preference for training expect to change industry and thus require industry-specific reskilling.

The difference in the information contained in tables 3 and 4 with respect to individual characteristics is mainly in the metric used to report the results. For instance, from table 3 we know that individuals' willingness to accept job offers declines with age. In table 4 this is expressed in wage-equivalent terms: a wage premium of \$1046 is required for each one-year increase in the age of the individual. The table also shows that to accept a job offer:

- Women require a \$29 004 higher wage premium than men.
- People in married or de facto relationships require a \$19 206 higher wage premium than single people.
- People who are not studying require a \$25 736 higher wage premium than people who are studying.
- People who own their home (or have a mortgage) require a \$25 552 higher wage premium than people who rent.

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<sup>16</sup> Marginal effects can be calculated, but because our main focus is marginal willingness to pay, only logits are reported.

<sup>17</sup> Each MWTP estimate is derived by dividing the corresponding coefficient in table C1 in appendix C by the coefficient for wage attribute from the same table. The estimate in dollars is derived by multiplying this ratio by \$74 380, which is the sample average of current (expected) annual wage.

<sup>18</sup> These costs are likely to be relatively less for moving to a capital city than to either Emerald or Karratha.

<sup>19</sup> The savings from food alone amounts to \$5000 a year, assuming a person is rostered for 200 days in a year and food costs \$25 a day.

- Those who do not know people at the destination require a \$43 884 higher wage premium than those who know people at the destination.

In other words, a person with one of these characteristics has to be compensated by the relevant amount to accept the job offer compared with a person without the characteristic.

The marginal willingness to pay for an unemployed person is \$72 148. This means that the wage premium required to get a person who is employed and not looking for work (base category) to accept a job offer has to be more by this amount compared with a wage premium for the same job for an unemployed person. The estimate may vary depending on how long a person has been unemployed. The corresponding MWTP for a person who is employed and looking for work is \$60 760.<sup>20</sup>

In summary, the results show a preference for longer-term contracts and contracts that include training. These conditions could be offered as an alternative to higher wages. The significance of knowing someone at the destination in the decision to accept a job offer highlights the usefulness of local networks in recruitment efforts. Similarly, knowing that those who are studying are relatively more willing to accept job offers can help in the better targeting of recruitment campaigns.

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<sup>20</sup> The reason why this result appears to be inconsistent with the corresponding result in table 3 is because in table 4 we control for the fact that individuals with high wage expectations are offered higher wages.

**Table 4 Estimates of marginal willingness to pay, percentage and dollar equivalent of average annual wage**

		MWTP estimate	Confidence interval <sup>1</sup>	
			lower 95%	upper 95%
<b>Job attributes</b>				
Annual wage attribute	%	100	100	100
	\$	74,380	74,380	74,380
Fly-in/fly-out	%	14.1	10.4	18.0
	\$	10,504	7,744	13,357
Temporary contract	%	-15.1	-17.8	-12.5
	\$	-11,236	-13,260	-9,321
With training	%	9.3	6.8	11.9
	\$	6,902	5,053	8,832
<b>Individual characteristics</b>				
Age <sup>2</sup>	%	-1.4	-2.3	-0.6
	\$	-1046	-1,731	-421
Male	%	39.0	21.9	58.1
	\$	29,004	16,311	43,249
Born in Australia	%	-20.0	-39.2	-0.3
	\$	-14876	-29,135	-230
Single	%	25.8	7.3	45.2
	\$	19,206	5,398	33,593
Employed and looking for work (Base category)				
Unemployed	%	97.0	60.4	139.6
	\$	72,148	44,942	103,844
Employed, looking for work	%	81.7	61.5	104.0
	\$	60,760	45,713	77,338
Currently studying	%	34.0	7.6	58.4
	\$	25,736	5,642	43,439
Own house	%	-34.4	-54.7	-13.4
	\$	-25,552	-40,687	-9,949
Have been to destination*	%	25.0	-15.7	63.0
	\$	18,595	-11,699	46,856
Know people living in destination	%	59.0	17.2	98.6
	\$	43,884	12,760	73,339
Frequency of social contact <sup>2*</sup>	%	7.3	-4.1	18.7
	\$	5,401	-3,049	13,913
Opinion on current accommodation <sup>2</sup>	%	-22.3	-34.6	-10.3
	\$	-16,618	-25,716	-7,636
<b>Other controls</b>				
Constant (moving-specific)	%	-41.0	-93.4	11.5
	\$	-30,496	-69,503	8,534
Current/expected wage ('000)	%	0.5	0.3	0.8
	\$	370	194	567
Actual/expected wage gap for employed	%	0.4	0.04	0.77
	\$	297	33	569

Notes: Random coefficients were specified for all four job attributes and estimated using 400 Halton draws (Train 2009). The triangular distribution was used for the annual wage attribute to restrict the estimates between to non-negative values. For the other three attributes the normal distribution was used. The wage attribute was imputed into the model as a percentage increase from the person's current (expected) wage. MWTPs in absolute terms were derived by multiplying the percentage-based MWTP by \$74 380, which is the average current/expected annual wage for the sample.

