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Does Poor Health Increase the Likelihood of Flexible Employment?

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Abstract

This paper examines the effect of health and health shocks on form of employment for the Australian working age population using fourteen waves of the Household, Income and Labour Dynamics in Australia Survey (2001-2014). Dynamic multilevel multinomial modelling methods are used to account for initial condition, state dependence and unobserved heterogeneity. The results show that poor health, measured by a constructed health index, significantly increases the likelihood of part time and casual employment, with the effect being larger for men and for part time employment. The greater effect of health and health shocks is on reducing the likelihood of employment.

Keywords: Health, flexible employment, dynamic multinomial models, HILDA survey

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1. Introduction

Populations around the world are ageing, particularly in developed countries, due to declining fertility and longer life expectancies. This has increased the focus on population health and specifically, health disparities. As people become older and approach retirement, their health typically declines. While prevalence of poor health is highest among older age groups (particularly those aged 65 and over), health also matters for the working age population.

Poor health is a substantial issue for the people of working age in Australia. While it is not straightforward to measure population health, the National Health Survey finds that 12 per cent of those of working age report having only poor or fair health, as distinct from good, very good or excellent health (ABS, 2015a). About 15 per cent report that they have a health condition that limits their ability to work: about half of those with a work-limiting condition also report being in poor health.

The literature has established that poor health is strongly associated with a lower likelihood of labour force participation (Cai and Kalb, 2006; Cai, 2010; Oguzoglu, 2010; García-Gómez *et al.* 2010, Webber and Bjelland, 2015) and the decision to retire (Disney *et al.* 2006; Lindeboom, 2006; Jones *et al.* 2010; Zucchelli *et al.* 2010; Bound *et al.* 2010). The evidence on employment outcomes other than labour supply decisions is limited in comparison. Health matters beyond the effect it has on keeping people out of work. It also matters for those who are employed given that National Health Survey statistics show that over a third of people suffering from poor health are employed.

Empirical evidence has found that poor health is associated with lower wages and lower hours of work (Currie and Madrian, 1999; Pelkowski and Berger 2004; Cai, 2009: Cai *et al.* 2014). These outcomes are related not only to employment participation but also the type of employment for those who do work. The ways in which people are employed in developed countries has been changing, in part because of the shift from manufacturing to service production. There has been a shift in recent decades (particularly since the 1980's) from primarily full time permanent employment to other forms of employment, referred to as flexible work. It is the purpose of this paper to examine the effect of health on form of employment, specifically part time and casual employment.

There is a growing body of literature analysing the existence (or not) of causal effects of form of employment on health (see for example Ferrie, 1999; De Witte, 1999; Benavides *et al.* 2000; Virtanen *et al.* 2005; Richardson *et al.* 2012) but the reverse relationship (causal effect

of health on form of employment) is also relevant and has been under-examined. De Lange *et al.* (2004; 2005) and Dalgard *et al.* (2009) suggest that there is a reverse relationship between (mental) health and job characteristics. It cannot be assumed that the causal relationship is unidirectional and De Lange *et al.* (2005) suggest there is good reason to pursue research on the causal relationship between health and form of employment.

Form of employment refers to the nature of employment arrangements, specifically whether an individual is employed on a part time (less than 35 hours per week) or full time basis and their contract of employment. The specific contracts of employment focused on in this paper are casual and permanent[1][2]. The growth in the share of casual and part time employment in recent decades in Australia suggests it is important to consider whether those in worse health are either pushed into or choose part time or casual employment, particularly given that flexibility in hours of work and employment arrangements might allow accommodation of health impairments.

This paper examines the effect of health and health shocks on form of employment using a dynamic multinomial framework. The model incorporates controls for state dependence, so that causal links between past and current labour market status and form of employment are accounted for. Dynamic panel multinomial logit models with random effects are used to distinguish effects of unobserved heterogeneity and the model accounts for the initial conditions problem (Wooldridge, 2005).

Following the approach suggested by Bound (1991) and Bound *et al.* (1999) and implemented by Disney *et al.* (2006), Jones *et al.* (2010), Garcia-Gomez *et al.* (2010) and Bound *et al.* (2010), a first stage model of self assessed health is used to construct an index of health (or measure of health stock). This attempts to account for measurement error in self assessed health (SAH) by modelling SAH as a function of demographic characteristics and more objective measures of health. Further, health is defined in two ways: the first looking at effects of changes in the health index and the second using information on whether individuals report a worsening in their health, a measure of health shock.

[1] Casual employees are those who are entitled to either paid holiday leave or sick leave but not both or who have no leave entitlements and who consider their jobs to be casual.
[2] Permanent employees are those employees who are entitled to either paid sick leave, paid holiday leave, or both and are not employed on a fixed term contract or casual basis.

Models are estimated on a sample aged 15 to 64 drawn from the first fourteen waves of the Household, Income and Labour Dynamics in Australia Survey (HILDA). Health is found to have a significant effect on form of employment. For both men and women, poor health increases the likelihood of part time and casual employment. The effect is however small and the greater effect of health is on reducing the likelihood of employment.

This paper presents three contributions to the existing literature. First, it provides evidence on relationships between health and form of employment where evidence was previously limited. Second, the analysis provides evidence for the working age population which can be compared with previous research which has focused older workers. Finally, it offers a methodological contribution by use of the multinomial dynamic framework which accounts for sample selection, state dependence, initial conditions, unobserved heterogeneity and measurement error in self assessed health.

2. Background

The Australian labour market has a high incidence of part time and casual employment compared to other developed countries (Wooden and Warren, 2004; Richardson and Law, 2009). In 2014, 2.3 million people were employed on casual terms representing about 24 per cent of all employees (ABS, 2015b**)**. It was estimated that 3.7 million people were employed on a part-time basis in 2014, representing 32 per cent of all employed persons (ABS, 2015b). With this relatively high incidence of part time and casual employment Australia therefore provides a good case study with which to determine whether those in poor health are more likely be employed in these forms of employment.

The high proportion of part-time work suggests that those in poor health in Australia are less likely to be restricted from choosing part-time hours compared with other countries. Poor health has been linked with fewer hours of work (Currie and Madrian, 1999; Pelkowski & Berger; 2004, Cai *et al.* 2014). Poor health may reduce both the capacity and preference to work for long hours or even normal full-time hours. The growth in part-time employment in recent decades could increase the probability that a person suffering ill health can find a job fitting with their preferences (or capability) for fewer hours. In the case that a part-time job is not available, the individual may choose not to participate at all rather than work more hours than is preferred (or feasible given their capabilities).

