# Too stressed to work: The Effects of Job Stressors on Health and Employment Outcomes

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**Abstract**

In this paper, I explore the notion of job stress and its implications on health and labor market outcomes. I use eleven years of longitudinal data on Australian households to jointly estimate a set of correlated dynamic equations representing employment behaviors, self-reported stressors, and mental and physical health outcomes. The results show that stressors causally impact health, with the effects being stronger for mental health. In particular, the effect of a one unit increase in stress is equivalent to the effect of experiencing a physical health shock. In addition, I find the effects to be stronger for females than males.[1]

**Keywords:** Job Stress; Psychosocial Job Characteristics; Mental Health; Labor Supply; Turnover.

# 1    Introduction

Job stress is a common phenomenon in today's workplace. The American Psychological Association reports that over seventy percent of employees in the United States list work as a significant source of stress (American Psychological Association Practice 2010). The concept of job stress has long been a subject of study in the psychology literature where it has been linked to a number of negative health outcomes.[2] In addition, numerous reports also indicate that job stress is associated with lower worker productivity (through presenteeism and absenteeism) and increased job turnover.[3] Despite this strong correlation, attempts to identify a casual impact of job stress on health are scarce and analyses of its dynamic effects are even fewer.

In this paper, I use eleven years of data from the Household, Income, and Labour Dynamics in Australia (HILDA) survey to examine the role of different work-related psychological stressors on mental health. Specifically, I examine the roles of individual perception of the general level of stress on the job and other specific stressors including job demand, which captures the level of job complexity; job control, which captures the amount of freedom in the job; and job security, which captures the future prospect of the job. These psychological stressors have have been formally supported by popular models of job stress in the psychology literature as important sources of job stress. For instance, the Job Demand-Control model, characterizes a stressful job as one with high job demand and low job control (Karasek 1979).[4] The Effort-Reward Imbalance Model defines a stressful job as one with high work effort and low reward (Siegrist 2002). In this model, job security is considered an important job stressor. While there has been some interest recently in the literature about the relationship between work and mental health, the current literature has placed a much larger emphasis on physical health and physical aspects of work; and for the most part, it has ignored the notion of job stress. These papers show that blue collar jobs lead to faster deterioration in physical health. For example, Fletcher et al. (2011) find that cumulative physical demands lead to deterioration in physical health. To my knowledge, Ravestejin et al. (2013) is the first to combine both physical and psychological stressors (at the occupation level) in a study exploring the role of occupation on physical health. They find that manual jobs coupled with

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[2]See Kuper and Marmot (2003) and Stansfeld et al. (2012) for examples of empirical studies from health and social psychology that use self-reported job stressors to explain variation in health outcomes.

[3]For instance, stress-related presenteeism (i.e., lost productivity that occurs when employees come to work, but are not fully functioning) and absenteeism from work cost Australia firms more than 10 billion per year (Medibank Private 2008).

[4]A more recent model, the Demand-Control-Support Model, moves away from the story of job strain (resulting from high job demand and low job control) and argues that job stress can arise from exposures to chronic job demands alone, possibly occupation specific (Bakker and Demerouti 2007).

low job control lead to larger negative effects on physical health compare to those with higher job control. In this paper, I contribute to the literature by further exploring the concept of job stress and the relationship between work and mental health. A novelty of my paper comes from the utilization of self-reported data of job stressors over time, which allows me to provide richer insights on the dynamics of individual perceptions of different job stressors and more accurate estimates of the effects of these stressors on health.

It is difficult to get unbiased estimates of stressors on health because there are many factors that can affect this relationship. For instance, individuals with poor health may select into particular occupations, jobs may offer health benefits, and individuals may have different ways of coping with work stressors that might affect health and job performance. Failure to control for these factors could lead to biased estimates of the effects of job stressors on health. For example, the direction of the bias may be downward if individuals with better health or better stress management skills are more likely to select into stressful jobs. In this paper, I address the selection issue by modeling a rich set of employment outcomes and allowing them to be functions of a rich set of observable and unobservable factors. Furthermore, I jointly estimate the set of employment outcomes, together with stressors, and health outcomes. I employ a semi-parametric model that allows for correlation in permanent individual unobserved heterogeneity across equations and correlation in time-varying individual unobserved heterogeneity over time. The empirical strategy allows me to control for additional bias that arises from simultaneity and measurement error.

The results show that the examined psychological stressors are detrimental for both mental and general health, with the effects being stronger on mental health. I find the estimated effects of perceived stress and job security to be stronger than the effects of job demand and job control on health. In particular, a one unit increase in perceived stress would have the same effect of experiencing a health shock. Next, I find the estimated effects of stressors on health after controlling for unobserved heterogeneity to be stronger for females than males. Moreover, the results indicate that females with better ability to handle stress are more likely to select into stressful jobs.[5]

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[5]On the other hand, changes in coefficient estimates of stressors on health after controlling for unobserved heterogeneity suggest negative selection for males.

# 2 Literature Review

A good understanding of the relationship between work and health has been limited due to the lack of data and quasi-experiments necessary to establish causality. Both employment and health are inherently dynamic outcomes that exhibit both direct and reverse causality. The literature has established a direct impact of work on health (effects are both positive and negative depending on the measures used for each outcome) and a reverse impact of health on work behaviors (where worse health leads to reduced labor force attachment in several dimensions). Below I review the literature examining these relationships in the areas most relevant for the outcomes I explore.

## 2.1 Impact of Work on Health

In the last decade, economists have attempted to explain the disparities in health across different occupations (e.g., Case and Deaton, 2005; Choo and Denny, 2006; Fletcher and Sinderlar, 2009; and, Morefield et al., 2011).[6] Early papers offer little insight into the mechanisms that cause disparities in health across occupations due to limited data on occupation which is often restricted to one digit level occupation codes. Recent papers have used detailed job information to better describe occupations. For example, Fletcher et al. (2011) merge occupations from Panel Study of Income Dynamics (PSID) to the Dictionary of Occupational Titles (DOT) to obtain information on physical demands and hazardous job characteristics and Ravestejin et al.(2013) use the Finnish Job Exposure Matrix (FINJEM) to obtain more detailed information on physical and psychological demands for occupations in the German Social Economic Panel (GSOEP). These papers find that blue collar and manual work negatively impact physical health. Llena-Nozal (2004) is the first to examine differences in mental health across occupations. She finds, after controlling for occupation selection, that females in professional and managerial have better mental health than those in manual occupations, but finds no effect of occupation on health for males.

In addition to papers that examine the relation between occupation and health, there are some papers that examine specific working conditions and different dimensions of health including overall health, physical health, and mental health (e.g., Cottini and Lucifora, 2010; Robone et al., 2011; Boes and Wuthrich, 2012; and Cottini and Ghinetti, 2012).[7] The

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[6]The literature is closely related to the literature of education-health gradient and socioeconomic-health gradient. See Conti et al. (2010), Cutler and Lleras-Muney (2006), Chevalier and Feinstein (2006), Zimmerman and Katon (2005), Clarke and Leight (2011).

[7]In detail, Robone et al. (2011) and examine more objective job characteristics such as working hours

majority of papers address the endogeneity of work conditions using fixed effect models or controlling for lagged health, rather than explicitly modeling the employment choices. In addition to papers that focus on characteristics of the jobs, there exists a literature that explores specific work events (e.g., displacement, unemployment, and promotion) on health. A few papers utilize a natural experiment strategy rather than modeling employment choices to address the endogeneity of work events. For example, Sullivan and Wachter (2009) find that loss of a job can have long run effects on health using mass layoff as an exogenous source of employment variation. Other papers recognize the issue of self-selection, but offer no empirical solution. This has led to a variety of estimates. For instance, in the literature exploring the role of promotion on health, Boyce and Oswald (2012) find no evidence that promotion leads to better health, while Johnston and Lee (2012) find that promotion leads to significant deterioration in mental health two years after the promotion.[8]

Previous studies, such as Galama and Kippersluis (2010), have described a number of identification issues that make the analysis of the effects of work on health difficult. The first identification issue is the behavioral responses that arise from the individual's joint decisions regarding occupation, consumption, and health investment. For instance, the effect of work on health could be ambiguous if an individual engages in a demanding job that is potentially harmful for health, but at the same time consumes more medical care and other healthy consumption to offset such negative health effects. The existing literature has paid little attention to the relationship between work and health behaviors, and the notion of compensating health behavior discussed above. The closest paper is the work of Kelly et al. (2014), which provides some evidences of the influence of initial occupation choice on subsequent health behaviors, but says nothing about the role of current occupations on subsequent health behaviors. The second identification issue is the non-random selection into occupations on the basis of initial endowments, education, and health. For example, only individuals with excellent health select into firefighting because the job requires a lot physical strength. There exists some papers that examine the effects of health on employment, but the literature provides very little insight on job selection based on health. The majority of the these papers are limited in scope because they focus on the retirement decision of older age workers or the career outcomes of workers with disabilities. One of the few exceptions, Peng et al. (2013), examines the effects of depression on a variety of work outcomes. They find that depression reduces the likelihood of employment and increases annual work loss

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and actual workplace, while Cottini and Ghinetti (2012) and Boes and Wuthrich (2012) focus on psychosocial work conditions such as imbalance work-life, job satisfaction, and complexity of job tasks.

[8]They explain such decline is caused by changes in job attributes (i.e., job control, job stress, income, and hours worked).

days, but finds no effects of depression on hourly wages or weekly hours worked. Frijters et al. (2014) uses a different empirical strategy and find the same effect of depression at the extensive employment margin. Specifically, they find that a one standard deviation decline in mental health reduces employment by 30 percentage points using death of a close friend as an exogenous shifter for mental health. In a more recent paper, Bubonya et al. (2016) explore the link between mental health and work place productivity. They find the absence rates are about five percent higher for workers with poor mental health.