All variables are significant at the 5% or lower level except those marked with an asterisk (\*).

1 Simulated confidence intervals using Krinsky-Robb procedure (Krinsky & Robb 1986).

2 Non-dummy variables.



## Estimates of total willingness to pay

From a policy perspective it is useful to know the total, in wage-equivalent terms, that a person with certain characteristics is willing to forgo, or requires to be compensated, to accept a specific job offer. This is referred to as the total willingness to pay (TWTP),<sup>21</sup> with a positive value indicating the amount individuals are willing to forgo and a negative value indicating the amount they have to be compensated. The results from table 4 allow us to calculate the TWTP for any individual in the sample and for any combination of the three non-wage job attributes. Appendix D includes the formula for calculating the total willingness to pay.

Our experimental design does not include a wage reduction as a condition of any job offer and, therefore, interpreting positive TWTPs requires caution. As positive values of TWTP relate to individuals who are implicitly willing to accept job offers without being offered a wage premium, for practical purposes the TWTP for them might as well be considered zero.

As an illustration, we calculated for each person in the sample the TWTP for accepting jobs that are ongoing, have no training component and which require relocation to either Emerald or Karratha.<sup>22</sup> The distribution of these TWTPs is shown in figure 1. The variation in the TWTP reflects the differences in individual characteristics. Overlaid on the histogram is the kernel density plot of the distribution (solid line) and also the normal distribution (dotted line) with the same mean and standard deviation to indicate the closeness of the sample distribution to the normal distribution. The mean value of this distribution is negative \$51 752 and the standard deviation is \$54 000. This means that to get 50% of the sample to accept jobs of this type requires offering wage compensation of at least \$51 752. The 14% of the sample with positive TWTPs<sup>23</sup> are individuals willing to accept job offers without any wage premium.

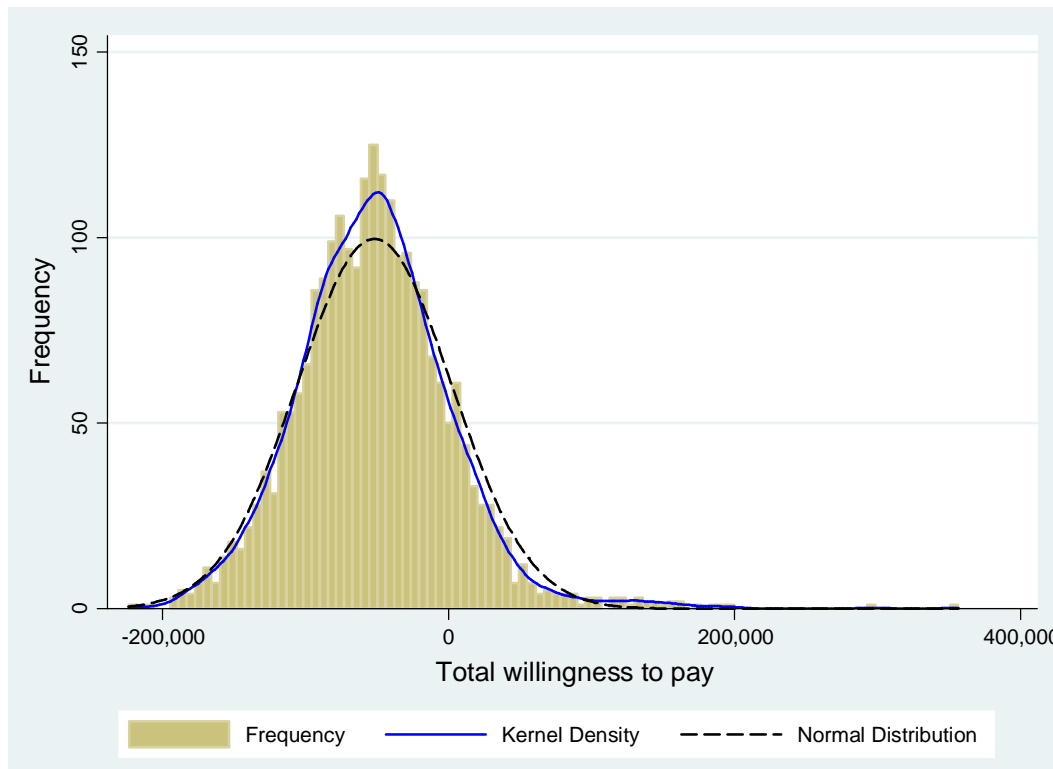
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<sup>21</sup> TWTP is essentially the sum of the various MWTPs conditioned on each individual's actual characteristics. A mathematical definition is provided in appendix D.