While the studies of the effect of health on hours worked go some way towards contributing to the analysis of health effects on job characteristics, a distinction must be drawn between consideration of continuous measures of hours worked as opposed to distinguishing between part time and full time employment. There are specific characteristics associated with part time employment which make it desirable to determine the causal effect of health on the likelihood of obtaining this specific form of employment. Oguzoglu (2015) and Zucchelli *et al.* (2012) made this distinction.

The relationship between health and casual employment is less settled than that between health and part time employment but there are supply and demand side reasons as to why health may have an effect on the likelihood of casual employment. On the supply side, there is the income effect. In Australia, casual employees are paid what is called a 'casual loading' to compensate them for lack of permanency and leave entitlements-their hourly pay rate is higher than that of a permanent worker in the same job. This casual loading offers some incentive for people who might want higher income to meet the cost of health expenditures. Casual employment in Australia can also offer flexibility to fit employment around other commitments, such as children, study and health problems given that casuals are not locked into a specific number of hours of work. On the demand side, people with poor health might be deemed high risk due to uncertainties surrounding productivity and whether the individual will remain in work long term. Offering casual employment reduces the risk to employers as they are not locked into an employment contract. While there are also disincentives toward pursuing casual employment, namely the lack of leave entitlements, the possibility of people in poor health choosing or being pushed into casual employment cannot be discounted and warrants further investigation.

Zucchelli *et al.* (2012) analysed the effects of health on transitions between certain forms of employment for older workers in Australia. They found some evidence that poor health could push older workers into part time employment. Oguzoglu (2015) used a dynamic multinomial model to study the impact of work limiting long term conditions on employment choices. Disability was found to be associated with a large reduction in the likelihood of full time employment. Strong state dependence was found to amplify the effect, especially for low skilled individuals. The findings from both of these papers support the literature on the effect of health on hours worked and the associated theoretical arguments. This paper builds on Oguzoglu (2015) and Zucchelli *et al.* (2012) by considering the working age population,

addressing concerns with the use of self assessed health measures and by broadening the forms of employment of interest to include casual employment.

Part-time and casual jobs fall under the category of what is known as flexible work. Flexible employment has been linked in the literature with higher job insecurity, lower income, limited rights and benefits and powerlessness compared with full-time permanent employment (Benach & Muntaner, 2007). These forms of employment have a somewhat different character in the Australian setting compared with other countries. There are some characteristics of the Australian labour market which are unique or unusual. In Australia, health care and unemployment benefits are not linked to employment history. There are also protections in the industrial relations system for casual employees. There is the previously mentioned 'casual loading'. Employers are also as obligated to contribute to superannuation accounts of casual workers as they are to permanent workers. Unfair dismissal protection covers both permanent and casual workers as does anti-discrimination legislation (Richardson *et al.* 2012).

Despite these positive characteristics and protections, casual and part-time work does have some negative implications in Australia especially for lifetime earnings and career path. The type of jobs offered as part-time or casual is one potential source of disadvantage for persons in these forms of employment. There are some jobs, higher level jobs, which are not offered on part-time or casual terms. Data from the Australian Bureau of Statistics (ABS) shows that part-time and casual workers are concentrated in lower skilled occupations and this is particularly evident for casuals (ABS, 2011). This highlights a degree of occupational concentration in part-time and casual work in Australia. Occupational segregation of part-time work has also been found in international literature (Prowse, 2005; O'Dorchai & Plasman, 2007). This highlights the negative implications of these forms of employment, as lower skilled occupations are lower paid and have more limited career progression (Francesconi, 2001).

Employees on casual contracts have also been found to be less likely than their permanent counterparts to receive training (Arulampalam & Booth, 1998; Forrier & Sels, 2003; Draca & Green, 2004; Richardson & Law, 2009). Those who do receive training receive a much lower rate than permanent full-time employees (Draca & Green, 2004; Richardson & Law, 2009), and the training they do receive is mostly specific (only of use in the current job) rather than

general training which can be used in future employment. Likewise, part-time employees are less likely to receive training compared with fulltime employees (Arulampalam and Booth, 1998; Harley and Whitehouse, 2001; Almeida-Santos and Mumford, 2004; Richardson and Law, 2009; Bassanini *et al.* 2005). A lower likelihood of training and promotion has implications for lifetime earnings and career progression through effects on the accumulation of human capital. Part-time work also has other marginalizing effects. These have been studied extensively and include lower hourly wages (Wilkins *et al.* 2010), lower wage growth (Chalmers and Hill, 2007; Francesconi and Gosling, 2005; Olsen and Walby, 2004; Myck and Paull, 2001), fewer fringe benefits (Rodriguez, 2002) and fewer opportunities to be hired for or promoted to higher level jobs (Francesconi, 2001; Russo and Hassink, 2005).

The negative implications associated with casual and part-time work are a particular concern if those in poor health are more likely to obtain these forms of employment. Poor health is associated with less time spent in the labour force to begin with therefore any negative impact from form of employment obtained is an added concern. It is important to determine whether those in poor health experience additional disadvantage through their form of employment in the time they do spend in paid work.

3. Modelling Strategies

3.1 Dynamic Model of Form of Employment

The form of employment model is a model with a multinomial dependent variable. Two specifications of form of employment are used. In the first, the dependent variable takes on the value 0 if not-employed (unemployed or not in the labour force), 1 if employed on a part-time basis and 2 if employed full-time. For the second specification, the dependent variable takes on the values 0 if not-employed, 1 if casually employed and 2 if in permanent employment. These specifications are used to answer the research question: are persons in poor health more likely to be in part-time or casual employment?[3]

The model used is a multilevel multinomial logit and can be written as:

[3] It would have been desirable to estimate models using a more detailed breakdown of form of employment (e.g. considering fixed term, self employed and overlap between part time and casual employment) however this disaggregation resulted in low observation numbers and difficulty in obtaining reliable estimates.

$$y_{itj} = \beta_{0\mathrm{j}} + \beta_j' X_{it} + \gamma_j y_{i,t-1} + \xi_j \hat{y}_{i,1} + \lambda_j \bar{x}_i + e_{itj} + u_i \qquad (1)$$

where *i* are individuals, *t* is time (or survey waves, *t*=1,…,*T*), j=1, 2, … J denotes the response category(form of employment) and e_{itj} denotes the residual. The intercept is composed of a fixed part given by $\beta_{0j}$and a random part given by u_i and $u_i \sim N(0, \sigma_u^2)$. This allows for unobserved heterogeneity which is given by the u_i.The $\boldsymbol{X}$ are the vector of observed individual characteristics (the explanatory variables).

