Understanding the role of natural hazards in internal labour mobility in Australia

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A R T I C L E   I N F O

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A B S T R A C T

Australia is among the countries most exposed to natural hazards, particularly wildfire, cyclones, floods and heat waves. Natural disasters are expected to increase in frequency and severity as climate changes. For some people, the increase in risk from these disasters is a reason to move away from certain places or avoid others. Contemporary migration literature has largely ignored environmental factors for mobility, concentrating instead on economic and amenity or lifestyle factors. In this study we fill this gap by exploring the extent to which people in Australia consider natural hazards in their location choices and mobility decisions. Results from a survey using best-worst scaling showed that non-environmental factors prevail, with safety from crime the factor people consider most important when moving somewhere for a new job, followed by living costs and provision of adequate health care. Environmental factors were secondary in people’s migration decisions but more important than attractive scenery and educational opportunities. The reasons people in Australia are not particularly dissuaded from moving to places where the prospects of good employment opportunities are high even though they risk the effects of natural disasters, might be a belief in their ability to cope with the disasters should they occur (self-efficacy). Among the environmental factors, high wildfire risk was most important in people’s migration decisions, even though the survey was conducted before the devastating wildfires in 2019/20 which were unprecedented in their extent and severity. Wildfires might since have become more important in people’s migration decisions, leading to long-term demographic change if people start avoiding high fire risk regions.

1. Introduction

Globally the weather is becoming increasingly volatile and many natural disasters more frequent and severe. The predictions for Australia are decreases in rainfall across southern Australia with longer droughts, further increases in sea and air temperatures, more hot days and an increase in intense heavy rainfall throughout the country (CSIRO, 2018). The impacts of natural disasters for individuals can be devastating, taking peoples’ lives and causing substantial social and economic damage. Major floods in Brisbane in 2011, for example, resulted in insurance payouts of AUD 2.6 billion (van den Honert and McAneney, 2011), and the damage of a cyclone hitting the northern East Coast of Australia in 2017 has been estimated at AUD 1.7 billion (Northern Star, 2018). The cost of the 2009 Victoria wildfires were estimated at AUD 4.4 billion (Teague et al., 2010) and the recent (2019/20) and most severe wildfires in Australia’s history mainly in the southeast of the country are estimated to be in the range of AUD 100 billion (Quiggin, 2020). Extreme heat compromises peoples’ well-being, lead to more accidents, and cause annual labour productivity losses equivalent to about AUD 7 billion (Zander et al., 2015). Severe natural disasters can lead to short-term relocation, but people often return once it is safe (Hunter, 2005; Warner, 2010) often motivated by an emotional attachment to home and place (Morrice, 2013; Reid and Bellin, 2015). Much less is known about those who are permanently displaced by natural disasters or the extent to which these have had long-term demographic impacts (e.g. Smith, 1996; Swanson et al., 2009). Besides actual movements after natural disasters, it will be important to assess the effect natural hazards will have on intentions to move or intentions to stay in places prone to natural disasters. Migration intention is a key component in predicting people’s migration

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behaviour as it goes through stages of intention, planning and final Realisation (de Jong, 2005; Kley and Mulder, 2010).

In high-income countries the environment and the climate are sometimes seen as favourable factors that attract people to specific locations in Australia and other high-income countries (e.g. Gurran, 2008; Parr, 2019). Counter-urban movements, often described in Australia as ‘sea change’ or ‘tree change’ (Connell and McManus, 2011), are based on a desire to live somewhere with, among other amenities, beautiful nature and climate weather (Burnley and Murphy, 2004). Such migration trends can have positive effects on local economies (Gurran, 2008) but that could be challenged by changes in perceptions of environmental risk: many of the sea- and tree-changers are moving to areas that are naturally hazard prone: coastal areas (sea change) prone to cyclones and flooding, or rural areas (tree change) that, in Australia, are prone to wildfire.