Because individuals do not randomly select into jobs, association between job stress and health cannot be taken as causality. In this paper, I address the job selection issue by jointly estimating several employment behaviors together with stressors responses and health transitions. I model several employment outcomes including job transitions, occupation choices, and hours of work. It is important to model these employment outcomes because they are functions of unobservable factors that might be correlated with the errors in individual job perceptions and health outcomes. Here, the unobservable factors can reflect permanent individual unobservable factors such as initial endowments or innate abilities and time-varying individual unobservables factors such as learning components that influence individual job selection, job perceptions, and health outcomes. Hence, the joint estimation of these employment equations provides identification for different stressors and endogenous variables that enter the individual job perceptions and health outcomes equations.[9] These unobservables are modeled in a flexible way using a semi-parametric method that allows the errors in the model to be correlated across equations and over time.[10] Beside job selection, the empirical strategy used in this paper also accounts for additional biases that arise from simultaneity, and measurement error.[11]

## 2.2   Job Stress Literature

The concept of stress has received little attention in both the theoretical and empirical economics literature. Greiner (2008) is the first to provide an economic model of job stress. Greiner describes job stress as the product of work overload and low job control in the context of labor supply model.[12] Furthermore, he assumes there is an optimal level of job stress, $S^*$

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[9]Additional endogenous variables include occupation dummies, work indicator, job experience and tenure, and occupation tenure.

[10]The specific method I use is known as the discrete factor random effects (DFRE) model. See Heckman and Singer (1984) and Mroz (1999) for comparison of this method with parametric methods.

[11]I also model attrition from the sample and initial conditions.

[12]The functional form of their stress production function displays two features. The first feature, quantitative overload, is defined as an increase of labor input in the job stress production function. The second

($S^* > 0$), and deviations from this optimum would negatively affect utility. This assumption takes into account that a small amount of stress (i.e., eustress) has a positive effect, and a large amount of stress (i.e., distress) has a negative effect on well-being. Gyout (2014) provides a different model of job stress in the context of labor turnover. Here, job stress is described as a cost that a worker incurs when he exerts a level of effort greater than his capacity to self-motivate. An individual can only change the level of job stress by selecting into a sector that requires a lower level of effort.[13] Das (2013) provides a more detailed model of stress that better accounts for the complexity and multi-stage nature of stress as discussed in the psychology literature. In the context of a life-cycle model of occupation choice, stress is accumulated each period, and the level of stress in a single period is determined by the occupation stressfulness and individual's non-cognitive skills (i.e., the individual's stress tolerance and stress learning ability). Stress is assumed to be bad, but individuals select into stressful occupations which pay better. He estimates a simple empirical model where he uses data from the Occupation Network (O*NET) to measure the level of occupation stressfulness and find that occupation stressfulness follows inverse U-shaped time path.

The empirical literature on job stress provides very little discussion and almost no conceptualization of the notion of job stress similar to those discussed above. Most studies use a single measure of job stress derived from responses to similar statements such as "my job involves a lot of stress" (Ayyagari and Sindelar, 2010). Some examples of studies using measures of perceived job stress include: French and Dunlap (1998), who estimate the compensating wage differential of job stress; Leontaridi and Ward (2008), who estimate the effect of job stress on quit intention and absenteeism; and Ayyagari and Sindelar (2010), who examine the impact of job stress on smoking and quitting. The work by Jeon and Fok (2009) is the first to my knowledge to use the psychosocial job characteristics from the HILDA data to study the association between work stressors (e.g., unfair payment, job insecurity, job demands, low skill utilization, and lack of freedom) and subjective well-being. They conclude that those who are exposed to a high level of work stress in all dimensions also have poor mental health.

One challenge with conceptualizing the notion of job stress and its relation to work and health is the complex nature of job stress that can be viewed both as challenges that arise from the job (also known as stressors) and strain caused by the job. Tausig and Fenwicks

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feature, a lack of control over work, is captured by the multiplicative relationship of labor and capital, with the labor effect increasing at higher levels of capital.

[13]Algan and Gyout (2014) test the hypothesis that a more flexible labor market leads to a lower overall level of job stress in the economy using the Longitudinal Household Employment Database (LEHD). They regress the size of job flow on the variation of the Stress Index, which is constructed using Google keyword for searches associated physical pain and psychological disorders.

(2012) describe these two general definitions of job stress in more detail. Firstly, job stressors can be viewed as a particular form of external force (e.g., stimulus or outside phenomena) that causes negative physical or psychological reaction in the individual. Secondly, job strain can be described as the specific body or physical reaction (i.e., stress related physical illness) to external threats. To my knowledge, such distinction has not been considered carefully in the empirical literature of job stress.[14] This distinction has important policy implications as the objective of reducing the levels of different job stressors is very different from the objective of reducing job strain. My paper addresses this point in two ways. First, I develop and estimate a model that accounts for these two concepts of job stress. Specifically, the model accounts for work challenges using different psychological stressors, and identifies work strain as the effects of those stressors on mental health. Second, I use self-reported data on individuals general perception of job stress, specific job stressors, and health, which allows me to identify more accurate effects of stressors on work and health. Finally, the estimation of causal parameters of the multiple dynamic equations will allow me to simulate behavior in order to further understand the roles of job selection on individual perceptions of different stressors, and the long term impact of job stressors on health outcomes over time.

# 3 Empirical Framework

The empirical model consists of a set of equations derived from a dynamic structural model of a forward looking individual making decisions about work while facing uncertainty about health. The dynamic structural model builds upon the previous works of Grossman (1972), Case and Deaton (2005), Galama and Van Kippersluis (2010), and Ravestejin et al. (2013). Below I introduce the dynamic structural decision making model that is used to approximate the set of structural demand and production functions of the dynamic empirical model. Details of the estimable set of dynamic equations are followed.

## 3.1 Theoretical Model

The following model describes the work behavior of an individual who seeks to maximize his lifetime utility. Conditional on his employment state in the previous period, an individual selects whether to work, to be unemployed, or to be out of the labor force. Furthermore, he chooses the number of work hours, the occupation, and the firm (i.e., same employer or

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[14]The theoretical literature on job stress seems to favor the second definition of job stress.

different employer) in which to work. The notion of job stress is embedded in the model through these two assumptions: (1) the level of job stressfulness depends on the set of negative job attributes, or job stressors, and (2) job strain is captured by the effects of these stressors on mental health.

An individual enters the period with information $(\Omega_t)$ about his employment status in the previous period $(b^e_{t-1})$, job stressors if he worked $(S_{t-1})$, his accumulated human capital (i.e., work experience $(E_{t-1})$, occupation tenure $(T^o_{t-1})$, and firm tenure $(T^j_{t-1}))$, his health $(H_{t-1})$, and demographic characteristics $(X_t)$. Before making employment decisions, he receives job offers that consist of a wage and a set of occupation stressors $(S^o_t)$.[15] After observing job offers, the individual decides whether to work $(b^e_t)$, number of hours to work $(b^i_t)$, occupation $(b^o_t)$, and whether to switch to a new employer $(b^j_t)$ (this option only applies if he was employed in the last period). While some job characteristics (i.e., occupation stressors, $S^o_t$) are revealed to the individual through job offers, other features of the job $(S^s_t)$ are only known to the individual after he accepts and works at the job. The information about these job features is assumed to depend on the individual's perceptions, experience, and learning on the job. I refer to these job characteristics as subjective job stressors, $(S^s_t)$. Next, the individual faces some uncertainty that the job ends (e.g., layoff or promotion). Health at the end of a period is a function of health at the beginning of the period, the work choices, the set of job stressors $(S_t \equiv [S^o_t, S^s_t])$, medical care consumption (which is not a choice in this model, but defined by health and stress within the period), and health shocks. These actions in period t, together with the set of endogenous state variables and outcome variables, form the set of information that the individual takes to the next period.

### Timing of the model

| Beginning of t | Job Offer | $b_t = [b^e_t, b^o_t, b^i_t, b^j_t]$ | Job Perception | Health Shock | Unobserved medical care consumptions | $H_t$ |
|---|---|---|---|---|---|---|
| $\Omega_t = (b^e_{t-1}, S_{t-1}, E_{t-1}, T_{t-1}, H_{t-1}, X_t)$ | $w_t, S^o_t$ | Observed Employment Behaviors | $S^s_t$ | $he_t$ | $m^*_t$ | End of Period Health |
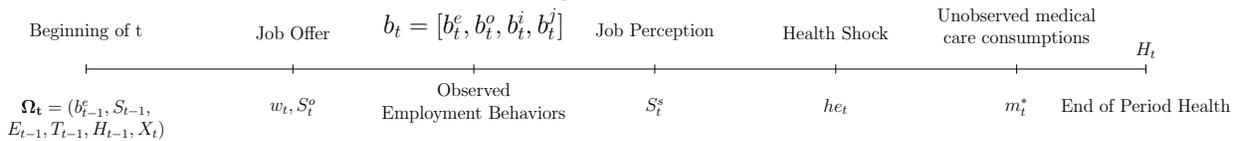
An individual receives utility from consumption $(c_t)$, leisure $(l_t)$, and health $(H_t)$. In addition, job characteristics $(S_t)$ also affect utility. Utility in period t is described as

$$U_t = U(c_t, H_t, l_t, S_t, u^u_t)$$

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[15]I assume the individual receives a job offer from one firm in each occupation. Baird (2014) considers this as the best offer of many job offers in each occupation. Moreover, he allows the worker to receive a continuation offer from the same employer he worked for in the last period, as I do.