<sup>22</sup> In other words the three dummy variables in equation (3) in appendix D are set to zero. The explanatory variable showing the difference between the actual and expected wage for persons who are employed is also set to zero when calculating TWTPs. This reduces the bias associated with individuals with high wage expectations receiving higher wage offers.

<sup>23</sup> This is represented by the area bounded by the curve and the x-axis between the vertical lines  $x = 0$  and  $x = \infty$ .

**Figure 1** Distribution of total willingness to pay (TWTP) for accepting a job offer which is ongoing, has no training component and requires a person to relocate to either Emerald or Karratha



Note: The mean and standard deviation of the above distribution is \$51 752 and \$54 000, respectively.

We next consider the total willingness to pay for three mutually exclusive and exhaustive groups who are offered the same type of jobs as above. These groups are:

- young: single, looking for work (includes all who are unemployed) and under 30 years of age (4%)
- old: married, employed and not looking for work, own a house and over 40 years of age (18%)
- the rest: neither young nor old (78%).

Comparing the average TWTP of the old and young groups will provide a contrast in the willingness to accept job offers, as the groups are at the opposite ends of the mobility spectrum.

Table 5 shows the minimum TWTP for 25, 50 and 75% of each group to accept job offers. As discussed earlier, a positive value for the TWTP is an indication that individuals are willing to forgo a wage premium to accept a job offer. A negative value, on the other hand, indicates that a job offer will only be accepted if a wage premium is paid. The results show that up to 25% of the sample is willing to accept the job offer if it includes a minimum annual wage premium of \$22 379. The minimum wage premia for 50 and 75% of the sample to accept the job offer are \$52 875 and \$85 725, respectively. More than 75% of the young group is willing to accept the job offer. In contrast, none of the old group is willing to accept the job offer without a wage premium. As the wage offer for those who are looking for work is based on their expected wage, the results for the young group, which includes all unemployed people, suggest willingness to lower their wage expectation to secure a job offer.

**Table 5 Minimum total willingness to pay to get 25, 50 and 75% of a group to accept jobs which are ongoing, have no training component and require relocation to either Emerald or Karratha**

Group	% of sample accepting job	Minimum wage premium (\$)		
		Estimate	95% confidence interval	
			Lower	Upper
Young	25	32,200	-11,370	84,746
	50	18,343	-25,899	65,283
	75	795	-46,324	43,058
Old	25	-78,132	-123,722	-27,346
	50	-98,400	-159,619	-39,618
	75	-123,080	-213,616	-52,472
The rest	25	-19,872	-66,038	33,211
	50	-45,607	-95,102	2,489
	75	-75,240	-134,410	-21,344
All	25	-22,379	-68,576	29,971
	50	-52,875	-102,753	-3,787
	75	-85,725	-148,730	-30,797

Note: Confidence intervals are calculated by summing the simulated variance of each MWTP estimate.

Table 6 shows the percentage of each group willing to accept the jobs without a wage premium. Thus willingness to accept job offers in Karratha and Emerald without a wage premium, especially among the young, is strong. The reasons why this is not actually observed could be due to a lack of information on job opportunities. It could also be that there is a mismatch in the skills these people have to offer and the skills in demand.

**Table 6 Per cent of a group willing to accept jobs, which are ongoing, have no training component and require relocation to either Emerald or Karratha, without a wage premium**

Group	Estimate	95% confidence interval	
		Lower	Upper
Young	75	11	100
Old	0	0	9
The rest	14	0	48
All	14	1	53

Note: Confidence intervals are calculated by summing the simulated variance of each MWTP estimate.

For the purposes of developing policies that seek to use wage incentives to encourage labour mobility, it thus makes sense to exclude from the analysis individuals who are likely to move without a wage premium. As they would have accepted the jobs without a wage premium, they are not of interest for policies using monetary incentives to move people for work. In table 7 we re-estimate the minimum TWTPs shown in table 5 but for a restricted sample, one that excludes all individuals who would have accepted a job offer without a wage premium.

As none of the old group is willing to accept a job offer without a wage premium, the whole group is included in the restricted sample, which means that the results for this group in tables 5 and 7 are identical. The minimum TWTPs however change for all other groups. For instance, the minimum wage premium required to get 75% of individuals in the restricted young group to accept the jobs is now \$15 680, and to get 25% of the whole restricted sample to accept the jobs it is \$37 671.