However, most literature to date is concerned about the negative aspects of environmental factors and how natural disasters and environmental degradation push people off their land, leading to increased rural out-migration (Berlemann and Struthardt, 2017). This is mostly true for people in low-income countries who depend on natural resources for their livelihoods and who often lack capacity to adapt otherwise (Hunter, 2005). However, non-rural people in low-income countries can also be affected, for example by urban extreme heat (Zander et al., 2019), but there has been little research on either environmental drivers of urban migration in low-income countries or on any form of environmental migration in high-income countries. One of the few examples, from Australia, showed that 7% of a sample of 1,839 people from across Australia intended to move to cooler places because of heat stress experienced in their current location, with this share exceeding 50% for young men working in physical intense industries such as construction (Zander et al., 2016).

Natural hazards and climate change can also affect location choice (Lu et al., 2018) with people trying to avoid places with harmful environments. In Australia, already one of the most urbanised countries in the world (ABS, 2019), city populations are increasing while rural and regional areas struggle to attract and retain in-migrants. Apart from areas attracting tree- and sea-changers, youth out-migration, population aging and low fertility, common in post-demographic transition societies, lead to a population reduction in rural and regional areas (Hugo, 2008). Even if jobs are available, turn-over rates for skilled professionals in regional Australia are high (e.g. Garnett et al., 2008). Peripheral areas therefore often try to attract new residents, often skilled and creative people who will drive innovation and who are often considered essential to grow an economy (van Oort et al., 2009), with policies and marketing strategies (Argent et al., 2013; Vuin et al., 2016). Such policies could be ineffective, however, unless there is knowledge of the impacts of perceived environmental risk and strategies to manage these perceptions.

The aim of our research is to add natural hazards into the understanding of mobility drivers, and to assess the extent to which the perceived risk of natural disasters is a disincentive to people moving somewhere. To do so we employed best-worst scaling (BWS) as part of an online survey to assess people’s preferences for characteristics of destinations they might move to in order to take up a better paid and more satisfying job. BWS is a stated preference method with wide applications in marketing (e.g. Lagerkvist, 2013) transportations (e.g. Islam and Zuidgeest, 2018), health (e.g. Louviere and Flynn, 2010) and environmental economics (e.g. Gleditsch et al., 2014). So far it has rarely been applied in demographic research. The sole study of which we are aware, Balbontin et al. (2015), used BWS to investigate location choice behaviour and respondents’ preferences for characteristics such as rent and access to services but did not include environmental factors. Our approach allows us to consider multiple location characteristics which can drive or impede migration and assess the importance of natural hazards which, as the climate changes, will become an inevitable part of people’s lives. Knowing which location characteristics impede migration can also be valuable to recruitment and retention policies in areas subject to environmental and social pressures.

2. Migration and environmental factors

The influence of the environment and climate change is largely absent in standard theories of migration (Black et al., 2011). Migration studies initially tended to follow neoclassical microeconomic theory which stipulates that a person’s individual choice to migrate or not, and where and when to migrate, is based on individual or household utility (welfare) maximisation (Harris and Todaro, 1970; Stark and Bloom, 1985). Alternatively residential or life course migration theory is used to explain migration as a function of social factors such as age, education, housing, health and marital status (e.g. Elder, 1975; Geist and McManus, 2008). However, increasing numbers of people do not follow conventional life course migration patterns (Thomas et al., 2016). A broader approach has been to model migration as a balance between push and pull factors with people relocating to minimise unfavourable and stressful living conditions (Wolpert, 1965). In this context a higher frequency of natural disasters, pollution and extreme weather is usually depicted in the environmental migration literature as pushing people to leave the rural areas and farming, although minimal risk of natural disasters and mild weather could also constitute pull factors for people migrating there. Thus, people might not move somewhere although the move might have some economic advantages, if other stressors, such as high risk of natural disasters are excessive.

Our study is therefore based on the assumption that some people might not wish to move to or live in a location with undesirable characteristics and an unfavourable environment even if they expect career advantages from the move. A similar approach has been used by demographers trying to understand, in the context of international migration, who would migrate to and stay long-term in regional Australia (Hugo et al., 2006).

More common in demography is the investigation of location satisfaction (e.g. Zenker and Gollan, 2010; Wickramaarachchi and Butt, 2014) which is linked to mobility outcomes (Mellander et al., 2011). Residential dissatisfaction may result from a change in particular social and physical amenities which can include environmental factors, although they tend not to be emphasised (Speare, 1974). Under this model, it is assumed that those satisfied with their location are more likely to stay while unsatisfied residents are more prone to leave (Zenker and Gollan, 2010). It follows that those who expect to be dissatisfied when moving to a location which lacks services or where there is what they consider to be a high risk of being affected by natural disasters are unlikely to move there even if the move improves employment satisfaction.