where $u_t^u$ is unobserved preferences. The individual spends all of his personal income on consumption (i.e., unhealthy consumption $(c_t^u)$ such as smoking and drinking, and healthy consumption $(c_t^h)$) , and medical care $(m_t)$. Income is a function of the individual's hours of work $(h_t)$ and the hourly wage $(w_t)$ received. The individual's budget constraint is

$$h_t * w_t = c_t^u p_t^u + c_t^h p_t^h + m_t$$

The wage an individual receives depends on his level of education, work experience, and job tenure. It follows the standard Mincerian earning function with a few exceptions. Health is allowed to enter the wage equation to capture the role of health on productivity. In addition, the set of job stressors is allowed to enter the wage function to capture compensating wage differentials associated with potential health damage caused by job stress (Viscusi 1993). The distribution of wages is defined by

$$w_t \sim w(S_{t-1}, E_{t-1}, T_{t-1}, H_{t-1}, X_t, u_t^w)$$

where $u_t^w$ represents unobserved wage variation. The individual's perception of the job $(S_t^s)$ depends on the occupation and hours of work.[16] Also, the individual's perception of the job is likely to depend on his health and labor market experience (i.e., work experience, firm tenure, and occupation tenure coming into the period).[17] The error term, $u_t^s$, represents unobserved determinants of stressors. Perceived job stressors are described by

$$S_t^s = S(b_t^o, b_t^i, E_{t-1}, T_{t-1}, H_{t-1}, X_t, u_t^s)$$

The level of health at the end of the period $(H_t)$ is a function of health at the beginning of the period $(H_{t-1})$ and stress on the job in the current period $(S_t = [S_t^s, S_t^o])$. To capture the long term effects of work on health, I also allow an individual's work experience and tenure $(E_t, T_t \equiv [T_t^j, T_t^o])$ to enter the health function. In addition, health is also a function of demographic characteristics and the households annual income captured by the vector $X_t$. Finally, the error term $u_t^H$ captures unobserved determinants such as medical care inputs and other health inputs. I assume both physical and mental health production functions included

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[16]In this model, I do not allow the levels of job stressors to accumulate through past levels of job stressors (for example, see Das(2013)). Rather, I allow stressors at period t to impact health and assume that there is no independent impact of past stressors on health conditional on health conditioned on health entering the period.

[17]Tenure resets to zero under scenarios of job or occupation switch.

the same inputs, but different marginal products. The health production function

$$H_t = h(H_{t-1}, b_t^o, b_t^i, S_t, E_t, T_t, u_t^H)$$

where $H_t$ represents mental health or physical health.

The individual maximizes the present discounted value of lifetime utility subject to the constraints above; i.e.,

$$\text{Max } U = \sum_{t=1}^{T} \left(\frac{1}{1+\delta}\right)^t U_t$$

where $\delta$ is the discount rate. The lifetime utility maximization can be represented using a Bellman equation, or recursive value function, where $d_t^{eioj} = [b_t^e, b_t^i, b_t^o, b_t^j]$ denotes an indicator for the combined behavioral alternatives of employment ($e$), hours worked ($i$), occupation ($o$), and job ($j$) alternatives. Conditional on information entering period t ($\Omega_t, u_t^u$) and the wage offer ($w_t$), the value of lifetime utility associated with alternative $e, i, o, j$, in period t is

$$
V_{eioj}(\Omega_t, u_t | w_t) = \int_{S^s} U\left(c_t, H_t, l_t, S_t^s, u_t\right) dS^s(.)
$$
$$
+ \beta \int_H \int_w \int_{S^s} E_t \left[\max_{d_{e'i'o'j'}} V_{t+1}(\Omega_{t+1}, u_{t+1} | w_{t+1} = w) | d_t^{eioj}\right] dH(.) dW(.) dS^s(.)
$$

Each period, an individual selects the combination of work alternatives, in this environment of stress and health uncertainty, that maximizes his lifetime utility. The observed employment outcomes reflect his optimal behaviors. The model also captures how the work environment, together with endowments and individual employment behaviors, affects health production.

## 3.2   The Set of Structural Equations

Solution to the dynamic decision making model above provides the specifications for the set of structural equations that I estimate in this paper. Specifically, the set of structural equations include (1) work behaviors, (2) subjective stressors, and (3) health production. I provide the detailed specifications of these equations below.

### 3.2.1 Employment behaviors

The employment behaviors include those at the extensive margin (i.e., whether to be employed or not) and those at the intensive margin (i.e., hours of work and occupation).[18] While chosen simultaneously, I model each behavior with a unique equation having the same arguments and correlated unobservables. Each behavior is a function of the individual's health at the beginning of the period, and his work history that captures last period job choices $(b_{t-1}^e)$, level of job stress $(S_{t-1})$, accumulated human capital (i.e, work experience $(E_{t-1})$, occupation tenure $(T_{t-1}^o)$, and firm tenure $(T_{t-1}^j)$), and a set of employment instruments $(Z_t^e)$.[19] The instruments include labor market information at the state level such as percent employed full time, percent employed in white collar jobs, unemployment rate, and a self-constructed instrument for employment growths by industry.

Conditional on being employed in the previous period $(e_{t-1} = 1)$, the probability of a particular employment alternative in period t (in log odds) is

$$ln\Big(\frac{P(b_t^j = b|e_{t-1} = 1)}{P(b_t^j = 1|e_{t-1} = 1)}\Big) = b^j(H_{t-1}, S_{t-1}, E_{t-1}, T_{t-1}, X_t, Z_t^e, u_{bt}^{b^j}) \qquad , b = 2, 3, 4 \qquad (1)$$

where alternatives are employed with same employer $(b = 1)$, employed with new employer $(b = 2)$, unemployed $(b = 3)$, and out of labor force $(b = 4)$.

Conditional on not being employed in the previous period $(e_{t-1} \neq 1)$, the probability of each employment alternative in t (in log odds) is

$$ln\Big(\frac{P(b_t^e = b|e_{t-1} \neq 1)}{P(b_t^e = 1|e_{t-1} \neq 1)}\Big) = b^e(H_{t-1}, E_{t-1}, X_t, Z_t^e, u_{bt}^{b^e}) \qquad , b = 2, 3 \qquad (2)$$

where alternatives are employed $(b = 1)$, unemployed $(b = 2)$, and out of labor force $(b = 3)$. Note that tenure is zero for those previously non-employed. Also, because of previously non-employment, lagged stressors $(S_{t-1})$ do not affect demand for current employment.

Conditional on working in period t $(e_t = 1)$, the continuous number of hours equation is

$$b_t^i|e_t = 1 = b^i(H_{t-1}, S_{t-1}, E_{t-1}, T_{t-1}, X_t, Z_t^e, u_t^{b^i}) \qquad (3)$$

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[18] I consider these work dimensions because they are influenced by, and can influence, health. In addition, I want to be able to examine the long term impacts of job stress on health through an individual's employment behaviors throughout his adult life.

[19] These instruments are independent of health outcomes conditioned on current employment.

Note that stressors in one's previous job are allowed to influence current work hours if one was previously employed.

Also, conditional on working period t ($e_t = 1$), an individual's observed occupation is described by

$$ln\left(\frac{P(b_t^o = b|e_t = 1)}{P(b_t^o = 1|e_t = 1)}\right) = b^o(H_{t-1}, S_{t-1}, E_{t-1}, T_{t-1}, X_t, Z_t^e, u_t^{b^o}) \qquad , b = 2, \ldots, 9 \qquad (4)$$

where b indicates the one digit occupation category. Specifically, $b = 1$ (Legislators, senior officials and managers), $b = 2$ (Professionals), $b = 3$ (Technicians and associate professionals), $b = 4$ (Clerks) ,$b = 5$ (Service Workers and market sales workers), $b = 6$ (Skilled agricultural and fishery worker), $b = 7$ (Craft and related trades workers), $b = 8$ (Plant and machine operators and assemblers), and $b = 9$ (Elementary occupations).

### 3.2.2   Subjective Stressors

I model the four stressors responses (i.e., perceived stress ($s = 1$), job control ($s = 2$), job demand ($s = 3$), and job security ($s = 4$)) using the following equation. These stressors are reported only by individuals who work in period $t$ ($e_t = 1$) and answer the self-completed questionnaire (SCQ). $Z_t^s$ represents the set of instruments including average responses for different stressors and an index representing occupation stressor.[20] The distribution of the reported levels of the stressors is

$$S_t^s|e_t = 1 = S(H_{t-1}, b_t^e, b_t^o, b_t^i, b_t^j, E_{t-1}, T_{t-1}, X_t, Z_t^s, u_t^{Ss}) \qquad , s = 1, \ldots, 4 \qquad (5)$$

### 3.2.3   Health Production

I model mental health ($h = 1$) and general health ($h = 2$) outcomes using the following function. The health equation includes current period stressors if the individual is employed.

$$H_t^h = H(H_{t-1}, S_t, E_t, T_t, X_t, u_t^H) \qquad , h = 1, 2 \qquad (6)$$

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[20]Detailed information on the set of instruments is data appendix.

### 3.2.4 Initial Conditions and Attrition

The dynamic equations (1) - (6) allow the current period outcomes to be a function of theoreitcally relevant variables from the previous period. Because we do not observe in the data set the lagged values that explain initially-observed endogenous variables, a different set of equations is required to explain outcomes in the first period. The following equations explain health status and work experience in the first period. The equation, $H_0$, is used to model both initial mental health and general health. They are functions of demographic characteristics $(X_0)$ and a set of instruments $(Z_0)$ including fathers and mothers education, employment histories, whether the individual is the oldest sibling, and whether the person lives with both parents at age fourteen.

$$H_0^h = H(X_0, Z_0, u^{H_0^h}) \qquad , h = 1, 2 \tag{7}$$

$$E_0 = E(X_0, Z_0, u^{E_0}) \tag{8}$$

Individuals may exit the estimation sample at some point within the eleven years span. I account for these non-random exits by modeling the attrition at the end of the period. Specifically, end of period values of variables are used to explain the probability that an individual is not observed in the subsequent period. Both the initial conditions and attrition equation are modeled jointly with the outcomes equations to provide more efficient estimation of the permanent unobserved heterogeneity.

$$ln\Big(\frac{P(A_{t+1} = 1 | A_t = 0)}{P(A_{t+1} = 0 | A_t = 0)}\Big) = A(H_t, S_t, E_t, T_t, X_t, u_{1t}^A) \tag{9}$$

## 3.3 Error Structure

I decompose the general error in this model $(u_t)$ into a permanent component $(\mu)$ , a time-varying component $(\nu_t)$, and an idiosyncratic component $(\epsilon_t)$ for each equation q; that is,

$$u_t^q = \mu^q + \nu_t^q + \epsilon_t^q \qquad , q = 1, \dots, 14$$

The permanent component in each outcome equation $(\mu_t^q)$ is allowed to correlate across the

set of equations; likewise, the time varying component $(\nu_t^q)$ is allowed to correlate across equations and over time. The components and probability weights are jointly estimated with other parameters of the jointly set of equations. Mroz (1999) shows that the DFRE method performs better than the assumption of joint normality. The additional error $(\epsilon_t)$ is assumed to be iid and is either extreme value distribution (in multinomial logit equations) or normal in continuous equations.