About 25% of the restricted young group, which is 6% of the original group, is willing to accept the job offer if it included a wage premium of \$3720. The limited success, in terms of the numbers of people

who participated, of programs such as Move 2 Work and Connecting People with Jobs, which offered a similar amount in direct monetary incentives, suggests that the observed patterns in geographic labour mobility in Australia may be less related to a willingness to move and more to labour demand-side factors.

**Table 7 Minimum total willingness to pay to get 25, 50 and 75% of a group in the restricted<sup>1</sup> sample to accept jobs which are ongoing, have no training component and require relocation to either Emerald or Karratha**

Group	% of sample accepting job	Estimate	Incentive required (\$)	
			Lower	Upper
Young	25	-3,720	-47,781	45,559
	50	-7,476	-55,416	37,975
	75	-15,680	-76,653	26,817
Old	25	-78,132	-123,722	-27,346
	50	-98,400	-159,619	-39,618
	75	-123,080	-213,616	-52,472
The rest	25	-32,256	-77,364	17,336
	50	-52,754	-103,157	-4,421
	75	-80,156	-142,760	-24,897
All	25	-37,671	-82,180	-13,284
	50	-61,529	-113,139	-12,294
	75	-91,841	-157,835	-34,328

Notes: Confidence intervals are calculated by summing the simulated variance of each MWTP estimate.

<sup>1</sup> The restricted sample excludes individual who are willing to accept job offer without additional wage incentive.

The estimates of the proportion who will accept the job offers are upper bounds. This is because there may be individuals in the sample who may not move even if the wage premium offered matches their total willingness to pay. As discussed earlier, this could be a result of either a lack of information or a lack of demand for their skills. The 14% in the sample who implicitly indicate accepting the job offers without a wage premium (see table 6) is evidence of this.

On the other hand, knowing the proportion who is willing to accept the jobs without a wage premium helps to place a value on alternative policies designed to encourage geographical labour mobility. For example, if the objective of a policy is to get 14% of the population to accept jobs of the type discussed in this section, and the policy is based only on monetary incentives, then the 14% of the population who is willing to accept the jobs without a wage premium will be unaffected by the policy, since they would have moved if they could have. Using calculations similar to those in table 7, it can be shown that to get 14% of the restricted sample to accept the jobs will require offering a wage premium of at least \$24 393 per person per year. This cost should be compared with the cost of alternative policies that directly address the information deficit (for example, labour market and career information for job seekers and services matching job seekers with job vacancies) and which improve education and training responses. These alternative policies may, for example, cost less than \$24 393 per person but may very well get the 14% with zero or positive TWTPs to move without any direct monetary incentive.

# Concluding comments

In this study we investigated the willingness of residents of New South Wales and South Australia to accept job offers in Karratha and Emerald. The aim of the study was to identify how individual characteristics are related to a willingness to accept job offers, but more importantly the monetary value placed on the different attributes of a job offer. The study used a discrete choice experiment to collect data on the stated preferences of a sample of people from these two states.

The study is unique in two ways. First, our estimates of willingness to move are not confounded by demand-side factors. This is because the jobs offered to an individual in the experiment closely match their current (desired) job, thus effectively controlling for labour demand. Second, by offering a wage premium on their current (expected) wage in the job offers allowed us to value, in monetary terms, the other attributes of a job offer, as well as the relative ‘value’ of individual characteristics. These estimates are important for conducting cost–benefit analyses of policies that seek to move people for work through direct monetary incentives.

With respect to the effects of individual characteristics on the willingness to move, the results from this study generally concur with those reported in the literature on labour mobility. Distance to location does not appear to be a factor in the decision to accept a job offer, presumably because the perception of distance in the decision-making process may be in terms of flying time rather than physical distance.

The wage premium necessary to attract individuals to accept job offers may be partially offset by offering initial training and long-term contracts. The implication of this result is that policies promoting geographic labour mobility are more likely to succeed if the employment contracts include upskilling or reskilling opportunities, possibly with employer input on the nature of training, and if the contracts are not short-term.

Individuals also place a higher value on contracts offering the fly-in/fly-out option compared with contracts requiring a permanent relocation to either Emerald or Karratha. After discounting the savings related to accommodation and meals while being rostered for work, the trade-off for the fly-in/fly-out option is, however, not particularly large.

Contrasting the limited success of programs such as Move 2 Work and Connecting People with Jobs with our overall results suggests that the observed patterns in geographic labour mobility in Australia may be less related to willingness to move and more to labour demand-side factors.