Form of employment is not observed unless an individual is employed, giving rise to selection into employment. This is addressed by including not-employed (unemployed or not in the labour force) as an outcome in the categorical dependent variable. Explicitly modelling economic inactivity as an outcome allows an estimate of the degree to which health is associated with being out of employment as well as the other determinants of this outcome.

The model is dynamic, controlling for the influence of state dependence. It is likely that individuals' previous employment status and form of employment affects their current form of employment. All the effects of state dependence are characterised through coefficients on a series of lagged dummy variables for form of employment ($\gamma_j y_{i,t-1}$). The larger the value of these coefficients, the greater the degree of state dependence in form of employment in the following period (Jenkins and Cappellari, 2008).

Estimating dynamic models also requires that the initial conditions problem be accounted for given that observed form of employment is affected by unobserved pre-sample labour market outcomes. This paper adopts the approach set out by Wooldridge (2005), including first period form of employment $\widehat{y_{i,1}}$ and the means of time variant explanatory variables $\bar{x}_i$. The means of time variant explanatory variables are also incorporated as a correction to account for relatively fixed underlying differences between individuals (the Mundlak (1978) and Chamberlain (1984) augmentation for random effects models).

There are limited statistical estimation techniques suitable for estimating panel data models with a categorical dependent variable. The gllamm procedure in STATA is used in this paper. The model estimated has a two level structure with occasion treated as a level nested within individuals. With panel data it is likely that there are correlations across time within

individuals. Multilevel models (as with other types of random effects models) explicitly model this dependency across time.

3.2 Model for Self-Assessed Health

There is a growing literature on the concerns with using subjective measures of health to estimate causal effects of health on labour market outcomes (see for example, Anderson & Burkhauser 1985; Stern, 1989; Bound 1991; Kerkhofs & Lindeboom 1995, Bound *et al.* 1999; Disney *et al.* 2006; Bound *et al.* 2010). A number of potential problems have been identified. Firstly, self reported measures are subjective and are not likely to be comparable across different groups. This lack of comparability has been found in a number of recent papers including Beam Dowd & Zajacova (2007), Singh-Manoux *et al.* (2007) and Kapteyn *et al.* (2009). Secondly, they are likely to be endogenous to labour market status with those not in the labour force in particular being more likely to report poor health to justify non-participation (Stern 1989; Dwyer & Mitchell 1999; Cai & Kalb 2006). Third, subjective measures are usually categorical whereas researchers can be presumed to be interested in measuring a continuous construct of health (Bound *et al.* 2010). Finally, while health is known to affect the likelihood of employment (and is hypothesised to affect other labour market outcomes) employment (particularly certain forms of employment or types of jobs) can also affect health.

This paper uses the method set out by Bound (1991) and Bound *et al.* (1999). Following this approach, the self assessed health measure is modelled as a function of demographic characteristics and more objective measures of health[4]. The idea behind this is to use the more objective measures of health as health indicators which act as instrumental variables to "purge" the self assessed health measure of measurement error and justification bias. Categorical self assessed health is assumed continuous for the purposes of this first stage regression[5]. The measure of the health stock is created using the predicted values from estimated models of self assessed health.

[4] Some of the literature using this approach does not include demographic variables. This assumes that any association between self assessed health and demographic characteristics does not reflect genuine variation in health. While this may be true, inclusion of the demographic characteristics removes the need for this assumption.

[5] This allows the model to be estimated by linear regression and to produce residuals which are not correlated with fitted values and covariates. The resulting fitted values were compared to those obtained by ordered probit

This measure of the health stock, or constructed health index, is used as a health measure in the form of employment models. Lagged and initial health are included in the models to reduce the possibility of simultaneity bias. By using lagged health, the change in health occurs before any change in labour market status. Inclusion of both initial period health and lagged health allows for the estimated coefficient on lagged health to be interpreted as a deviation from an underlying health stock represented by initial health (García-Gómez et al. 2010; Jones et al. 2010; Hagan et al. 2009). Table 1 presents the variables used in the health stock model.

Table 1: Variables used in Model of Self-Assessed Health

Variable	**Description of Variable**
Age	Age in years
Age squared	Age in years, squared
Married/De Facto	1 if married or has partner, 0 otherwise
Household Size	Number of people residing in the household
Owns home	1 if owns home, 0 otherwise
Degree or above	1 if has degree or above, 0 otherwise
Advanced Diploma/Diploma	1 if has advanced diploma or diploma, 0 otherwise
Cert III/IV	1 if has certificate III or IV, 0 otherwise
Year 12	1 if has year 12, 0 otherwise
Year 11 or below	Reference category, 1 if has year 11 or below
SF-36 Mental Health	Score on the SF-36 Mental Health scale, 0-100
SF-36 Physical Functioning	Score on the SF-36 Physical Functioning scale, 0-100
Has Long Term Health Condition not Limiting Work	1 if has a long term condition which does not limit work, 0 otherwise
Condition such as Arthritis, Asthma, Heart Disease, Alzheimer's, Dementia	1 if has condition, 0 otherwise
Condition restricting physical activity or physical work	1 if has condition, 0 otherwise
Shortness of breath or difficulty breathing	1 if has condition, 0 otherwise

(the usual approach) and were found to be extremely similar. This suggests that the assumption of health being continuous is not unreasonable for the purposes of constructing the health index.