3. Methods

3.1. Best-worst scaling design

Best-worst scaling is a form of ranking that is cognitively easier for people than comprehensive ranking of multiple items (Marley and Louviere, 2005; Flynn et al., 2007) while still allowing characteristics to be assessed relative to each other. In our BWS design respondents repeatedly chose the best (most likely to discourage movement; see section 3.2) and the worst (least likely to discourage movement) item from a list of items that varied following our experimental design. The frequency of best and worst choices indicated the relative importance of the environment and climate change as push and pull factors.

In total we selected ten items (location characteristics), justified as...
being either a common natural hazard or a social or amenity (lifestyle) related characteristic that can impact peoples’ location choices (see next section). Because ten items cannot be presented to respondents simultaneously without being too complex to answer, a Balanced Incomplete Block Design (BIBD) was adopted to generate different blocks of items. BIBDs, which are commonly used for BWS-1 as this design has three favourable properties: 1) each task includes same number of items, 2) each item occurs the same number of times across tasks, and 3) each item appears equally often with every other item. We created 30 blocks with three items (location characteristic) each (Table S1 in Supplementary Materials) and every respondent was given six of these blocks. We randomised the order of the three items that appeared in each block to control for possible order effects (Massey et al., 2015), Fig. 1 shows an example of one of the BWS blocks.

3.2. Rationale for item (location characteristic) selection

Factors that drive mobility and migration are complex and people often move for multiple reasons (Warner, 2010; Black et al., 2011; Green, 2017). We attempted to include as many important causes of mobility as possible to evaluate their relative importance. We choose the following four environmental factors to which Australia is highly prone (e.g. Coates et al., 2014): floods, cyclones, heat waves and wildfires, all of which are predicted to increase in frequency or intensity with climate change (Sharples et al., 2016; CSIRO, 2018). Three of the hazards (flooding, cyclones and wildfires) are sudden onset and can be very destructive. Heat waves are slow onset with a creeping impact that might not be felt immediately but which, in Australia among many other regions of the world, has a significant health burden (Bi et al., 2011). People have been found to have different migration responses to slow and sudden onset hazards (Koubi et al., 2016; Wesselbaum, 2019) with the effects of the slow onset hazards often being underestimated (Koubi et al., 2016).

For the six non-environmental factors, we chose common factors that explain contemporary residential migration and location choices. Family, friends, marriage and other social networks, are often named among the most important drivers of residential migration after economic opportunities (Todaro, 1980; Parr, 2019). We therefore included the location characteristic ‘Far away from family and friends (home)’, assuming that people would rather not move too far away from their social networks. An important economic factor is living costs, particularly those associated with housing (Morrison and Clark, 2011). Residential moving is also associated with the prospect of improving education and finding good schools, particularly among younger people (Boheim and Taylor, 2002; Kim et al., 2015), and with searching for safe communities with low crime rates (Keels et al., 2005). A pleasant recreational environment (e.g. attractive scenery) plays an increasing role in lifestyle-driven migration to places with perceived superior amenity quality (Lekies et al., 2015). Amenity migration includes migration to places with high quality public transport and communication technologies, public recreational facilities, mild climate and beautiful countryside. The availability of health care is not only a major motivating factor in the migration decisions of older people Hudson et al., (2019) but also for families with small children or with plans of having children. Many people leave rural areas for urban ones because they consider health care availability to be inadequate (e.g. Liao and Wang, 2019). We included health care as well as educational facilities as proxies for essential services which also characterise the amenities of a location.

3.3. Data collection and sampling

Data were obtained through a commissioned online survey. The market research company (Survey Sampling International) sent links to our survey to their panel participants. We requested a sample of their panel that was representative of the national age distribution (but restricted to people over 18), gender and residential state or territory. We received 1,210 responses but discarded some because they were incomplete or were completed in less than 5 min, leaving a useable sample of 1,101.