# 4    Data

The main data used in this study comes from the Household, Income and Labour Dynamics in Australia (HILDA) survey, a longitudinal survey of a large national sample of Australian households. The original sample in the first wave consists of 19,914 people or 7,682 households. The survey is collected annually and the eleven waves of data used in this study span from 2001 to 2012.[21] The information from the HILDA survey provides ideal data for this study given the detailed information on employment and health and unique self-reported information on psychological stressors that is not available in other datasets.

## 4.1    Sample Selection

The sample in this study includes non self-employed individuals between the ages of 24 and 59 who are observed to be in the data for at least six continuous waves. The total number of individuals remaining after accounting for these conditions is 7,103 individuals or 67,582 observations. Additional individuals are dropped from the sample due to missing labor market condition information in the initial period. The final sample consists of 5,125 individuals or 46,238 observations.[22]  One drawback of the data is the small number of individuals who did not complete the Self Completed Questionnaire (SCQ), around seven percent of the sample, which asks about health and subjective stressors.[23]  In addition, about ten percent of the people exit the sample at some points after being in the data for six waves.

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[21]An additional 2,153 households were added to the sample in wave eleven.

[22] This number also accounts for person-year observations being dropped due to additional missing outcomes in a single period.

[23]SCQ is a separate questionnaire that interviewees are asked to mail in.

**TABLE 1**
**Estimation Sample: Entry, Exit, and Sample Size**

| Year | First Period (t) | Attrition rate (t+1) | Total |
|------|------------------|----------------------|-------|
| 2001 | 3,447 | 0 | 3,447 |
| 2002 | 311 | 0 | 3,758 |
| 2003 | 345 | 0 | 4,103 |
| 2004 | 312 | 0 | 4,415 |
| 2005 | 371 | 0 | 4,786 |
| 2006 | 339 | 6.5 % | 5,125 |
| 2007 | 0 | 7 % | 4,793 |
| 2008 | 0 | 8.3 % | 4,461 |
| 2009 | 0 | 7.9 % | 4,092 |
| 2010 | 0 | 7.4 % | 3,768 |
| 2011 | 0 | N/A | 3,490 |
| Total | 5,125 | 1,635 | 46,238 |

The column "first period" provides the number of individuals who enter the sample in a given year. The column "attrit" provides the number of individuals who exit the sample in the following year.

## 4.2 Summary Statistics for Estimation Sample

**Health outcomes**

The health outcomes in this study come from the SF-36 Health Questionnaire, a widely used survey for self-reported measure of health status.[24] The mental health measure has been shown to be a good instrument for detection of depression and anxiety.[25] Specifically, it is constructed using the categorical responses to the following five questions about an individual's feeling in the past four weeks:"(1) Been a nervous person, (2) Felt so down in the dumps nothing could cheer you up, (3) Felt calm and peaceful, (4) Felt down, and (5) Been a happy person." In addition, the general health outcome is constructed using the categorical responses to the following questions : "In general, would you say your health is: , I seem to get sick a little easier than other people, I am as healthy as anybody I know, I expect my health to get worse, My health is excellent. [26] Both measures are transformed into continuous variables ranging on the scale from 0 (worse health) to 100 (good health).

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[24]The SF-36 health survey consists of 36 questions that are used to form 8 scales of functional health, well-being scores, and two summarized psychometrically-based physical and mental health measures (Ware 2004).

[25]Scores below 52 have been shown to strongly predict major depression (Roy and Schurer 2013).

[26]Butterworth and Crosier (2004) shows that he general health measure loads higher on the physical than the mental component of the SF-36.

## Measures of job stress

The work-related psychological stressor outcomes are obtained from a set of self-reported psychosocial job characteristics in the HILDA. These outcomes are ordinal categorical variables ranging from 1 (strongly disagree) to 7 (strongly agree). Leach et al. (2010) show these items load strongly on three factors: job demand, job control, and job security. To simplify the analysis, I reduce the dimensions of these measures by averaging over items in each relevant factor. Description of the stressors is provided in the data appendix. In addition, I construct an index of occupation stressors using the work context file of the Occupation Information Network (O*NET), a database of occupational characteristics in the United States that contains rich information on a wide range of job characteristics including social and physical work conditions, as well as psychosocial job characteristics. I utilize the O*NET because there is no similar database for Australia.[27] In this paper, I use ten items from the interpersonal relationship category and structural job characteristics category to construct an index of occupation stressors.

Table 2 displays the summary statistics for the dependent variables separated by gender. Males are more likely to be employed, work more hours, and hold a blue collar job. Also, males have better mental health, but worse general health status. I estimate the set of equations separately for males and females to account for the differences in labor market experience and health experience between the two groups. Summary statistics for the independent variables and detailed descriptions of other variables are provided in the appendix.

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[27]I use two crosswalks to link the O*NET data to the main data set. The first crosswalk obtained from the Bureau of Labor Statistics links the Standard Occupation System (SOC) to the International Standard Classification of Occupations of 2008 (ISCO-08). The second crosswalk, obtained from the International Labour Organization, provides the conversion of the new ISCO-08 occupation codes to the older ISCO-88 codes.

## TABLE 2
## Summary Statistics: Dependent Variables

| Variable | Male Mean | Male SD | Female Mean | Female SD |
|---|---|---|---|---|
| **Employment, conditional on being employed** | | | | |
| **last period** $(b_t^e\|e_{t-1}=1)$ | | | | |
| Employed with Same Employer | 0.84 | 0.36 | 0.82 | 0.39 |
| Employed with New Employer | 0.12 | 0.33 | 0.11 | 0.31 |
| Unemployed | 0.01 | 0.12 | 0.01 | 0.11 |
| Out of Labor Force | 0.02 | 0.14 | 0.06 | 0.24 |
| | | | | |
| **Employment, conditional on not being employed** | | | | |
| **last period** $(b_t^e\|e_{t-1}\neq 1)$ | | | | |
| Employed | 0.22 | 0.41 | 0.18 | 0.38 |
| Unemployed | 0.11 | 0.31 | 0.06 | 0.24 |
| Out of Labor Force | 0.68 | 0.47 | 0.76 | 0.43 |
| | | | | |
| **Hours Worked** $(b_t^i\|e_t=1)$ | 44.12 | 10.45 | 32.84 | 12.98 |
| | | | | |
| **Occupation** $(b_t^o\|e_t=1)$ | | | | |
| Legislators, senior officials and manag | 0.15 | 0.36 | 0.08 | 0.28 |
| Professionals | 0.20 | 0.40 | 0.31 | 0.46 |
| Technicians and associate professionals | 0.14 | 0.35 | 0.19 | 0.39 |
| Clerks | 0.08 | 0.28 | 0.21 | 0.41 |
| Service Workers and market sales worker | 0.08 | 0.26 | 0.12 | 0.33 |
| Skilled agricultural and fishery worker | 0.02 | 0.12 | 0.00 | 0.05 |
| Craft and related trades workers | 0.13 | 0.34 | 0.00 | 0.07 |
| Plant and machine operators and assembler | 0.12 | 0.33 | 0.01 | 0.11 |
| Elementary occupations | 0.07 | 0.25 | 0.06 | 0.23 |
| | | | | |
| **Subjective Stressors** $(S_t^s\|e_t=1)$ | | | | |
| Perceived Stress | 3.30 | 1.57 | 3.24 | 1.69 |
| Job Control | 4.23 | 1.42 | 3.99 | 1.49 |
| Job Demand | 4.43 | 1.71 | 3.96 | 1.88 |
| Job Security | 5.31 | 1.23 | 5.56 | 1.20 |
| | | | | |
| **Health Outcomes** $(H_{t+1}^h)$ | | | | |
| Mental Health | 74.82 | 16.39 | 73.14 | 17.32 |
| General Health | 68.55 | 19.74 | 70.36 | 21.23 |
| | | | | |
| **Attrittion** $(A_{t+1})$ | | | | |
| Not Attrit | 0.90 | 0.29 | 0.90 | 0.29 |
| Attrit | 0.10 | 0.29 | 0.10 | 0.29 |
| | | | | |
| **Initial Conditions** | | | | |
| Initial Experience $(E_0)$ | 19.55 | 9.97 | 15.34 | 9.23 |
| Initial Mental Health $(H_0^1)$ | 74.07 | 16.62 | 72.28 | 17.72 |
| Initial General Health $(H_0^2)$ | 70.24 | 20.08 | 71.92 | 20.66 |

# 5 Estimation

I use full information maximum likelihood to estimate the model[28]. Below is the description of an individual's contribution to the likelihood function.