Variable	Description of Variable
Effects as a result of stroke, head injury or other brain damage	1 if has condition, 0 otherwise
Sight problems not corrected by glasses	1 if has condition, 0 otherwise
Social Support	Social support, scale 1-7 (7 is more support)
Smoker	1 if currently smoking or ever smoked, 0 otherwise
Heavy Drinker	1 if a heavy drinker, defined as drinking more than 6 standard drinks a day when drinking, 0 otherwise
Lack of Physical Activity	1 if lack of physical activity, defined as no physical activity at all or less than once per week, 0 other wise
Has lived in Australia 0-4 years	1 if has lived in Australia 0-4 years, 0 otherwise
Has lived in Australia 5-9 years	1 if has lived in Australia 5-9 years, 0 otherwise
Has lived in Australia 10-19 years	1 if has lived in Australia 10-19 years, 0 otherwise
Has lived in Australia 20+ years	1 if has lived in Australia 20 years or longer, 0 otherwise
Reference category	Reference category, 1 if born in Australia
Capital Income ($1000's)	Capital income, divided by 1000
Weekly Non Labour Income ($100's)	Weekly non labour income, divided by 100
State dummies for each State and Territory	1 if lives in State or Territory, 0 otherwise

Unlike categorical measures of self-assessed health, the continuous nature of the health index reflects a less constrained measure which can be compared across groups (due to socioeconomic factors and more objective variables included in its construction). This is apparent in Table 2 with the mean score of the health index declining with age. The measure also incorporates different dimensions of good health by including health indicators reflecting physical functioning, mental health, work limiting disability and other conditions in constructing the index. There are intersections between self-assessed health, mental health and work limiting disability and these intersections are also present between the health index and other measures of health (see Table 2). The health index is related to the other health measures via the method used in its construction but by incorporating different dimensions of health it more accurately represents true health.

Table 2: Mean Scores of Health Index, Men and Women (Aged 15-64)

	Men	Women
Total	68.3	72.0
Self Assessed Health		
Excellent	79.1	83.4
Very good	74.2	78.6
Good	66.8	69.9
Fair	52.8	53.8
Poor	33.8	36.0
Long term condition		
Has Work Limiting Long Term Condition	45.5	47.0
Has Long Term Condition not Limiting Work	62.7	65.0
No Long Term Condition	73.2	77.8
Age Group		
15-24	77.4	76.7
25-34	74.5	77.1
35-44	69.6	74.0
45-54	65.5	69.7
55-64	62.3	65.6
Correlation between HI and SAH	0.572	0.597

In addition to the health index, a measure of health shock is used. This measure used self-reported information contained in HILDA. A health shock is defined as somewhat worse or much worse health compared to 12 months ago. A dummy variable was created with value 1 if a health shock occurred and 0 otherwise. Results using the health index will be considered superior for the reasons outlined above, however analysing estimates using the health shock measure along with those using the health index allow for an assessment of the significance of the effect of gradual versus sudden deterioration in health on form of employment.

4. Dataset and Variables of Interest

The data used for this paper come from the first fourteen waves of the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA survey is a household based panel survey which collects annual data about economic and subjective well-being, labour market dynamics and family dynamics. Details of the survey are documented in Watson and Wooden (2002).

The sample used for the econometric analyses was restricted to those aged between 15 and 64 years excluding full-time students and models were estimated separately by gender. The estimation sample for form of employment models comprises an unbalanced panel of 40,291 person-wave observations for 6,504 individuals for men and 45,294 person-wave observations for 7,052 individuals for women for the specification comparing not-employed, part-time and full-time employment[6]. The estimation sample reduces to 25,791 person-wave observations for men and 33,268 person-wave observations for women for the second specification of form of employment (comparing "not employed, casual and permanent employment)7. Due to the inclusion of lagged form of employment variables (and lagged health featuring as an explanatory variable), the estimating sample comprises data from waves 2 to 14 of HILDA. Table 3 contains means and definitions for the dependent and explanatory variables included in the form of employment models.

[6] Observations are assumed missing at random.
[7] The lower estimating sample for the second specification arose from excluding the self-employed. Form of employment is not observed for the self-employed in the second specification of form of employment.

Table 3: Description and Means of Variables used in Form of Employment Models[8]

Variable	Description of Variable	Men	Women
Post GFC	1 if observation is from 2008 or later, 0 otherwise	0.466	0.472
Lagged health index	Health index score from previous year, 0-100	69.074	71.990
Initial health	Health index score from initial wave of data, 0-100	72.860	72.181
Health shock	1 if health somewhat worse or much worse than last year, 0 otherwise	0.113	0.134
Has children aged 0-4	1 if has children aged 0-4, 0 otherwise	0.163	0.177
Has children aged 5-14	1 if has children aged 5-14, 0 otherwise	0.247	0.293
Married/De Facto	1 if married or has partner, 0 otherwise	0.742	0.719
Partner is employed	1 if has partner in employment, 0 otherwise	0.536	0.611
Weekly non labour income ($100's)	Real weekly non labour income divided by 100	2.938	2.476
Partner wage	Real hourly wage of partner, takes value 0 if has no partner	15.316	18.653
Rural	1 if lives in rural area, 0 otherwise	0.145	0.138
Migrant	1 if migrant, 0 if Australian born	0.211	0.207
Experience	Years in employment since leaving full time education	23.734	18.455
Economic inactivity	Years not employed since leaving full time education	2.430	7.354
Unemployment rate	Unemployment rate calculated by age, sex, state of residence and year	5.907	5.809
Education	Measured by dummy variables reflecting highest educational attainment		
Degree or above	1 if has degree or above, 0 otherwise	0.263	0.300
Advanced diploma/diploma	1 if has advanced diploma or diploma, 0 otherwise	0.099	0.105
Certificate	1 if has certificate III or IV, 0 otherwise	0.295	0.158
Year 12	1 if has year 12, 0 otherwise	0.126	0.149
Year 11 or below	Reference category, 1 if has year 11 or below	0.217	0.288

Form of Employment

Using information contained in the HILDA, full time and part time workers are distinguished between based on their hours worked. The ABS definition is applied, with part time workers

[8] Partner wage rate and non-labour income are inflated to the value in the year 2014 by the RBA annual inflation rate over the period (2001-2014) derived from the ABS Consumer Price Index.

being those workers who work less than 35 hours in all jobs and full time workers defined as working 35 hours or more. The HILDA survey contains two measures of contract of employment, one using ABS definitions and the other self reports. The ABS defined measure does not distinguish between fixed term and casual employees therefore this paper uses the self reported measure to identify those in casual employment and those in permanent, ongoing employment. The "not employed" category is a broad measure of economic inactivity, comprising both the unemployed and those not in the labour force.