The core of the questionnaire was the BWS with the accompanying text as follows:

Imagine you are offered a better paid and more satisfying job somewhere else that requires you to move a long distance within Australia. Then imagine what the new location might be like. Which characteristics of the new location would be most likely to dissuade you from moving there to take up the new job and which characteristics would be the least likely to do so?

Please look carefully at the next questions which each represents a group of characteristics of the new location that might affect your decision to move there. In each group, select the characteristic that is most likely to discourage you (left column) and the characteristic that is the least likely to discourage you from moving (right column). The questions consist of different characteristics repeated in different combinations. They look similar but are different and it is important for us that you look at all of them carefully and make your choice. In every one of the next questions you are asked to pick exactly one element from the left column and one from the right column.

Because much contemporary global mobility is for economic reasons (mainly to take up employment with higher wage; Harris and Todaro, 1970), we asked respondents to assume that they will have the opportunity to move to a different location for a better job. By premising our questions on this assumption, we wanted to make the hypothetical setting more realistic than had we asked about general intentions to move or not to move somewhere. We also asked people to consider only long-distance movements within Australia to rule out short-distance movements within the neighbourhood or city, where people could commute for a new job, but stay in the same area with the same exposure to natural disasters. However, we excluded international migration which is qualitatively different from internal migration in terms of the barriers and motivations.

We decided to ask what location characteristics would dissuade people from moving (i.e. use of negative wording, or negated question; see, e.g. Weijters and Baumgartner, 2012) because we wanted to remind people that there are stressors in any new location even if employment prospects are attractive. We did this because we wanted people to trade off their desire for a new job with the prospect that living conditions in the new location may be unfavourable and stressful, based on Wolpert (1965). Trade-offs would not have been possible had we asked respondents what favourable living conditions would encourage them the most and least when moving for a job.

We also asked respondents about their moving intentions and their experience with natural disasters. The final part of the questionnaire was devoted to questions about respondent’s demographic background (age, gender, education, employment situation). The moving intention question was phrased as “How likely is it that you will change your usual place of residence in the next 5 years?” with possible answers on a 4-point scale (Very likely, Likely, Unlikely, Very unlikely).

Experience affects risk perception, with those having experienced a disaster usually being more likely to feel the risk (e.g. Lawrence et al., 2014) and therefore more likely to adapt. Experience was explored through the questions “What is your personal experience with each of the following natural disasters?”, followed by a list of the disasters. Respondents were asked to score each disaster as follows: ‘I am not aware of any risk’ (0), ‘I have not personally been affected but I am aware of the risk’ (1), ‘I have not personally been affected but people I care about have’ (2), ‘I have personally been affected by it’ (3).

1 The library crossdes (Sailer, 2015) in R was used to obtain a design with these three properties.
4. Data analysis

We analysed data obtained from BWS in two ways: first, as aggregated responses and second as disaggregated (individual) responses. With the aggregated data, we counted the number of times respondents chose each of the ten location characteristics (items) as ‘Best’ (B; most likely to discourage movement) and ‘Worst’ (W; least likely to discourage movement), obtained B–W scores for each respondent by subtracting W from B then aggregating the B–W scores across the whole sample. The B–W scores were standardised to range between −1 and 1 by dividing the B–W scores by the number of times each location characteristic appeared in total. The location characteristics were also ranked by relative importance based on the square roots of the ratios of B to W which makes interpretations of percentage differences across location characteristics easier.

As preferences differ across individuals, we analysed the disaggregated data using probabilistic discrete choice models to BWS data (Louviere et al., 2015) to investigate preference heterogeneity and predict future migration behaviour. Discrete choice models are based on random utility theory (McFadden, 1974) which assumes that people make choices that maximise their utility, and that this utility contains an unobservable random component which is unobservable (the error term). This stipulates that, while the scientist cannot predict the exact choice that a person will make, they can estimate the probability that a person will choose each location characteristic (McFadden, 1974), in this instance as BEST or WORST. We estimated random parameter logit (RPL) models, with 2,000 Halton draws, to allow for the fact that multiple choices are made by one respondent (panel data) and that there might be unobserved heterogeneity in the sample.