$$L_i(\theta, \rho, \omega) = \sum_{k=1}^{K} \rho_k \Bigg\{ \frac{1}{\sigma}\Phi(E_0|\mu_k^{E_0})\frac{1}{\sigma}\prod_{h=1}^{2}\Phi(H_0^h|\mu_0^{H_0^h}) \sum_{l=1}^{L}\omega_l \prod_{t=1}^{T}\Bigg[\prod_{b=1}^{3}\Big[P(b_t^e=b|\mu_{bk}^{b_t^e}, v_{btl}^{b_t^e})^{1[b_{it}^e=b]}\Big]^{1[e_{it}\neq 1]}$$

$$\prod_{b=1}^{4}\Big[P(b_t^j=b|\mu_{bk}^{b_t^j}, v_{btl}^{b_t^j})^{1[b_{it}^j=b]}\Big]^{1[e_{it}=1]} \prod_{b=1}^{9}\Big[P(b_t^o=b|\mu_{bk}^{b_t^o}, v_{btl}^{b_t^o})^{1[b_{it}^o=b]}\Big]^{1[e_{it}=1]}$$

$$\Big[\frac{1}{\sigma}\Phi(b_t^i|\mu_k^{b_t^i}, v_{tl}^{b_t^i})\Big]^{1[e_{it}=1]} \prod_{s=1}^{4}\Big[\frac{1}{\sigma}\Phi(S_t^s|\mu_k^{S_t^s}, v_{tl}^{S_t^s})\Big] \prod_{h=1}^{2}\Big[\frac{1}{\sigma}\Phi(H_{t+1}^h|\mu_k^{H_{t+1}^h}, v_{tl}^{H_{t+1}^h})\Big]$$

$$\Big[P(A_{t+1}=1|\mu_k^A, v_{1tl}^A)\Big]^{A_{it+1}}\Big[1-P(A_{t+1}=1|\mu_k^A, v_{0tl}^A)\Big]^{1-A_{it+1}}\Bigg]\Bigg\}$$

In the above function, $\theta$ represents the vector of estimated parameters in the empirical model, $\rho$ represents the estimated components of the joint distribution of the permanent heterogeneity , and $\omega$ represents the vector of the estimated components of the joint distribution of the time-varying heterogeneity. For example,

$$\rho_k = P\big(\mu_0^{E_0} = \mu_{0k}^{E_0}; \mu_0^{H_0} = \mu_{0k}^{H_0}; \mu_1^{b_t^e} = \mu_{1k}^{b_t^e}, ...., \mu_3^{b_t^e} = \mu_{3k}^{b_t^e}; ......; \mu_1^A = \mu_{1k}^A\big)$$

I do not allow the time-varying heterogeneity to enter the initial condition equations.

# 6 Identification

The validity of coefficient estimates depends on how well the multiple equation model addresses several identification issues. In particular, an important identification threat to the estimation of the effects of stressors on health is the notion of job selection based on health. To alleviate this source of bias, I estimate a set of employment outcomes that is a function of past health and stressors. In addition, I instrument for the employment outcomes using a shift-share instrument for industry employment growth introduced by Bartik, and additional

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[28]The unobserved heterogeneity captured by the DFRE are integrated out during construction of the likelihood function

local level labor market information on unemployment rates, percent full-time, and percent white-collar. The Bartik instrument has been used in many studies to instrument for labor supply. [29] In addition to these instruments, I rely on the nonlinearity of these equations for identification.

Another identification issue is the potential that individual perceptions of the different stressors depend on their health. Here, I rely on the average sample responses of the different job stressors, and an average index of occupation stressors to instrument for individual stressor responses. I construct average sample responses by gender, age group (5 years), occupation (at 2 digits), and year. The occupation stressor index only varies at the occupation level (2 digits).[30] To increase the validity of these exclusion variables, I control for occupation in the health outcomes. The results show these instruments have good statistical power in the stressor equations before and after controlling for unobserved heterogeneity.[31] I also test the validity of these instruments as exclusion restrictions by including them in the stressor equations (employment instruments), and health outcomes (both employment instruments, and stressor instruments). The coefficients on these included instruments are not significant, and hence they satisfy conditions to be valid exclusion restrictions.[32]

Finally, an important threat of identification of stressors on health in this study is the omission of other important health inputs such as negative health behaviors and medical consumption. The reasons for not including these outcomes are both due to data limitations and for the purpose of simplifying the analysis so as to focus on the effects of stressors on health.[33] Here, I rely on the discrete random effect method (DFRE) to alleviate the potential bias that arises from omitting these inputs. Specifically, the method includes multiple sources of unobserved heterogeneity (including both individual permanent and time-varying heterogeneity), and allows for these factors to be correlated across equations.

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[29]The results show some of these instruments are not significant in the work outcome equations after controlling for unobserved heterogeneity. However, they are found to be jointly significant in the model without heterogeneity. See tables 6-9 for coefficient estimates of the model without unobserved heterogeneity and tables 15 - 18 for results of the model with unobserved heterogeneity.

[30]I have experimented with using different O*NET items that are more closely associate with each specific outcomes, but I decide to use an average index of psychological demand here to simplify the problem

[31]See Table 10 and 11 for coefficient estimates of these instruments in the model without unobserved heterogeneity, and Table 13 and 14 for results in the model with unobserved heterogeneity.

[32]The current version is a joint test. I am working on testing these instruments one by one.

[33]The literature has not provided strong evidences supporting a systematic differences in health inputs across jobs or occupations.

# 7  Results

I first present the results from ordinary least square, which I refer to as non-heterogeneity model, to show preliminary relationships between the psychogical stressors and health. Second, I present the results from the main empirical model described above, which I refer to as the heterogeneity model.

## 7.1  Model without Unobserved Heterogeneity

Table 5 presents the coefficient estimates for health outcome equations using the model without unobserved heterogeneity (UH). Hence, the estimates reflect bias associated with selection into occupations, as well as endogeneity bias (i.e., lagged health, employment-related variables, subjective stressors), and omitted variable bias. The (admitted biased) coefficients indicate that a higher level of perceived stress is correlated with poorer health, whereas higher job control and job security lead to better health. The effects of these stressors are stronger for mental health compared to general health. Out of the four measures, job demand is the only stressor in which the correlation is insignificant. Regarding other work dimensions, non-employment implies better mental health and general health relative to working in professional occupation. One interesting finding is that all estimated effects of stressors, in both health equations, are smaller for females relative to males. Past health variables significantly impact current health, suggesting persistence. Also, note that higher past mental health significantly predicts higher general health (and vice versa). The persistence in cross health effects is much smaller than similar health effects, suggesting that the two health variables do not measure overlapping health concepts.

Tables $6-8$ provide preliminary results of the role of health and stressors on different work outcomes. Contrary to initial hypothesis, the results show that the estimated effects of health on all work dimensions are small; this is true for both male and female. On the other hand, the results show the effects of stressors are large and significant. For instance, the table shows high perceived job stress increases the probability of switching to a new job. In addition, the effects are found to be stronger for females. While these coefficients are likely to be biased, they are consistent with previous papers that examine the roles of nonpecuniary characteristics on individuals' employment behaviors in the labor market. For example, Bartel (1981) finds that young workers are more likely to quit repetitious jobs, and middle-aged men are more likely to quit jobs with bad working conditions. A more recent paper, Cottini et al. (2011) also find that adverse work conditions ( i.e., hazardous

physical conditions, undesirable work schedules, bad boss, and workplace conflicts) increase probabilities of job quit.

Lastly, I will examine the factors that influence individual perceptions of different job stressors. Results in Table 10 and 11 show that both general and mental health have very little influence on individual perceptions of the different stressors for both males and females. Rather, they are seen to largely depend on occupation and job status. Similarly, work experience and job tenure show very small effects on individual job perceptions.

## 7.2   Model with Unobserved Heterogeneity

Table 12 presents results of the health outcome equations for the model that allows for correlation across equations and over time through the modeling of common unobserved heterogeneity (model with UH). For males, I find the marginal effects of job stressors are smaller in this model. All job stressors except for job demand remain significant. In particular, a one unit increase in perceived stress, job control, or job security lead to $-1.14$, $0.26$, or $1.24$ (respectively) units change in mental health. On the contrary, I find the marginal effects of stressors for females are larger after controlling for unobserved heterogeneity. The magnitude of the largest effect, the effect of perceived stress on mental health, is found to be close to that of the effect of experiencing a health shock.[34] The results also show that job demand is detrimental to females mental health while job control has very little effect. In detail, a one unit increase in job demand, job control, or job security would lead to $-1.12$, $0.09$, and $0.92$ (respectively) units change in mental health. In addition, I find the marginal effects of occupation are stronger for females (but not for males) after controlling for unobserved heterogeneity, and blue collar jobs lead to poorer mental and general health. The fact that the effects of stressors remain significant even after accounting for selection into occupation indicates the stressors considered are important work determinants of health, especially for females. Similar patterns are also observed for general health, but the effects of stressors are smaller than those in the mental health equation.

Here, I return to other coefficient estimates in the heterogeneity model to better understand the sources of unobserved heterogeneity that drive the outcomes in the model.[35] The following findings are similar for males and females. First, I find the coefficient estimates of past stressors in the work outcome (for those who are currently employed) to be more significant after controlling for unobserved heterogeneity. The coefficient estimates of all stressors, ex-

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[34]Health shock is an experience of serious injury or illness.

[35]These coefficient estimates are reported in Table 13-18.

cept for job demand, indicate that stressful jobs decrease the likelihood of staying employed in the same job for both males and females. On the other hand, I find the coefficient estimates of health in the employment equations remain the same as the non-heterogeneity model. Similar findings are observed in occupation and hours work equations, but it is less clear how stressors influence these employment outcomes.[36] The results indicate the sources of unobservables in these work outcomes might associate with worker characteristics that are unrelated to health. Second, I find the coefficient estimates on occupations in stressor equations are stronger after controlling for heterogeneity (with the changes being more prominent in perceived stress and job demand equations), while the effects of health and other individual characteristics remain the same as the non-heterogeneity model. These findings suggest that it is important to model different job outcomes, and controlling for past health is not enough to eliminate different bias that arises from selection when estimate the effects of stressors on health.