Health

Health is defined by using the constructed health index and the health shock measure described in section 3.2. The health index is obtained by regressing the 5 class self assessed health status onto other and more objective measures of health as well as demographic variables using linear regression. The health measures used as explanatory variables in the health stock model include the SF-36 measures of mental health and physical functioning, measures of whether long term conditions were work limiting, presence of specific long term conditions and health related behaviours such as smoking, drinking and lack of physical activity (see Table 1).

The idea of the technique is that there is a latent and continuously distributed variable representing propensity of reporting a specific health status and this is underlying the responses in the original dependent variable. This is argued to be a more accurate measure of health than the 5 class self assessed health variable. In order to determine the effect of sudden deterioration in health a measure of health shock is used and results using each health measure are assessed, keeping in mind the concerns regarding self-assessed measures of health.

Other Explanatory Variables

A range of demographic and socioeconomic variables are included in the form of employment models. A dummy variable captures the effect of the global financial crisis on labour market conditions. Household characteristics are captured by marital status (whether married or living in a de facto relationship) and presence of children (represented by a pair of dummy variables to distinguish the effects of age of children). Partner characteristics and other sources of income are accounted for by including partner's employment status, partner

wage and non labour income. Dummy variables are also included to capture those living in a rural area and people who migrated to Australia.

Total years of labour force experience are included to capture the effect of previous employment history[9]. Economic inactivity (years spent out of employment) is included to represent de-skilling and strength of attachment to the labour force. A state, gender and age group specific unemployment rate is included to account for the discouraged worker effect which results from a higher unemployment rate. Education is coded using five dummy variables for different levels of attainment.

Table 4 and Table 5 document the total number of form of employment transitions over the 13 waves of HILDA included in the estimating sample (waves 2 to 14)[10]. Table 4 contains the employment transitions for the first specification of form of employment while Table 5 contains the transitions for the second specification.

Table 4: Number (and Percentage) of Transitions over Waves 2 to 14 of the HILDA Survey, Estimating Sample Form of Employment Specification I

	Not Employed	**Part-time**	**Full-time**	**Total**
Men				
Not Employed	3,097	356	496	3,949
	(78.42)	(9.01)	(12.56)	(100.00)
Part-time	350	1,846	891	3,087
	(11.34)	(59.80)	(28.86)	(100.00)
Full-time	731	899	22,250	23,880
	(3.06)	(3.76)	(93.17)	(100.00)
Total	4,178	3,101	23,637	30,916
	(13.51)	(10.03)	(76.46)	(100.00)
Women				
Not Employed	7,952	1,381	386	9,719
	(81.82)	(14.21)	(3.97)	(100.00)
Part-time	1,234	9,167	1,556	11,957
	(10.32)	(76.67)	(13.01)	(100.00)
Full-time	673	1,465	11,019	13,157
	(5.12)	(11.13)	(83.75)	(100.00)
Total	9,859	12,013	12,961	34,833
	(28.30)	(34.49)	(37.21)	(100.00)

[9] Age is not included in the models as it is very highly correlated with years of labour force experience and experience is considered to be more causal of form of employment than age.

[10] Note that while Table 3 and Table 4 contain all transitions over waves 2 to 14 of HILDA for the estimating sample for both specifications, the total observations in each table are lower than that for the econometric models. This reflects the unbalanced nature of the panel. Transitions can only be observed where there are observations in consecutive waves for each individual.

Table 5: Number (and Percentage) of Transitions over Waves 2 to 14 of the HILDA Survey, Estimating Sample Form of Employment Specification II

	Not Employed	Casual	Permanent	Total
Men				
Not Employed	2,730	247	244	3,221
	(84.76)	(7.67)	(7.58)	(100.00)
Casual	217	976	483	1,676
	(12.95)	(58.23)	(28.82)	(100.00)
Permanent	447	382	12,973	13,802
	(3.24)	(2.77)	(93.99)	(100.00)
Total	3,394	1,605	13,700	18,699
	(18.15)	(8.58)	(73.27)	(100.00)
Women				
Not Employed	7,308	617	539	8,464
	(86.34)	(7.29)	(6.37)	(100.00)
Casual	503	2,027	700	3,230
	(15.57)	(62.76)	(21.67)	(100.00)
Permanent	753	524	11,360	12,637
	(5.96)	(4.15)	(89.89)	(100.00)
Total	8,564	3,168	12,599	24,331
	(35.20)	(13.02)	(51.78)	(100.00)

Both tables illustrate a high degree of state dependence (persistence) in form of employment for both men and women, particularly for not-employed, full-time and permanent. This supports the inclusion of the variables to capture state dependence.

5. Results

Parameter Estimates

Key results for the form of employment models are displayed in Tables 6, 7, 8 and 9[11][12]. Each table contains parameter estimates for key variables, as well as estimated between individual variance (the variance from including a random intercept to account for unobserved heterogeneity). The results show that the models are subject to unobserved heterogeneity. The variances for the individual random effects are statistically significant in each table, justifying the use of a random effects model. In addition, likelihood ratio tests were performed for both specifications of form of employment. The test statistic in each case found overwhelming evidence of individual effects, lending further justification for preferring the panel (multilevel) model.

[11] Tables with the full set of parameter estimates are available upon request.

[12] For each results table, significance of results is reported at three levels. ***Statistically significant at 1% level. **Statistically significant at 5% level. *Statistically significant at 10% level. Standard errors are reported in parentheses.