We applied two different models. First, as often done (e.g. Lancsar et al., 2007), we analysed only the ‘Best’ choice, ignoring the choice for the least important (referred to as BEST model). Secondly, we analysed ordered responses using rank ordered logit (ROL) models (Louviere et al., 2015) having used knowledge of respondents’ choices as BEST and WORST from a block of three location characteristics, i.e. being able to rank each location characteristic in a BWS combination set from 1 to 3. To account for heterogeneity in the sample we applied rank order parameter logit (RO-RPL) models (see Yangui et al., 2019).

4. Results

4.1. Sample characteristics

The average age of respondents was 44.2 years (SD: 14.6; median: 44), with ages ranging from 18 to 65; the sample had slightly fewer women (47.7%) than men. Age, gender, the share of people with children and the regions where respondents lived were similar to Australia’s population while the levels of education and income were higher among our sample (Table 1). This bias towards better educated people and those with higher income is common for online surveys because this segment of the population is more likely to participate in them (Nielsen, 2011; Windle and Rolfe, 2011). About half (51.5%) of the respondents intended to move (i.e. change usual place of residence) within the next five years.

About 8% people were unaware of each of the natural hazards. Heat waves had been experienced by about a third of respondents (36%) but only 10–15% had personally experienced wildfires, cyclones or floods (Fig. 2). There were no significant differences across locations (Fig. S1 in Supplementary Materials).

4.2. Best-worst scaling results

4.2.1. Relative importance of location characteristic

Seven location characteristics had positive scores, meaning that, on average, they were more often chosen as most than least important barriers to migration (Fig. 3a). Non-environmental factors were more likely than environmental factors to discourage migration to take up a
new job, with a high crime rate being most important, followed by high living costs and lack of good health care facilities (Fig. 3a). A high crime rate was 32% more important than high living costs in discouraging people from moving somewhere and 72% more important than inadequate health care (Fig. 3b).

A high risk of wildfires was the most important environmental factor, followed by high flood and cyclone risks, which both had similar scores. A high wildfire risk was about 16% more important than high flood and high cyclone risks, and 138% more important than frequent heat waves. Three location characteristics had negative BWS scores – i.e. they were chosen more often as least likely than most likely as reasons for not moving somewhere - frequent heat waves, lack of education opportunities and unattractive scenery (Fig. 3a). There were no significant differences in the B–W scores across the locations (state or territory of people’s current residency).

Those who intended to move in the next five years scored the importance of flood and cyclone risks as negative, compared to those not intending to move in the next five years (Fig. S2 in Supplementary Materials). The importance of fire and heat waves risks was similar among the two groups. Among the non-environmental factors, distance to home was the only factor that differed between the two groups with those unlikely to move in the next five years providing higher scores.

4.2.2. Preference heterogeneity

As expected, there was a strong correlation between the standardised B–W scores and the coefficient of the RPL model results ($r = 0.99$; see also Fig. S3 in Supplementary Materials). Results from the baseline (without interactions) random parameter logit (RPL) models on the BEST choice data and from the rank order data (RO-RPL) were also very similar (Table 2) with the signs of the coefficient and the significance levels the same for all location characteristics. In both models, two location characteristics were not significant (high cyclone risk and being far away from home), signifying that respondents did not differentiate between high flood risk (the reference level), high cyclone risk and being far away from home when thinking about location choices and mobility decisions. Those location characteristics that were chosen more often as least important (see Fig. 3) had a negative coefficient (heat wave risk, scenery and education opportunities), meaning that they were less important than flood risk (reference level). A high crime rate had the highest coefficient in each model, followed by high living costs, meaning that these two factors were much more important to people than flood risk. A high wildfire risk and a lack of health care were also slightly more important than flood risk. The standard deviations were highly significant for each location characteristic, suggesting that there was unobserved heterogeneity across the sample.

To better understand this heterogeneity, we included interaction effects between socio-economic parameters and each location characteristic. Using log-likelihood ratio tests we determined the best-fitting models which included significant interactions only (Table 2).
RANK model with interactions, ‘high cyclone risk’ became significant and positive, meaning that it was considered more important than flood risk (the reference level). Women were more likely than men to be reluctant to move far away from home. Lack of educational opportunities was more important for respondents with children and the higher a respondents’ income, the greater the influence of a high crime rate. Older people were less likely to consider unattractive scenery and high living costs (in BEST model only) and more likely to consider the adequacy of health care (only in RANK model) as disincentive to move somewhere. The BEST model showed that those who were better educated placed more importance on adequate educational opportunities in their location choices.