I use model fit to examine the performance of the estimates.[37] Both simulated outcomes from the models with and without individual heterogeneity match the observed data well. In addition, I also test the model fits dynamically. I do this by simulating outcomes in each period and allowing the endogenous variables to be replaced by simulated outcomes in the past period. The results indicate that the model fits the majority of the outcomes. The different graphs of model fit are provided in the appendix.

# 8    Counterfactuals

Below, I use the estimated parameters and the empirical model to perform two counterfactual exercises. The goal of these exercise is to provide insights into the benefits of different policies that target at reducing job stress in the workplaces and policies that aim at increase flexibility in the labor market.

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[36]The coefficient estimates in the male equations suggest that greater perceived stress last period decreases the probability of selecting into a white collar occupation, and greater job control increases the probability of being in a blue collar occupation.

[37]Specifically, I graph the average of main outcomes variables by age together with simulated outcomes from the model, which are calculated using the estimated parameters of the model.

## 8.1 Long term effects of Job Stress

In this simulation, I explore what happen when an individual experiences a high level of job stress for some periods of time. To do this, I assign everyone a maximum level of perceived stress for four years and simulate the entire model for eleven years. Then, I compare the simulated outcomes against the scenario where everyone is assign a minimum level of stress for the entire eleven years. The simulation shows that a four year experience of high stress (versus no stress) leads to seven percent decrease in mental health and four percent decrease in general health for males. [38] I find that the differences in health can be explained by an increase in probabilities of entering unemployment or switching to new employer. The results show those with high perceived stress also report higher job demand and lower job security than those with no stress. In addition, they are found to work longer hours; however, the simulation does not show clear difference in occupation between those without stress and those with high stress. For males, the simulation shows that a four year of high perceived stress leads to about eleven percent decrease in mental health and ten percent decrease in general health. I find similar results in females as those just discussed above.

## 8.2 Job movers vs. Job stayers

In the following simulation, I further explore the importance of job mobility on the evolutions of stressor and health over time. To do so, I force everyone to stay in one job and simulate the model for eleven years. Then, I compare these simulated outcomes to the scenario where everyone is forced to switch to a new employer each period for the eleven years. I find that male job movers have lower perceived stress, lower job demand, and work less hours relative to stayers. However, they also have lower job security. I find a very small difference in occupation. The results indicate that job movers have better general and mental health than stayers. I find similar results for females, but with greater difference in magnitude of outcomes between movers and stayers. One important exception, I find that job mobility improves mental health, but causes small decline in general health for females.

# 9 Discussion and Conclusion

In this paper, I seek to explore the notion of job stress and its impact on mental health and labor market outcomes. It is difficult to estimate the effects of stressors on mental health

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[38]the health gap remains for the entire eleven years.

because the relationship between stressors and health is likely to be affected by individual's job selection and perceptions of the work environment. In this paper, I overcome these concerns by jointly estimate the different work outcomes, individual job perceptions, and health productions together allowing the unobserved factors to be correlated across these equations. While the empirical model estimated here controls for different sources of bias that arise in estimation, it also suffers from some limitations. In particular, the robustness of the coefficient estimates depends on the validity of the set of exclusion restrictions in the employment and stressor equations. In addition, the modeling of multiple outcomes in the empirical model might lead to issue of misspecification given a lack of well-developed theoretical model of work and mental health. Finally, the assumption of the unobserved heterogeneity might also lead to misspecification.[39] Nevertheless, the results show that work outcomes and individual job perceptions depended on other factors beside health, so it is important to model these work outcomes, and using lagged health to control for job selection is not enough. In addition, the results indicate there is a great deal of heterogeneity so one would risk more my making naive assumption on the unobserved heterogeneity.[40]

The results show the coefficient estimates to be different in the non-heterogeneity model and the heterogeneity model. Furthermore, I find the changes in coefficient estimates resulted from controlling for unobserved heterogeneity to be different for males and females. The results suggest that females with higher ability to handle stress or with better health endownment are more likely to select into a more stressful job. As the result, controlling for the unobserved heterogeneity makes the effects of stressors become stronger.[41] The results indicate that the sources of unobservable might be the opposite for males where individuals with lower ability to handle stress are more likely to work in bad jobs. I also find the effects of other work dimensions on health to be different for males and females. Specifically, I find that blue collar jobs lead to poorer mental and general health for females, but no evidence of this for males. On the other hand, I find the estimated effect of not work on health to be large for males after controlling for unobserved heterogeneity.[42] I also simulate the model using the estimated parameters to further explore the long term effects of stressors on health. The simulation confirms that job stressors indirectly affect health by increasing the probability of switching to new employer or entering unemployment, and by increasing

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[39]The researcher has to choose a combination of permanent and time-varying factors.

[40]The coefficient estimates in the model with only permanent heterogeneity are very similar to coefficient estimates in ordinary least square model.

[41]The unobservable here would have a positive correlation with job stressors, and a negative correlation with health shocks.

[42]It might be males who are not working are also likely to have lower health endowment or ability to handle challenges on the job.

individual perceptions of job demand. Furthermore, I find that while increasing the level of flexibility in the labor market could reduce the level of job stress and increase worker mental health, a better strategy is to create work-based programs or policies that gear at improving psychosocial aspects of work environment.

# 10 Tables

**TABLE 3**
**Explanatory Variables**

| Variable | Mean | SD | Min | Max |
|---|---|---|---|---|
| **Labor Market Experience** | | | | |
| Work Experience ($E_{t-1}$) | 21.54 | 9.71 | 0.3 | 49 |
| Firm Tenure ($T^j_{t-1}$) | 7.32 | 7.72 | 0.0 | 44 |
| Occupation Tenure ($T^o_{t-1}$) | 7.41 | 8.50 | 0.0 | 45 |
| | | | | |
| **Health** ($H_t$) | | | | |
| Mental Health$_{t-1}$ | 68.69 | 24.84 | 0.0 | 100 |
| General Health$_{t-1}$ | 65.15 | 26.62 | 0.0 | 100 |
| Health Variables Missing | 0.07 | 0.25 | 0.0 | 1 |
| | | | | |
| **Stressors** ($S_{t-1}$) | | | | |
| Perceived Stress$_{t-1}$ | 3.02 | 1.81 | 0.0 | 7 |
| Perceived Job Demand$_{t-1}$ | 3.84 | 2.08 | 0.0 | 7 |
| Perceived Job Control$_{t-1}$ | 3.77 | 1.79 | 0.0 | 7 |
| Perceived Job Security$_{t-1}$ | 4.98 | 1.89 | 0.0 | 7 |
| Subj. Stressor Variables Missing | 0.08 | 0.27 | 0.0 | 1 |
| Occupation Stressor$_{t-1}$ | 0.40 | 0.18 | 0.0 | 1 |
| | | | | |
| **Other Exogenous Variables** | | | | |
| Health Shock in t | 0.07 | 0.26 | 0.0 | 1 |
| Union | 0.35 | 0.48 | 0.0 | 1 |
| Supervise | 0.53 | 0.50 | 0.0 | 1 |
| New Child in t | 0.06 | 0.24 | 0.0 | 1 |
| Divorce in t | 0.01 | 0.11 | 0.0 | 1 |
| Log(income) | 10.90 | 0.79 | 0.0 | 13 |
| | | | | |
| **Demographic Characteristics** | | | | |
| Less than High school | 0.25 | 0.43 | 0.0 | 1 |
| Technical College | 0.33 | 0.47 | 0.0 | 1 |
| College | 0.17 | 0.37 | 0.0 | 1 |
| Grad School | 0.12 | 0.33 | 0.0 | 1 |
| Age | 41.61 | 9.16 | 24.0 | 59 |
| Single | 0.40 | 0.49 | 0.0 | 1 |
| Children | 1.15 | 1.22 | 0.0 | 12 |
| Female | 0.57 | 0.50 | 0.0 | 1 |
| Time trend | 5.01 | 2.99 | 0.0 | 10 |

continued...

## TABLE 4
## Explanatory Variables (continued...)

| Variable | Mean | SD | Min | Max |
|---|---|---|---|---|
| **Major Statistical Region** | | | | |
| Sydney | 0.17 | 0.37 | 0 | 1 |
| Balance of NSW | 0.13 | 0.34 | 0 | 1 |
| Balance of Victoria | 0.06 | 0.24 | 0 | 1 |
| Brisbane | 0.10 | 0.30 | 0 | 1 |
| Balance of QLD | 0.12 | 0.32 | 0 | 1 |
| Adelaide | 0.07 | 0.25 | 0 | 1 |
| Balance of SA | 0.03 | 0.16 | 0 | 1 |
| Perth | 0.06 | 0.25 | 0 | 1 |
| Balance of WA | 0.02 | 0.14 | 0 | 1 |
| Tasmania | 0.04 | 0.19 | 0 | 1 |
| Northern Territory | 0.01 | 0.09 | 0 | 1 |
| ACT | 0.02 | 0.15 | 0 | 1 |
| Rural | 0.36 | 0.48 | 0 | 1 |
| | | | | |
| **Exogenous Variables in Employment Equation** | | | | |
| Percent white collar | 0.61 | 0.03 | 0.6 | 1 |
| Percent full time | 0.72 | 0.02 | 0.7 | 1 |
| Bartik Instrument | 0.01 | 0.01 | -0 | 0 |
| Unemployment Rate | 4.88 | 1.04 | 1.9 | 8 |
| | | | | |
| **Exogenous Variables in Stressor Equations** | | | | |
| Average Perceived Stress | 2.85 | 1.12 | 0 | 4 |
| Average Job Demand | 3.62 | 1.53 | 0 | 5 |
| Average Job Control | 3.83 | 1.51 | 0 | 5 |
| Average Job Security | 4.63 | 1.80 | 0 | 6 |
| Occupation Stressor$_t$ | 0.44 | 0.20 | 0 | 1 |
| | | | | |
| **Exclusion Variables in Initial Condition Equations** | | | | |
| Fathers education - elementary | 0.17 | 0.37 | 0 | 1 |
| Fathers education- middle school | 0.51 | 0.50 | 0 | 1 |
| Fathers education missing | 0.11 | 0.31 | 0 | 1 |
| Mothers education- elementary | 0.14 | 0.34 | 0 | 1 |
| Mothers education- middle school | 0.56 | 0.50 | 0 | 1 |
| Mothers education missing | 0.09 | 0.29 | 0 | 1 |
| Father employed when person is 14 | 0.89 | 0.32 | 0 | 1 |
| Father unemployed for more than six month when person growing up | 0.11 | 0.31 | 0 | 1 |
| Mother employed when person is 14 | 0.52 | 0.50 | 0 | 1 |
| Miss mother employment | 0.48 | 0.50 | 0 | 1 |
| Living with both parent at age 14 | 0.82 | 0.38 | 0 | 1 |
| Oldest Child | 0.32 | 0.47 | 0 | 1 |
| Father's occupation at age 14 | 0.46 | 0.50 | 0 | 1 |
| Father's occupation missing | 0.06 | 0.23 | 0 | 1 |
| Mother's occupation at age 14 | 0.55 | 0.50 | 0 | 1 |
| Mother's occupation missing | 0.24 | 0.43 | 0 | 1 |