The focus of our study was on supply-side factors but future research using discrete choice experiments could consider varying demand-side factors, for example, by offering jobs with training and in non-matching occupations. In this way we may be able to gain insights into the effectiveness of subsidising training in alternative areas. Future work may also look at the extent of the mismatch between actual labour demand and the skills of those who are the most willing to move.

This research has demonstrated that discrete choice experiments provide a useful tool for understanding individuals’ job and training preferences and the value they place on different aspects of these preferences. In particular, they could show which aspects of jobs and training can improve geographical labour mobility. The strong willingness to move for work indicated by the unemployed suggests the potential for improving social inclusion through labour-mobility schemes.

## Limitations

The sample for the discrete choice experiment consists of individuals from New South Wales and South Australia. While this may raise questions about the generalisability of the results to the whole Australian population, our analysis shows that the state of residence and the location of jobs are insignificant in the willingness to accept a job offer. Therefore, widening the study to other states may not necessarily change the results materially.

The job offers to respondents in the sample are hypothetical and decisions to accept or reject them were made in a relatively short time. In real life, consideration of job offers often takes longer than this. Although, generally, respondents do not deliberately give false responses, their responses may be biased if they know the choices they make are inconsequential. It is possible that some respondents may indicate a higher willingness to accept jobs in the hope that programs will be developed to assist them to find such jobs. Indeed some respondents asked in the comments section of the survey whether such jobs were actually available. In the literature on discrete choice experiments, hypothetical bias exists in many forms, although the bias tends to be reduced when individuals are presented with more objective information directly related to their experience or when the good is private rather than public (John & Craig 2001; Hensher 2010). Such biases are generally context-related and the results from other studies are not transferable.

The experiment design did not include job offers with wage cuts. The predictions of positive total willingness to pay implicitly assume a linear effect based on the wage premiums offered. Therefore the results have more validity for individuals who are paid a wage premium to relocate than for those who are prepared to lower their wage expectation.

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# Appendix A: Choice experiments

The popularity of choice modelling (CM) is due to widespread use of contingent valuation (CV) in cost–benefit analyses. CV is a stated-preference (SP) survey method for eliciting willingness-to-pay information from individuals. SP methods are particularly important for public goods (for example, valuation of environmental assets), where there is no obvious observed individual ‘consumption’ of a good due to its non-rival nature and where externalities from consumption exist. Generally, it is well suited for providing valuations of goods whose monetary values are not obvious.

However, there has been significant criticism of SP methods, which culminated in the National Oceanic and Atmospheric Administration (NOAA) report by, among others, Nobel prize winners Kenneth Arrow and Robert Solow, which offered strict guidelines on how CV surveys were to be carried out (Arrow et al. 1993). Since then CV has evolved from a survey where participants expressed exactly how much they are actually willing to pay for certain policies, to one where participants were told the costs of policies, and were asked whether they would be willing to incur those costs. Further work has refined the method and increased its robustness in a variety of ways, which will be briefly discussed.

CM can be seen as the general case of the dichotomous CV. The dichotomous CV generally involves presenting subjects with two hypothetical options: one involving a ‘status quo’ option, and the other a proposed policy change, along with the consequences the policy change will bring. These changes or variations are termed the ‘attributes of options’ and one of the attributes that is always included is the individual, or private, cost of having the policy implemented. Subjects are then asked to choose their most preferred option. CM is more general, in that it allows for more than two choices in each choice set and therefore a wider range of trade-offs between multiple attributes.

The simple idea behind CM is that an individual  $i$  chooses an option  $j$  based on two major components: the deterministic component  $D$ , which is a function of the attributes of the option  $A_j$ , and the stochastic component  $E$ , which is a function of some random process for which distributional assumptions are imposed. The assumption for the random component in decision-making has its roots in random utility theory (Marschak 1960). The individual’s choice of an option can then be expressed as choosing the alternative with the highest utility,  $U$ , where:

$$U_{ji} = D(A_j) + E$$

This lends itself to econometric modelling using McFadden’s conditional logit (McFadden 1974), which can then inform us on how a change in the level of an attribute in an alternative (for example, the amount of pollution reduced as a result of a policy) will affect the probability of an individual choosing that option. When a monetary value such as cost is included as an attribute, it allows us to convert any probability to an equivalent monetary value; therefore, effectively expressing willingness to pay or be paid estimates for any non-monetary attribute. In the current study on willingness to move for work, the ‘cost’ variable is the wage attribute, since individuals must be paid, or be willing to give up wages, to accept a job offer. All estimates can therefore be normalised using the coefficient on wages. This leads to what is known as the marginal willingness to pay. We provide more details on how to calculate this in appendix D.