Cyclones were the only environmental hazard for which previous experience influenced preferences. A high cyclone risk at a potential new location had less influence on choices among people who had experienced a cyclone than it did for those for whom the experience was vicarious. Those who intended to move within the next five years ranked ‘too far from home’ as lower and ‘lack of educational opportunities’ as higher than those unlikely to move. Those with moving intentions also considered unattractive scenery as a stronger disincentive to move somewhere than those not intending to move (RANK model only).

5. Discussion and implications

5.1. Socio-economic factors

When the strength and direction of preferences are considered across all the potential impediments, the characteristic that appears to have greatest explanatory power is the extent to which respondents can take control of their potential responses. Other studies have also found that self-efficacy has a strong influence on migration decisions (Jasinskaja-Lahti and Yijia, 2011; van Dalen and Henkens, 2013; Hoppe and Fujishiro, 2015) as it is consistent with people’s self-belief that they can cope with the new conditions that are inevitably encountered when moving to a new location. Using self-efficacy as a potential metric is helpful not only for interpreting the results but also for developing strategies for reducing the impact of potential barriers to movement.

The strongest barrier to taking up a putative new job was the fear of an increased crime rate in the new location. Crime is rarely considered in mobility studies. Its absence from Australian mobility research may be because the frequency of crime in Australia is very low (NODC, 2019) and declining for most violent crimes (Bryant and Bricknell, 2017) and both compliance with and enforcement of laws maintaining high levels of public safety is relatively high. Even outside Australia, however, most research has generally considered crime as a push factor that encourages emigration from places with increasing crime, with some social groupings having higher tolerance or less capacity to respond with emigration than others (Foote, 2015), rather than as a barrier to immigration.

Given that the motivation for moving to a new location provided in the scenario was a better job, the importance of cost-of-living as a potential impediment to moving was expected to be consistent with economic models (Greenwood, 2016). Thus, the high cost of living can be viewed as directly opposing the main incentive for moving to with a job that receives higher wages. While there is some level of self-control, in that one can actively impose a level of frugality that counters higher living costs, there will be no financial benefit from moving to a better-paid job if the costs of living in the place where the job is located absorb all the increase. That high living costs were only the second most important factor for not moving somewhere emphasises the importance of feeling safe (low crime rate) in the first place before economic considerations, something not commonly assumed in labour migration following neoclassical economics theories.

Health care was the most important service that people did not want to compromise when moving somewhere for employment. The result is consistent with a long-term Dutch study which found that poor health was the principal reason intentions to move were not realised (van Dalen and Henkens, 2013). While there is a high level of self-efficacy in the choice of a lifestyle that might promote good health, and in the nature and quality of health services utilised, the ill-health can be unpredictable so that the availability of services when needed is something that can become suddenly very important and over which one has little control. This is a factor that may have been influenced by including in the respondent sample people who were unlikely ever to move, or at least within the next five years, a characteristic associated with higher levels of risk aversion (Clark and Lisowski, 2019) (Fig. S2 in Supplementary Materials). Indeed, several studies showed that migration is predicted by person-level factors, such as risk aversion (Gibson and McKenzie, 2011; van Dalen and Henkens, 2013), expectations for adaptation capacity or...
The results for education opportunities as location choice driver were surprising. We did not differentiate between further education for the respondents themselves and opportunities to educate their children. Both have been shown to play a significant role in the migration decisions of people wanting to settle in places (Hugo, 2008; Wickramaarachchi and Butt, 2014). We found, however, that a lack of educational opportunities was almost as irrelevant as unattractive scenery with negative coefficients in both models and a negative B–W score. Respondents with children considered a lack of educational opportunities a stronger disincentive than did those without children, as also found elsewhere (e.g. Hugo et al., 2006). Respondents thinking about their own education may think that the availability of higher education online programs makes the physical presence of educational institutions of little relevance (Johnson, 2019). Also, respondents may have considered education quality to be sufficiently consistent across Australia not to be considered in their mobility decisions.