## TABLE 5
## Estimation Results: Health Outcomes -No Heterogeneity Model

| VARIABLES | Male | | Female | |
|---|---|---|---|---|
| | Mental Health | General Health | Mental Health | General Health |
| General Health$_{t-1}$ | 0.09** | 0.72** | 0.10** | 0.72** |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Mental Health$_{t-1}$ | 0.52** | 0.03** | 0.52** | 0.05** |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Health Shock in t | -3.64** | -6.35** | -4.45** | -9.00** |
| | (0.36) | (0.36) | (0.35) | (0.35) |
| SCQ$_{t-1}$missing | 43.64** | 51.56** | 42.63** | 50.95** |
| | (0.67) | (0.68) | (0.62) | (0.62) |
| Perceived Stress$_t$ | -1.35** | -0.56** | -1.16** | -0.49** |
| | (0.07) | (0.07) | (0.07) | (0.07) |
| Perceived Job Demand$_t$ | 0.09 | -0.03 | 0.18** | -0.01 |
| | (0.07) | (0.07) | (0.07) | (0.07) |
| Perceived Job Control$_t$ | 0.36** | 0.31** | 0.24** | 0.24** |
| | (0.08) | (0.08) | (0.07) | (0.07) |
| Perceived Job Security$_t$ | 1.37** | 1.05** | 1.18** | 0.71** |
| | (0.09) | (0.09) | (0.09) | (0.09) |
| Stressors$_t$missing | 3.76** | 3.70** | 2.74** | 2.79** |
| | (1.16) | (1.18) | (1.06) | (1.05) |
| Hours Work | 0.01 | 0.01 | 0.02* | 0.04** |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Job Switch$_t$ | 0.42 | 0.49 | 1.04** | -0.16 |
| | (0.32) | (0.32) | (0.35) | (0.35) |
| Occupation Switch$_t$ | 0.14 | -0.08 | -0.24 | 0.42 |
| | (0.24) | (0.24) | (0.27) | (0.27) |
| Legislators, senior officials and managers | 0.65 | 0.77* | -0.09 | -0.35 |
| | (0.35) | (0.36) | (0.43) | (0.43) |
| Technicians and associate professionals | 0.98** | 0.76* | -0.26 | -0.19 |
| | (0.37) | (0.37) | (0.34) | (0.34) |
| Clerks | 0.46 | 0.78 | -0.34 | -0.15 |
| | (0.45) | (0.46) | (0.35) | (0.35) |
| Service Workers and market sales worker | 1.14** | 0.70 | -0.86* | -0.54 |
| | (0.47) | (0.47) | (0.41) | (0.41) |
| Skilled agricultural and fishery worker | 0.43 | 0.84 | -2.38 | -1.85 |
| | (0.87) | (0.88) | (2.25) | (2.24) |
| Craft and related trades workers | 1.21** | 0.69 | -3.29* | -2.31 |
| | (0.41) | (0.42) | (1.58) | (1.57) |
| Plant and machine operators and assembler | 0.84 | 0.73 | -0.29 | -0.65 |
| | (0.43) | (0.43) | (1.05) | (1.04) |
| Elementary occupations | 0.89 | 1.05* | -1.43** | -0.73 |
| | (0.52) | (0.52) | (0.54) | (0.54) |
| Not Employed$_t$ | 1.93* | 2.13** | 2.46** | 1.83** |
| | (0.84) | (0.85) | (0.77) | (0.77) |
| New Child in t | 0.08 | -0.30 | 0.05 | 1.36** |
| | (0.39) | (0.39) | (0.38) | (0.38) |
| Divorce in t | -4.70** | 0.57 | -6.40** | 1.94** |
| | (0.92) | (0.93) | (0.83) | (0.83) |
| Household Income | 0.54** | 0.52** | 0.47** | 0.31** |
| | (0.15) | (0.15) | (0.12) | (0.12) |

A */** next to coefficient indicates significance at the 5/2% level.

# TABLE 6

Estimation Results: Employment Outcomes and Hours Worked - Male Sample (No Heterogeneity Model)

| VARIABLES | Employment Outcome Conditional on being employed in t-1 ($b_t^e|e_{t-1}=1$) (relative to same job ) | | | Employment Outcome Conditional on not being employed in t-1 ($b_t^j|e_{t-1}\neq 1$) (relative to employed) | | Hours Worked |
|---|---|---|---|---|---|---|
| | New job | Unemployed | OLF | Unemployed | OLF | |
| Work Experience ($E_{t-1}$) | 0.02* | -0.10** | -0.13** | -0.12** | -0.15** | 0.82** |
| | (0.01) | (0.02) | (0.01) | (0.02) | (0.01) | (0.02) |
| Firm Tenure ($T_{t-1}^j$) | -0.11** | -0.08** | -0.02 | | | -0.04** |
| | (0.01) | (0.02) | (0.01) | | | (0.01) |
| Occupation Tenure ($T_{t-1}^o$) | 0.00 | -0.00 | -0.00 | | | 0.08** |
| | (0.00) | (0.01) | (0.01) | | | (0.01) |
| General Health$_{t-1}$ | 0.00* | -0.00 | -0.01* | 0.00 | -0.02** | 0.02** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.01) |
| Mental Health$_{t-1}$ | -0.00 | -0.01* | -0.01** | 0.00 | 0.00 | 0.00 |
| | (0.00) | (0.01) | (0.00) | (0.01) | (0.00) | (0.01) |
| SCQ$_{t-1}$missing | -0.92** | -1.70** | -3.80** | 0.21 | -1.14** | 4.08** |
| | (0.27) | (0.57) | (0.44) | (0.44) | (0.32) | (0.94) |
| Perceived Stress$_{t-1}$ | 0.04 | 0.07 | -0.02 | | | 0.54** |
| | (0.02) | (0.05) | (0.05) | | | (0.06) |
| Perceived Job Demand$_{t-1}$ | -0.07** | -0.10* | -0.07 | | | 0.51** |
| | (0.02) | (0.05) | (0.04) | | | (0.06) |
| Perceived Job Control$_{t-1}$ | -0.03 | -0.05 | -0.12* | | | 0.26** |
| | (0.02) | (0.06) | (0.05) | | | (0.06) |
| Perceived Job Security$_{t-1}$ | -0.32** | -0.30** | -0.26** | | | 0.26** |
| | (0.02) | (0.06) | (0.05) | | | (0.07) |
| Stressors$_{t-1}$missing | -0.96** | -0.56 | 0.38 | | | 5.64** |
| | (0.26) | (0.56) | (0.42) | | | (0.94) |
| Percent white collar | -1.51 | 0.34 | 0.33 | 6.22 | -0.10 | -8.49** |
| | (0.99) | (2.97) | (2.51) | (3.30) | (2.77) | (2.91) |
| Percent full time | 2.33 | 2.42 | 3.77 | -8.67 | -14.71** | 21.09** |
| | (1.89) | (4.98) | (4.38) | (6.21) | (4.67) | (5.67) |
| Bartik Instrument | 11.61 | -13.53 | -2.30 | 20.07 | 32.41* | -36.35 |
| | (6.16) | (17.57) | (14.74) | (21.14) | (15.74) | (19.08) |
| Unemployment Rate | -0.12** | 0.10 | 0.06 | 0.06 | 0.10 | -0.03 |
| | (0.03) | (0.08) | (0.07) | (0.10) | (0.07) | (0.09) |

A */** next to coefficient indicates significance at the 5/2% level.