Recent reviews and discussion of the methodology can be found in List, Sinha and Taylor (2006), Ryan and Whelan (2010), Alpizar, Carlsson and Martinsson (2001), Hensher, Rose and Greene (2005) and Louviere, Hensher and Swait (2000b).

# Appendix B: Jobs choice context

This section presents several job offer scenarios to you. Each scenario contains two job offers – Job A and Job B. Please compare the characteristics of each offer with your own current employment situation. Depending on what is best for you, select one of the three following options:

- 1 Accept Job A
- 2 Accept Job B
- 3 Reject both jobs and stay with your current employment situation.

In each scenario, please consider the job offers as if they were real since your responses will inform policies relating to employment and labour mobility.

## Features common to all job offers

A large company with over 500 employees wants to recruit enthusiastic individuals to work on its regional projects.

The job being offered to you is a position identical to (your current occupation)/(the occupation you would like to work in). All the offers are for full-time work and attract standard 20 days annual leave, 15 days annual sick leave and 9% superannuation.

## Jobs in Emerald, Queensland

### Emerald, Queensland, 700 km north-west of Brisbane

Emerald is a town located in the centre of regional Queensland. It has a population of about 12 000. It is 300 km from the coast. Rockhampton is the nearest big city, with a population of 80 000, 270 km east of Emerald. The average daily temperature in Emerald ranges from 16 °C to 30 °C. The main industries around Emerald include coal, gems, cotton, fruits and grain.



## What does Emerald offer?

- *Services:* Emerald provides a full array of services for its residents, including a community centre, a library, churches, a recreational centre, a shopping centre (including Coles and Woolworths supermarkets), a cinema, sports clubs, childcare services, a post office, an airport and a regional court.
- *Education:* Emerald has three government primary schools, two private primary schools, one government and two private high schools, a Central Queensland University campus and Emerald Agricultural College.
- *Health:* Emerald has a district hospital.

## Features that differ across job offers in Emerald

Both job offers have identical characteristics, as described above. However, they differ with respect to three characteristics:

- 1 *Wage:* the amount that you will be paid per week before taxes will vary with each job offer.
- 2 *Relocation package:* you will be offered one of the following two relocation packages with each job offer:
  - a) *Full relocation:* you will need to relocate to Emerald to take up this position. The cost of relocation, including flights and movers, will be paid in full by the company and will also include the cost of moving family members if they relocate with you. At Emerald, you will work a standard 38-hour/5-day week. You will need to arrange for your own accommodation. The average rent for a one and a three bedroom house/unit is \$550 and \$1050 per week, respectively. The average cost of purchasing a one and a three bedroom house/unit is \$275 000 and \$549 000 respectively.
  - b) *Fly-in/fly-out:* you will need to relocate to Brisbane to take up this position. The cost of relocation, including flights and movers, will be paid in full by the company and will also include the cost of moving family members if they relocate with you. From Brisbane you will alternate between being flown to Emerald where you will work for two weeks, and then being flown back to Brisbane for one week of leave. The company will pay all your travel expenses between Brisbane and Emerald. You will work an average of eight hours a day for 12 of the 14 days that you are on site in Emerald. You will need to arrange for your own accommodation in Brisbane but in Emerald your accommodation and food will be provided by the company. The average rent for a one and a three bedroom house in Brisbane is \$385 and \$635 per week, respectively. The average cost of purchasing a one and a three bedroom house/unit is \$303 000 and \$510 000 respectively.
- 3 *Contract:* you will be offered one of the following three contracts with each job offer:
  - a) *Ongoing with training:* Your employment contract will be ongoing. For the first three months you will undergo on-the-job as well as off-the-job training to equip you with skills specific to your new position. During this period half of your wages before tax will be deducted to pay for the cost of the training.
  - b) *Ongoing, no training:* your employment contract is ongoing. The contract does not require you to undertake training.
  - c) *Fixed six months, no training:* your contract will be for six months and it will be non-renewable. The contract does not require you to undertake training.

In each scenario presented to you, the characteristics of each job will be clearly stated. You should compare these three characteristics before deciding which job to accept. If neither of the job offers is acceptable to you then choose option 3.

## Jobs in Karratha, Western Australia

### Karratha, Western Australia, 1500 km north of Perth

Karratha is the major town in the Pilbara region, with a current population of about 12 000. It is located approximately three km from the coast. The daily average temperature in Karratha ranges from 20 °C to 32 °C. The region around Karratha produces 35% of Australia's minerals and petroleum output. The Western Australian Government, through its Pilbara Cities Initiative, plans to invest \$1 billion in this region over the next four years. One of the aims of the initiative is to transform Karratha into a major city with a population of 50 000 by 2020.