5.2. Environmental factors

The finding that environmental factors ranked between those essential for a living (safety, living costs and adequate health care) and lifestyle factors provides some evidence that people are not indifferent towards environmental factors when making migration decisions. The most important environmental disincentive to migration was a high wildfire risk, even though data was collected before the severe wildfire summer of 2019/20. Fires have long been a feature of the Australian environment (Murphy et al., 2013) and are part of the contradictory mythology of ‘the bush’ in Australia as both a place of regeneration and of danger (Pinnington and Lafferty, 2004). The latter view of fire is strongly reinforced by the media which tends to dramatize descriptions of fire through use of sensational language whenever wildfires are reported (Cohen et al., 2006). Given that loss of property, and usually some loss of life, is reported every summer (Haynes et al., 2010), it is unsurprising that fires tend to be feared. The importance of wildfires in people’s migration decisions might have been even stronger had the survey been undertaken after the latest wildfires (REF) that were unprecedented in their extent and severity and which will further be escalated by climate change. More research is needed to investigate the spatial and temporal scale of actual movements following these bushfires to predict long-term demographic changes in areas of high wildfire risk.

Floods and cyclones had similar levels of influence, probably because they are often causal (Horsburgh and Wilson, 2007). Their similarity may be because the floods most likely to affect people in Australia, given the generally high standard of urban planning and insurance cost structures in Australia that discourages residential construction on areas prone to flooding, are associated with the extreme conditions that come with cyclones (Horsburgh and Wilson, 2007). Cyclones themselves are a phenomenon of northern Australia, where less than 10% of the Australian population live, so that factors other than the fear of the environmental risk may have been driving the preferences. That is, respondents may have considered they were unlikely to move to areas likely to be affected by cyclones regardless of the employment opportunities.

The lack of influence of heat waves was surprising given that heat waves cause more deaths than all other natural disasters together (Coates et al., 2014) and given that this was the natural disaster that most respondents had personally experienced (see Fig. 2). This may be because there are few places in Australia that are not subject to heat waves, with even the coolest state, Tasmania, subject to heat waves sufficiently severe to increase hospitalisations (Campbell et al., 2019). Also, extreme heat is felt most strongly by older members of the population and those with pre-existing illnesses (Bi et al., 2011) but this group is under-represented in our sample which does not include people older than 65 years.

5.3. Lifestyle factors

Unattractive scenery, which we included as proxy for lifestyle motivations, was the least important disincentive. We would have expected that lifestyle choices played a more significant role in peoples’ location choices since previous studies found that the most important reasons people would not accept jobs in regional Australia were related to lifestyle (Hugo et al., 2006) and that lifestyle factors positively influence long-term settlement in regional locations (Wickramaarachchi and Butt, 2014) because people derive greater satisfaction from their location if they find that the lifestyle suits them (Mellander et al., 2011). An attractive environment is one lifestyle factors that has been positively associated with community satisfaction and people’s desires to remain somewhere (Mellander et al., 2011; Florida et al., 2011). It might be that, while lifestyle factors are important for retention or for recently retired people (sea and tree changes; Burnley and Murphy, 2004), a lack of them may not necessarily be an impediment to people moving to a better job. We would have expected a positive relationship between age and those not wanting to move somewhere with unattractive scenery, but the results of both models, the RPL and the RO-RPL showed that older people were less likely to choose unattractive scenery as BEST choice, or first rank, irrespectively (Table 2). Also, as most migration for employment is probably to urban areas, beautiful scenery might be less important as a lifestyle motivation than the availability of cafes and restaurants or other recreational opportunities.

5.4. Policy implications

Many regions attempt to attract more people, preferably knowledge and creative workers. Provision of incentives can usefully be tempered by a knowledge of disincentives, so that these can be actively ameliorated. Sometimes it is a matter of correcting impressions. Concerns about cyclones were lower among those who had lived through them, suggesting that few cyclones are as frightening and destructive as people expect, but such fears may need to be ameliorated to attract people to places prone to such events. Similarly, the risk of crime is probably far lower than the fear of it but acknowledging the fear, and demonstrating the relative safety of a community, may sometimes be needed to attract some people. For some impediments, however, the risk may indeed be a real reflection of the probability of occurrence. In such cases there needs either to be greater compensation for those moving, such as a larger salary to cover higher living costs, or active management of the concerns through greater investment in health care facilities or wildfire risk reduction. In this study we have provided results from a national perspective. Local governments, however, need to know if there are any features of their particular town, city or region, that affects migration decisions, either negatively or positively. Our methodology, the BWS, is a relatively simple approach that could be tested with potential migrants at the local scale. The results may help not only in attracting newcomers but could also help with worker retention and in the development of policies that could improve the regional risk profile among those living elsewhere.