Table 6: Key Multinomial Logit Parameter Estimates (and Standard Errors) for Outcomes of not-employed and Part-time Relative to Full-time Employment, Men

	Health Index (1)		**Health shock (2)**	
	Not Employed	Part-time	Not employed	Part-time
Not employed at t-1	2.770*** (0.0922)	1.465*** (0.0948)	2.918*** (0.0922)	1.528*** (0.0947)
Part-time at t-1	0.900*** (0.0926)	2.496*** (0.0769)	0.952*** (0.0914)	2.490*** (0.0780)
Not employed at t=1	1.011*** (0.117)	1.193*** (0.114)	0.990*** (0.116)	1.179*** (0.113)
Part-time at t=1	0.984*** (0.114)	1.548*** (0.103)	0.897*** (0.115)	1.526*** (0.103)
Lagged health index	-0.0287*** (0.0028)	-0.0151*** (0.0028)		
Health shock			0.746*** (0.0763)	0.306*** (0.0745)
Initial health	-0.0148*** (0.0035)	-0.0094*** (0.0034)	-0.0285*** (0.0030)	-0.0168*** (0.0030)
Between individual variance	1.701*** (0.128)		1.711*** (0.129)	
Sample	40,291		40,810	
Individuals	6,504		6,363	
Pseudo R squared	0.3107		0.3096	
BIC	30571.87		31064.26	

Table 7: Key Multinomial Logit Parameter Estimates (and Standard Errors) for Outcomes of not-employed and Part-time Relative to Full-time Employment, Women

	Health Index (1)		**Health shock (2)**	
	Not Employed	Part-time	Not employed	Part-time
Not employed at t-1	3.566*** (0.0864)	1.959*** (0.0773)	3.635*** (0.0877)	1.963*** (0.0781)
Part-time at t-1	1.321*** (0.0663)	2.611*** (0.0571)	1.315*** (0.0656)	2.602*** (0.0569)
Not employed at t=1	1.435*** (0.104)	1.251*** (0.0966)	1.498*** (0.105)	1.315*** (0.0976)
Part-time at t=1	1.148*** (0.0859)	1.438*** (0.0762)	1.192*** (0.0868)	1.502*** (0.0773)
Lagged health index	-0.0223*** (0.0023)	-0.0077*** (0.0021)		
Health shock			0.573*** (0.0657)	0.0545 (0.0582)
Initial health	-0.0029 (0.0029)	0.0010 (0.0025)	-0.0154*** (0.0024)	-0.0048** (0.0022)
Between individual variance	1.606*** (0.101)		1.692*** (0.102)	
Sample	45,294		46,306	
Individuals	7,052		6,939	
Pseudo R squared	0.3717		0.3743	
BIC	51199.32		51883.12	

Table 8: Key Multinomial Logit Parameter Estimates for Outcomes of not-employed and Casual Relative to Permanent Employment, Men

	Health Index (1)		Health shock (2)	
	Not Employed	Casual	Not employed	Casual
Not employed at t-1	3.475***	2.407***	3.605***	2.452***
	(0.115)	(0.118)	(0.113)	(0.118)
Casual at t-1	1.412***	2.975***	1.452***	3.008***
	(0.116)	(0.104)	(0.116)	(0.106)
Not employed at t=1	0.814***	0.896***	0.836***	0.939***
	(0.128)	(0.128)	(0.127)	(0.130)
Casual at t=1	0.576***	1.037***	0.525***	1.017***
	(0.129)	(0.116)	(0.128)	(0.118)
Lagged health index	-0.0234***	-0.0092***		
	(0.0034)	(0.0035)		
Health shock			0.749***	0.0463
			(0.0954)	(0.105)
Initial health	-0.0154***	-0.00502	-0.0267***	-0.0109***
	(0.0040)	(0.0041)	(0.0034)	(0.0036)
Between individual Variance	1.186***		1.198***	
	(0.131)		(0.128)	
Sample	25,791		26,171	
Individuals	4,823		4,711	
Pseudo R squared	0.3624		0.3641	
BIC	19354.29		19440.03	

Table 9: Key Multinomial Logit Parameter Estimates for Outcomes of not-employed and Casual Relative to Permanent Employment, Women

	Health Index (1)		Health shock (2)	
	Not Employed	Casual	Not employed	Casual
Not employed at t-1	3.486***	2.155***	3.491***	2.118***
	(0.0902)	(0.0950)	(0.0903)	(0.0950)
Casual at t-1	1.347***	3.049***	1.320***	3.068***
	(0.0838)	(0.0840)	(0.0827)	(0.0833)
Not employed at t=1	1.304***	1.208***	1.358***	1.258***
	(0.103)	(0.110)	(0.104)	(0.111)
Casual at t=1	0.809***	1.135***	0.828***	1.146***
	(0.0944)	(0.0968)	(0.0954)	(0.0972)
Lagged health index	-0.0224***	-0.0083***		
	(0.0026)	(0.0027)		
Health shock			0.564***	-0.0241
			(0.0720)	(0.0797)
Initial health	-0.0058*	-0.0018	-0.0180***	-0.0080***
	(0.0030)	(0.0032)	(0.0025)	(0.0025)
Between individual variance	1.389***		1.487***	
	(0.114)		(0.119)	
Sample	33,268		34,041	
Individuals	5,877		5,777	
Pseudo R squared	0.3581		0.3583	
BIC	32419.16		32876.58	

Tables 6 through 9 present the parameter estimates of the effect of health and health shocks and the lagged and initial form of employment variables. The parameter estimates for the lagged health index are negative and statistically significant on the probability of part time employment and the probability of casual employment. Poor health increases the probability of part time employment relative to full time employment and increases the probability of casual employment relative to permanent employment. The magnitude of these estimates is small. Poor health also increases the probability of non-employment for both specifications of form of employment. A health shock increases the probability of non-employment and increases the likelihood of part time employment for men (and by a larger magnitude than the results using the health index). A health shock has no significant effect on the likelihood of casual employment. The effect of health and health shocks differs by gender, with the estimated effect for women found to be smaller than that for men. This difference is most noticeable in the results in Tables 6 and 7, in particular for the effect of health and health shocks on the likelihood of part time employment.

Apart from differences in the effect of the health measure on form of employment (and the way the effect of health measures differ by gender), there are few differences in the results between the two specifications for each model. The difference in the magnitude of the effect of health when using the different measures can be explained in part by the different scales used. The parameter estimate of the effect of the health index represents the estimated effect of a one unit change in the health index which ranges from 0 to 100. The estimate of the effect of a health shock is the effect of the dummy variable taking on value 1 and therefore a larger estimate might be expected. Aside from any difference in scales, the results suggest that a sudden deterioration in health via a health shock greatly increases the likelihood of non-employment and part time employment for men. The lack of a significant effect of a health shock on the likelihood of part time (for women) and casual employment may indicate that health has a greater effect on the decision to participate in employment, as suggested by the results using the constructed health index.

Along with the concerns with use of self-assessed measures previously discussed, the diagnostics in Tables 6 through 9 suggest that the model using the health index is to be preferred. The BIC is lower for this model and the level of between individual variance is also lower suggesting that inclusion of the health index explains a greater amount of between individual variance compared with the health shock measure. While the results using the measure of health shock are not to be discounted, the remainder of discussion on health

effects in this paper concentrates on results obtained using the health index, in particular to examine the significant effect of health on form of employment in these models.