### What does Karratha offer?

- **Services:** Karratha provides a full array of services for its residents, including a community centre, a library, churches, a recreational centre, the largest shopping centre in the Pilbara region (including Coles and Woolworths supermarkets and K-Mart store), a cinema, sports clubs, childcare services, a post office, airport and a regional court.
- **Education:** Karratha has four government primary schools, one private primary school, one government and one private high school and also a TAFE centre with university facilities.
- **Health:** Karratha has a district hospital and a medical centre which offers same-day appointments and is open seven days a week.

### Features that differ across job offers in Emerald

Both job offers have identical characteristics as described above. However they differ with respect to three characteristics:

- 1 **Wage:** the amount that you will be paid per week before taxes will vary with each job offer.
- 2 **Relocation package:** you will be offered one of the following two relocation packages with each job offer:
  - a) Full relocation: you will need to relocate to Karratha to take up this position. The cost of relocation, including flights and movers, will be paid in full by the company and will also

include the cost of moving family members if they relocate with you. At Karratha, you will work a standard 38-hour/5-day week. You will need to arrange for your own accommodation. The average rent for a one and a three bedroom house/unit is \$550 and \$1050 per week, respectively. The average cost of purchasing a one and a three bedroom house/unit is \$275 000 and \$549 000 respectively.

- b) Fly-in/fly-out: you will need to relocate to Perth to take up this position. The cost of relocation, including flights and movers, will be paid in full by the company and will also include the cost of moving family members if they relocate with you. From Perth you will alternate between being flown to Karratha where you will work for two weeks, and then being flown back to Perth for one week of leave. The company will pay all your travel expenses between Perth and Karratha. You will work an average of 8 hours a day for 12 of the 14 days that you are at on site at Karratha. You will need to arrange for your own accommodation in Perth but in Karratha your accommodation and food will be provided for by the company. The average rent for a one and a three bedroom house in Perth is \$385 and \$635 per week, respectively. The average cost of purchasing a one and a three bedroom house/unit is \$303 000 and \$510 000 respectively.

3 *Contract*: you will be offered one of the following three contracts with each job offer:

- a) Ongoing with training: your employment contract will be ongoing. For the first three months you will undergo on-the-job as well as off-the-job training to equip you with skills specific to your new position. During this period half of your wages before tax will be deducted to pay for the cost of the training.
- b) Ongoing, no training: your employment contract is ongoing. The contract does not require you to undertake training.
- c) Fixed six-months, no training: your contract will be for six months and it will be non-renewable. The contract does not require you to undertake training.

In each scenario presented to you, the characteristics of each job will be clearly stated. You should compare these three characteristics before deciding which job to accept. If neither of the job offers is acceptable to you then choose option 3.

# Appendix C: Estimates from mixed multinomial logit model

**Table C1 Mixed multinomial logit estimates of willingness to accept job offers in Karratha or Emerald from model with job attributes**

	Coefficient	Standard error
<b>Job attributes</b>		
Annual wage attribute	2.152	0.06
Fly-in/fly-out	0.306	0.04
Temporary contract	-0.326	0.03
With training	0.199	0.03
Constant (moving-specific)*	-0.876	0.58
Annual wage attribute (assumes standard deviation of a triangular distribution)	2.152	0.06
Fly-in/fly-out (assumes standard deviation of normal distribution)	1.131	0.06
Temporary contract (assumes standard deviation of normal distribution)	0.197	0.08
With training (assumes standard deviation of normal distribution)*	0.007	0.04
Constant (moving-specific) (assumes standard deviation of normal distribution)	3.707	0.13
<b>Individual characteristics</b>		
Age <sup>1</sup>	-0.031	0.01
Male	0.845	0.20
Born in Australia	-0.424	0.21
Single	0.557	0.21
Unemployed	2.092	0.43
Employed, looking for work	1.772	0.24
Currently studying	0.721	0.27
Own house	-0.741	0.22
Have been to destination*	0.532	0.42
Know people living in destination	1.261	0.45
Frequency of social contact <sup>1*</sup>	0.157	0.12
Opinion on current accommodation <sup>1</sup>	-0.481	0.14
<b>Other controls</b>		
Current/expected wage ('000)	0.011	0.003
Actual/expected wage gap for employed	0.009	0.004
McFadden Adjusted R-Square <sup>^</sup>	0.30	
Log-likelihood	-8968.27525	

Notes: Random coefficients were specified for all four job attributes and estimated using 400 Halton draws. The triangular distribution was used for the annual wage attribute to restrict the estimates between to non-negative values. For the other three attributes the normal distribution was used. The wage attribute was imputed into the model as a percentage increase from the current (expected) wage.

All estimates are significant at the 5% or lower level except those marked with an asterisk (\*).

<sup>1</sup> Non-dummy variables.