5.5. Study limitations

Results need to be interpreted with some caution. First, we asked people to imagine that a better job is attractive regardless of their current real job satisfaction. While the consistency of our results suggest that the respondents were able to engage with this thought experiment – even if they never intended to move, they could imagine doing so – the sample included many people who had no intention of moving within the next five years, which may have influenced the strength of their responses if not their direction.
Second BWS constrains the number of items that can be included (here location characteristics). While we based our choices on issues commonly raised in the migration literature and included the most common natural hazards in Australia, for some respondents there will have been other characteristics of locations that would discourage them from moving there which we did not consider. However, the lack of mention of extra impediments in a comments box provided for participants suggests such omissions were rarely salient to the responses provided. Each BWS tasks only included three items (location characteristics). It might have happened for some respondents that none of the three were very meaningful in migration decisions. In this case respondents were still assumed to have chosen the most important item and the least important item, although all three were not that important. Those respondents who were not going to move anywhere soon, or even never for employment, may have found it difficult to gauge location characteristic preferences when considering the theoretical scenarios presented in the BWS.

The BWS approach relies on people making informed and consistent choices over a series of tasks. One reason respondents might choose the same item (location characteristic) as the most important reason in some combination sets and as least important in others could be because of fatigue and loss of interest. However, such replies may not always indicate inconsistency in logic because respondents always had to trade off three location characteristics in once BWS task. the consistency of answers therefore depends on the combination of tasks within a set, meaning a respondent might well regard a location characteristic as most important from one set of three items but least important when part of a different set of three other items. Only about 10% of respondents chose a location characteristic as both most and least important (Table S2 in Supplementary Materials). This percentage was highest (11.5%) for ‘high living costs’ and lowest (6.4%) for ‘high crime rate’.

Finally, using an online survey inevitably introduces biases in terms of education level and familiarity with the online environment even if other Australian studies have shown that there were no significant differences between different survey modes (e.g. Windle and Rolfe, 2011). We doubt, however, that a fully random study would produce results greatly different to ours given we have allowed for education in our analyses.

6. Conclusions

According to neoclassical economic theory people move to other places if the economic benefits exceeds the costs. When moving for employment, differences between locations are usually assessed by changes in wages. However, people trade-off other stressors against this economic reward in their migration decisions. We investigated what unfavourable characteristics of a new location, including and environmental hazards, might dissuade people from moving there despite the prospect of better employment. Results of a stated preference best-worst scaling (BWS) suggest that compensation beyond salary was inversely correlated with the amount of control people could reasonably over the risks they might face at a new location from existential threats. The risk of crime was thus far more of a disincentive to taking up a better job than high living costs that might directly reduce the financial advantages of taking up the better job. Limited health facilities and several environmental risks, particularly the threat from wildfire, a particularly Australian risk, were also significant disincentives to potential recruits while lifestyle related factors surprisingly did not discourage people from moving somewhere. Some risks are inflated, others need pro-active action. Either way, acknowledging the potential for disincentives to affect migration decisions may help to improve planning for demographic change, particularly in regional areas which are mostly likely to be affected by such stressors. For Australia, the prospect of wildfire caused more concern than high risks of floods, cyclones or heat waves when people were making decisions about moving. If, as the climate changes, Australia is affected more frequently by wildfires as destructive as the most recent ones (2019/20), some regions may be avoided for peoples’ migration decisions.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

K.K. Zander: Conceptualization, Methodology, Investigation, Formal analysis, Writing - original draft. Tom Wilson: Methodology, Writing - review & editing. Stephen T. Garnett: Conceptualization, Writing - original draft, Writing - review & editing.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.wace.2020.100261.

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