According to both models there is state dependence in form of employment. Being part time or not employed in the previous period greatly increases the likelihood of part time employment or not being in employment in the current period (and decreases the likelihood of full time employment). Likewise, casual employment or not being in employment in the previous year greatly increases the likelihood of casual employment in the current year (and decreases the likelihood of permanent employment). Initial form of employment also greatly increases the likelihood of remaining in the same labour market state.

The results also found that other factors were associated with form of employment. For women, the presence of children, particularly young children, greatly increases the likelihood of part time and casual employment. Greater employment experience (years spent in employment) significantly increases the likelihood of full time and permanent employment for men and women as does higher education. Non labour income lowers the likelihood of full time employment. Having an employed partner decreases the likelihood non-employment. This may be explained by both the respondent and their partner facing the same local labour market and also partner characteristics. Living in a rural area increases the likelihood of casual employment amongst those who are employed.

Average Predicted Probabilities

The parameter estimates presented in Tables 6 to 9 do not have a straightforward interpretation in terms of the magnitude of the effects of the explanatory variables. To aid interpretation of these results, average predicted probabilities were estimated for the results obtained using the health index. These enable quantitative estimates of the magnitude of effects. Predicted probabilities are presented using health quintiles to determine health effects, with the lowest quintile reflecting the worst health.

Figures 1 and 2 assess the magnitude of the associations between health and form of employment for the two specifications of form of employment setting all observations to have the same health (chosen to be the means of each health index quintile) and averaged across all observations. The low magnitude of the parameter estimates for part time employment in Tables 6 and 7 and casual employment in Tables 8 and 9 are reflected in the predicted probabilities of form of employment. Both men and women in the lowest health index quintile have a lower predicted probability of permanent employment compared with

persons in the highest health index quintile. Likewise, both men and women in the lowest health index quintile have a higher probability of non-employment and lower probability of full-time employment compared with persons in the highest health index quintile. The health differences in the predicted probability of part time and casual employment are less obvious in Figure 1 and Figure 2.

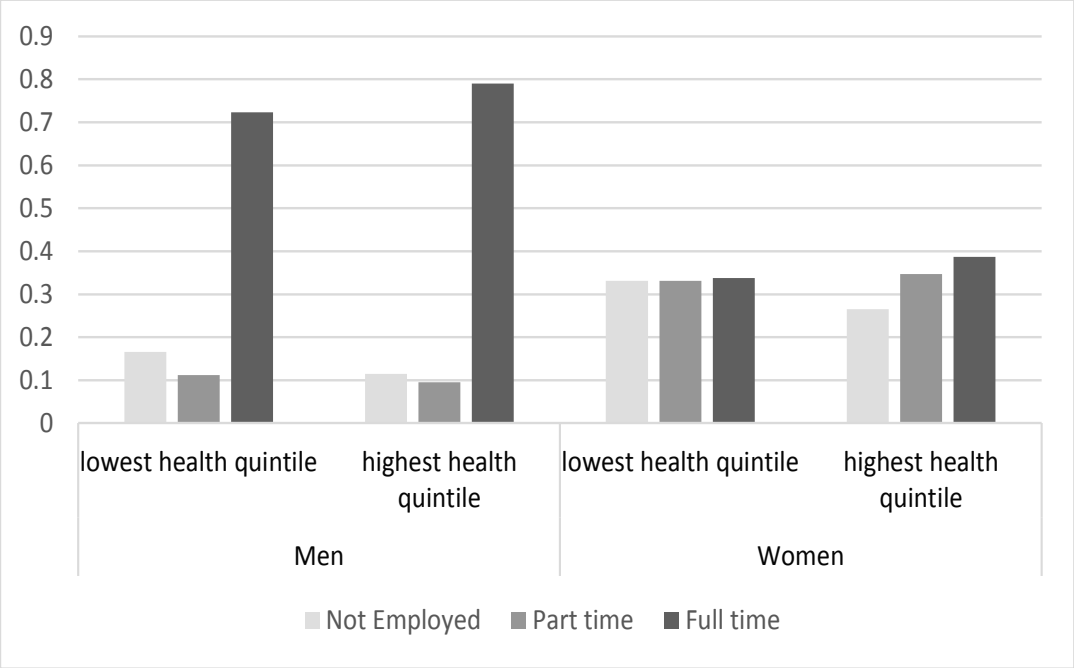

Figure 1: Average Predicted Probability of Form of Employment by Health Index Quintile and Gender (Specification 1)

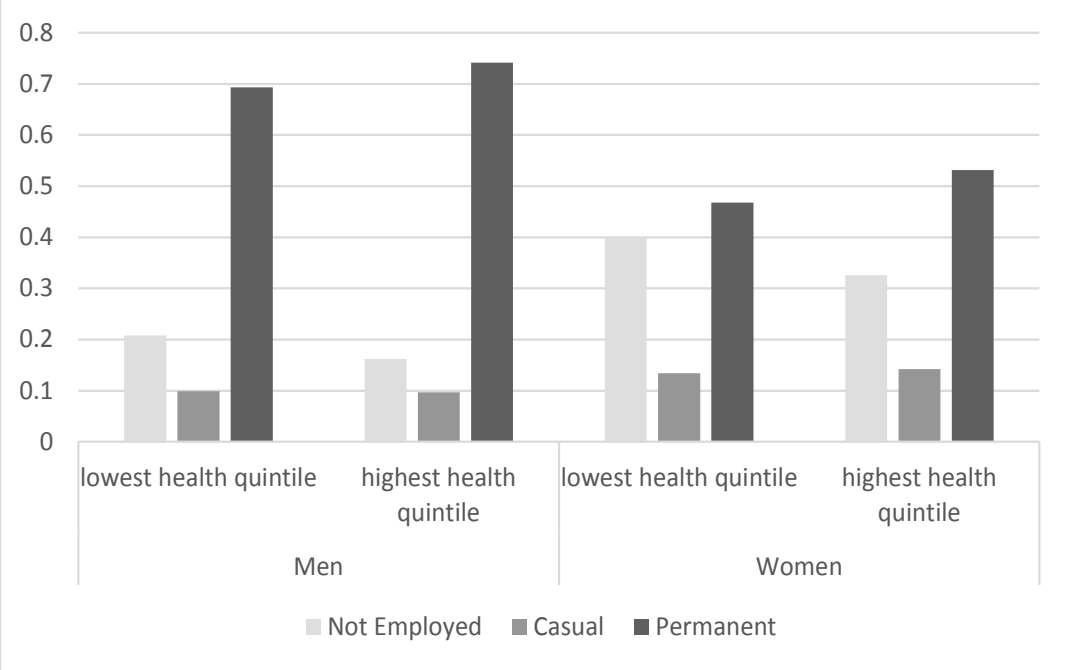

Figure 2: Average Predicted Probability of Form of Employment by Health Index Quintile and Gender (Specification 2)