<sup>^</sup> Calculated using constant only MNL model as base case.

# Appendix D: Estimation and design

Respondent  $i$ 's utility from choosing alternative  $j$  from choice set  $s$  can be expressed as:

$$U_{ijs} = \beta_1(wage_{ijs}) + \beta_2(FIFO_{ijs}) + \beta_3(Training_{ijs}) + \beta_4(Temporary_{ijs}) + \gamma X_i + \epsilon_{ijs} \quad (1)$$

where

$\beta_1, \beta_2, \beta_3, \beta_4$  are coefficients corresponding to the respective job characteristics, while  $\gamma$  is a vector of coefficients corresponding to individual coefficients

$wage_{ijs}$  is the annual wage expressed as a percentage of the annual wage of the respondent's current job or expected job if they are looking for work

$FIFO_{ijs}$  takes the value 1 if the job offer involves a fly-in, fly-out arrangement and takes the value 0 otherwise

$Training_{ijs}$  takes the value 1 if the job offer involves three months of training with a reduced wage and takes the value 0 otherwise

$Temporary_{ijs}$  takes the value 1 if the job offer involves a temporary six months position and takes the value 0 otherwise

$X_i$  is a vector of individual characteristics

$\epsilon_{ijs}$  is an error term whose distribution will vary depending on the modelling assumption.

Equation (1) can be estimated by McFadden's conditional logit (McFadden 1974). The software Ngene (developed by ChoiceMetrics Pty Ltd) was used to generate a two-block, five-choice set design that minimises the D-error of the coefficients of the equation above (Hensher, Rose & Greene 2005). The coefficients used to generate the design were from a pilot survey conducted on TAFE (technical and further education) students at a TAFE institute in Victoria.

The estimates for marginal willingness to pay presented in this report were estimated using the Mixed Multinomial Logit (MMNL) (Revelt & Train 1998) using the following specification in order to relax some restrictive assumption for the basic conditional logit:

$$U_{ijs} = \delta_{1i}(wage_{ijs}) + \delta_{2i}(FIFO_{ijs}) + \delta_{3i}(Training_{ijs}) + \delta_{4i}(Temporary_{ijs}) + \gamma X_i + error_{ijs} \quad (2)$$

where

$$\delta_{ki} = \bar{\delta}_k + \eta_k Z_{kij}$$

and  $k$  which ranges from 1 to 4 represents the four job attributes.

Each coefficient associated with a job characteristic has a subscript  $i$ . As shown in the definition, these coefficients now vary across individuals – they are in fact assumed to be distributed according to some distributional assumption imposed on  $Z_{kij}$ .  $\bar{\delta}_1$  is the estimated mean of this distribution, while  $\eta_k$  is the estimated standard deviation. In our application, we assume that  $Z_{kij} \sim N(0,1)$  (standard normal distribution) with the exception of  $\delta_{1i}$ , which is distributed according to the triangular distribution. The triangular distribution allows all values of  $\delta_{1i}$  to be constrained to be positive, which is a reasonable assumption for this model, given that it would make little sense if



increased wages decreased the utility from the alternative and, hence, reduce the likelihood of accepting the job offer.

Notice that if coefficients are not allowed to vary across individuals, then differences across individuals, represented by the term  $\eta_k Z_{kij}$ , may be forced into the error term, which may then increase the likelihood of correlation between the error term and the explanatory variables or correlation with each other. Such correlation could result in bias in the results.

From equation (1), marginal willingness to pay (MWTP) for a particular attribute, or individual characteristic,  $\mu$  can be defined as:

$$MWTP_{\mu} = \frac{C_{\mu}}{\beta_1}$$

where  $C_{\mu}$  is any coefficient in the model that is not  $\beta_1$ .

In equation (2) the expression is more complicated, since the coefficients vary across individuals. For the purpose of making simple inferences, we ask only what the average MWTP would look like across individuals; that is, we restrict ourselves to using  $\bar{\delta}_k$ , which gives us:

$$MWTP_{\mu} = \frac{\bar{C}_{\mu}}{\bar{\delta}_1}$$

where  $\bar{C}_{\mu}$  is the mean of any coefficient in the model that is not  $\bar{\delta}_1$ .

Similarly from equation (2), total willingness to pay (TWTP) for individual  $i$  can be defined as:

$$TWTP_i = \frac{\bar{\delta}_2}{\bar{\delta}_1}(FIFO_{ijs}) + \frac{\bar{\delta}_3}{\bar{\delta}_1}(Training_{ijs}) + \frac{\bar{\delta}_4}{\bar{\delta}_1}(Temporary_{ijs}) + \frac{\gamma}{\bar{\delta}_1}X_i \quad (3)$$

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