Men in poor health do have a higher predicted probability of part-time and casual employment compared with those in the highest health index quintile in Figures 1 and 2 and while the parameter estimates appeared to be small, the predicted probabilities enable a better interpretation. Men in poor health have a 1.7 percentage point higher probability of part time employment and 0.2 percentage point higher probability of casual employment. Taking into account the share of men employed in part time and casual employment this represents a 16 per cent higher likelihood of part time employment for men in poor health and just over 2 per cent higher likelihood of casual employment for men in poor health. The magnitude of the effect of health on casual employment remains small but the same cannot be said of the effect on part time employment.

The health differences in predicted probability of part time employment and casual employment for women are in the opposite direction to that for men. Women in the highest health index quintile have a 1.6 percentage point higher probability of part time employment compared with those in the lowest health index quintile, and 0.8 percentage point higher probability of being casually employed. After taking account of the share of women employed in part time and casual employment this represents a 4.8 per cent increase in part time employment for women in the best health and a 6.2 per cent increase in casual employment for women in the best health.

The finding of a health effect in the opposite direction for women is not inconsistent with the parameter estimates which found that poorer health was associated with a higher likelihood of part-time and casual employment. The increased likelihood of employment for persons in better health translates to an increase for both part time employment and full time employment (and an increase for both casual and permanent employment). The relative effects are what is captured in the analysis and rates of increase by health differ between part time and full time employment, and between casual and permanent employment.

This is illustrated when the probabilities are calculated for the employed only (see Tables 10 and 11). Using these figures, men in the lowest health quintile have a 2.7 percentage point higher likelihood of being employed part time compared with those in the highest health quintile. Women in the lowest health quintile are 2.2 percentage points more likely to be employed part time. Men in the lowest health quintile have a 1 percentage point higher likelihood of being employed casually compared with those in the highest health quintile.

Women in the lowest health quintile are 1.2 percentage points more likely to be casually employed than women in the highest health quintile. The magnitude of these estimates combined with the information presented in Figures 1 and 2 emphasises the finding that health has a significant effect on form of employment, with the effect being quite large for part time employment for men but only small for women and for casual employment (taking into account relative shares of these forms of employment by gender).

Table 10: Average Predicted Probability of Form of Employment (Employed Persons) by Health Index Quintile and Gender, Evaluated at Mean Health Index Score by Health Quintile

Health Quintile	Men		Women	
	Part time	Full time	Part time	Full time
1	0.134	0.866	0.495	0.505
2	0.121	0.879	0.484	0.516
3	0.116	0.884	0.480	0.520
4	0.112	0.888	0.477	0.523
5	0.107	0.893	0.473	0.527

Table 11: Average Predicted Probability of Form of Employment (Employed Persons) by Health Index Quintile and Gender, Evaluated at Mean Health Index Score by Health Quintile

Health Quintile	Men		Women	
	Casual	Permanent	Casual	Permanent
1	0.125	0.875	0.223	0.777
2	0.120	0.880	0.217	0.783
3	0.118	0.882	0.215	0.785
4	0.117	0.883	0.213	0.787
5	0.115	0.885	0.212	0.788

The effect of state dependence may play a role, with even a small increase in the likelihood of part time and casual employment resulting in a larger effect than the estimates suggest (Oguzoglu, 2015). Nevertheless, the evidence on estimated health effects using the constructed health index and the result measuring the effects of health shocks suggest that the effect of health on form of employment is small relative to the effect of health on the

likelihood of employment. Poor health has a greater effect via increasing the likelihood of withdrawing from employment.

6. Summary and Conclusions

This study examines the effects of health and health shocks on form of employment for the working age population. It aimed to provide further evidence of how health affects employment outcomes beyond participation, particularly given the proportion of employed persons who report poor health. The empirical analysis in this paper accounts for state dependence, unobserved heterogeneity, selection into employment and reporting bias and measurement error of self-assessed measures of health.

There is evidence that poor health measured via a constructed health index increases the likelihood of part time and casual employment for men and women, but the magnitude of this effect is small for all but the effect on part time employment for men. The finding of an effect of health on the likelihood of part time employment is now new, with Zuchelli *et al.* (2012) and Oguzoglu (2015) both previously exploring this relationship but this paper has extended the finding to the working age population and to a measure of health rather than disability. Broadening form of employment to include other forms of employment also may be important, given the significant effect of health on the likelihood of casual employment found in the analyses.

The findings indicate a great deal of state dependence in form of employment and labour market status, also previously found by Oguzoglu (2015) and Zucchelli *et al.* (2012). The effect of state dependence may amplify the effect of health on form of employment, as suggested in Oguzoglu (2015). A one-off increase in the likelihood of flexible employment has the potential to translate into persistence in part time or casual work. The greater effect of health, however, is on the effect on employment. Persons in poor health or experiencing health shocks are much less likely to be employed.

It must be noted that the availability of flexible forms of employment is likely to make it possible for some people in poorer health to hold down a job, which they could not do if the only option was fulltime permanent work. Nevertheless the effect of poor health on form of employment, whether it results in individuals choosing part time or casual work or selecting out of employment, still puts them at a disadvantage in comparison with healthier individuals who do not face such constraints on their form of employment.

These findings may have important implications for the emphasis of policy efforts to address the negative employment related outcomes of poor health. The finding of an adverse effect of poor health on employment is not new but many previous studies focused only on a subset of the population, namely older workers. This paper found that younger people respond to poor health in a similar way and suggests that governments need to also keep younger workers in the 'policy frame' when considering the impact of health on employment.

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