# TABLE 7

Estimation Results: Employment Outcomes and Hours Worked - Female Sample (No Heterogeneity)

| VARIABLES | Employment Outcome Conditional on being employed in t-1 ($b_t^e \mid e_{t-1}=1$) (relative to same job) | | | Employment Outcome Conditional on not being employed in t-1 ($b_t^j \mid e_{t-1} \neq 1$) (relative to employed) | | Hours Worked |
|---|---|---|---|---|---|---|
| | New job | Unemployed | OLF | Unemployed | OLF | |
| Work Experience ($E_{t-1}$) | 0.02** | -0.04** | -0.02** | -0.08** | -0.07** | 0.43** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.02) |
| Firm Tenure ($T_{t-1}^j$) | -0.11** | -0.14** | -0.06** | | | 0.21** |
| | (0.01) | (0.03) | (0.01) | | | (0.02) |
| Occupation Tenure ($T_{t-1}^o$) | -0.01* | -0.04* | -0.01 | | | -0.06** |
| | (0.00) | (0.02) | (0.01) | | | (0.01) |
| General Health$_{t-1}$ | 0.00* | -0.01** | -0.01* | -0.01** | -0.01** | 0.02** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.01) |
| Mental Health$_{t-1}$ | -0.01** | -0.00 | -0.01** | 0.00 | 0.00 | 0.01 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.01) |
| SCQ$_{t-1}$missing | -1.07** | -2.23** | -2.70** | -0.58 | -0.48* | 9.33** |
| | (0.24) | (0.53) | (0.27) | (0.31) | (0.20) | (0.91) |
| Perceived Stress$_{t-1}$ | 0.04* | 0.15** | -0.01 | | | 0.90** |
| | (0.02) | (0.05) | (0.03) | | | (0.07) |
| Perceived Job Demand$_{t-1}$ | -0.06** | -0.13* | -0.10** | | | 1.00** |
| | (0.02) | (0.05) | (0.02) | | | (0.06) |
| Perceived Job Control$_{t-1}$ | -0.04* | -0.02 | 0.00 | | | 0.20** |
| | (0.02) | (0.05) | (0.02) | | | (0.07) |
| Perceived Job Security$_{t-1}$ | -0.26** | -0.33** | -0.11** | | | 0.46** |
| | (0.02) | (0.06) | (0.03) | | | (0.08) |
| Stressors$_{t-1}$missing | -0.51* | -0.37 | 0.72** | | | 4.27** |
| | (0.23) | (0.52) | (0.27) | | | (0.93) |
| Percent white collar | -1.57 | -1.02 | -4.02** | 7.42** | 1.55 | -0.60 |
| | (1.00) | (2.75) | (1.45) | (2.30) | (1.40) | (3.38) |
| Percent full time | 0.72 | 3.04 | -1.05 | 5.50 | -3.63 | 44.09** |
| | (1.91) | (4.81) | (2.44) | (4.28) | (2.53) | (6.19) |
| Bartik Instrument | 5.18 | 27.83 | -17.93* | 0.85 | -7.13 | -42.32* |
| | (5.96) | (16.11) | (7.72) | (13.29) | (7.89) | (19.65) |
| Unemployment Rate | -0.11** | 0.05 | -0.04 | 0.22** | 0.08* | -0.34** |
| | (0.03) | (0.09) | (0.04) | (0.06) | (0.04) | (0.11) |

A */** next to coefficient indicates significance at the 5/2% level.

**TABLE 8**
Estimation Result: Occupation - Male (No Heterogeneity)

| VARIABLES | Occupation (base cat- Legislators) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Professionals | Technicians | Clerks | Service Workers | Skilled Agricult | Craft-Trade Work | Machine Operator | Elementary Occ. |
| Work Experience ($E_{t-1}$) | -0.15** | -0.08** | -0.12** | -0.08** | -0.17** | -0.02 | -0.01 | -0.14** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) | (0.01) |
| Firm Tenure ($T_{t-1}^{j}$) | -0.00 | -0.02** | -0.01 | 0.00 | -0.02 | -0.03** | -0.03** | 0.00 |
| | (0.00) | (0.00) | (0.01) | (0.01) | (0.01) | (0.00) | (0.00) | (0.01) |
| Occupation Tenure ($T_{t-1}^{o}$) | 0.06** | 0.01** | 0.01* | 0.04** | 0.06** | 0.10** | 0.06** | -0.00 |
| | (0.00) | (0.00) | (0.01) | (0.01) | (0.01) | (0.00) | (0.00) | (0.01) |
| Not Work$_{t-1}$ | -0.72* | -1.55** | -3.16** | -1.70** | -0.66 | -2.12** | -4.14** | -4.14** |
| | (0.32) | (0.33) | (0.35) | (0.37) | (0.61) | (0.34) | (0.34) | (0.36) |
| General Health$_{t-1}$ | -0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.00 | -0.00 | -0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Mental Health$_{t-1}$ | -0.01** | -0.01* | -0.01 | 0.00 | -0.01* | 0.00 | 0.00 | -0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.01) | (0.00) | (0.00) | (0.00) |
| SCQ$_{t-1}$missing | -1.33** | 0.07 | -0.92* | 0.35 | -1.47 | -0.19 | -0.08 | -0.91* |
| | (0.40) | (0.43) | (0.45) | (0.48) | (0.75) | (0.42) | (0.42) | (0.45) |
| Perceived Stress$_{t-1}$ | -0.15** | -0.10** | -0.09** | -0.07* | -0.11 | -0.16** | -0.16** | -0.10** |
| | (0.02) | (0.02) | (0.03) | (0.03) | (0.05) | (0.03) | (0.03) | (0.03) |
| Perceived Job Demand$_{t-1}$ | 0.13** | -0.09** | -0.29** | -0.21** | -0.31** | -0.18** | -0.35** | -0.48** |
| | (0.02) | (0.02) | (0.03) | (0.03) | (0.05) | (0.02) | (0.03) | (0.03) |
| Perceived Job Control$_{t-1}$ | -0.32** | -0.21** | -0.52** | -0.65** | -0.00 | -0.39** | -0.67** | -0.59** |
| | (0.03) | (0.03) | (0.03) | (0.03) | (0.06) | (0.03) | (0.03) | (0.03) |
| Perceived Job Security$_{t-1}$ | 0.05 | -0.04 | -0.05 | 0.18** | 0.06 | -0.16** | -0.11** | -0.13** |
| | (0.03) | (0.03) | (0.03) | (0.04) | (0.07) | (0.03) | (0.03) | (0.04) |
| Stressors$_{t-1}$missing | -0.81* | -2.56** | -3.96** | -3.26** | -1.25 | -3.89** | -5.32** | -4.92** |
| | (0.41) | (0.44) | (0.45) | (0.49) | (0.79) | (0.43) | (0.42) | (0.46) |
| Percent white collar | -0.07 | -4.97** | -2.30 | -5.19** | -21.34** | -17.11** | -8.00** | -5.23** |
| | (0.95) | (1.06) | (1.36) | (1.40) | (3.91) | (1.58) | (1.47) | (1.72) |
| Percent full time | -4.57* | 0.75 | -11.06** | 11.25** | 2.91 | 3.52 | 1.75 | 2.70 |
| | (2.19) | (2.22) | (2.70) | (2.76) | (4.88) | (2.50) | (2.51) | (2.96) |
| Bartik Instrument | 1.56 | -0.27 | 1.02 | -3.18 | 8.62 | -11.10 | 1.97 | -2.12 |
| | (7.08) | (7.38) | (9.13) | (9.20) | (16.86) | (8.39) | (8.48) | (10.22) |
| Unemployment Rate | 0.02 | -0.04 | -0.17** | 0.16** | 0.53** | 0.13** | 0.20** | 0.14** |
| | (0.04) | (0.04) | (0.05) | (0.04) | (0.08) | (0.04) | (0.04) | (0.05) |

A */** next to coefficient indicates significance at the 5/2% level.

**TABLE 9**

Estimation Result: Occupation - Female (No Heterogeneity)

| VARIABLES | Occupation (base cat- Legislators) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Professionals | Technicians | Clerks | Service Workers | Skilled Agricult | Craft-Trade Work | Machine Operator | Elementary Occ. |
| Work Experience ($E_{t-1}$) | -0.11** | -0.09** | -0.07** | -0.11** | -0.04 | -0.11** | -0.14** | -0.14** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.04) | (0.02) | (0.01) | (0.01) |
| Firm Tenure ($T^{j}_{t-1}$) | -0.02** | -0.03** | -0.04** | -0.08** | -0.04 | -0.00 | 0.02 | -0.04** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.03) | (0.02) | (0.01) | (0.01) |
| Occupation Tenure ($T^{o}_{t-1}$) | 0.11** | 0.04** | 0.05** | 0.05** | 0.11** | 0.06** | 0.01 | 0.01 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.02) | (0.02) | (0.02) | (0.01) |
| Not Work$_{t-1}$ | 0.05 | -1.65** | -2.16** | -2.84** | -1.32 | -2.31** | -4.25** | -3.90** |
| | (0.28) | (0.29) | (0.29) | (0.31) | (1.30) | (0.86) | (0.57) | (0.35) |
| General Health$_{t-1}$ | 0.00 | 0.00 | -0.00 | -0.00 | 0.01 | -0.01* | 0.01 | -0.01* |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.01) | (0.01) | (0.01) | (0.00) |
| Mental Health$_{t-1}$ | -0.01 | -0.01** | -0.01** | -0.01** | 0.00 | -0.01 | -0.02* | -0.01** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.02) | (0.01) | (0.01) | (0.00) |
| SCQ$_{t-1}$missing | -0.95* | -1.06** | -1.21** | -1.60** | 1.22 | -4.21** | -0.27 | -1.77** |
| | (0.39) | (0.39) | (0.39) | (0.41) | (1.85) | (1.16) | (0.73) | (0.46) |
| Perceived Stress$_{t-1}$ | -0.10** | -0.19** | -0.16** | -0.17** | 0.05 | -0.43** | -0.32** | -0.16** |
| | (0.02) | (0.03) | (0.03) | (0.03) | (0.14) | (0.11) | (0.07) | (0.04) |
| Perceived Job Demand$_{t-1}$ | 0.11** | -0.10** | -0.25** | -0.35** | -0.79** | -0.19* | -0.24** | -0.50** |
| | (0.02) | (0.02) | (0.02) | (0.03) | (0.15) | (0.09) | (0.06) | (0.04) |
| Perceived Job Control$_{t-1}$ | -0.31** | -0.29** | -0.36** | -0.47** | -0.05 | -0.12 | -0.56** | -0.51** |
| | (0.03) | (0.03) | (0.03) | (0.03) | (0.13) | (0.09) | (0.06) | (0.04) |
| Perceived Job Security$_{t-1}$ | 0.13** | 0.03 | 0.01 | -0.02 | 0.01 | -0.19 | -0.15* | -0.16** |
| | (0.03) | (0.03) | (0.03) | (0.04) | (0.16) | (0.11) | (0.07) | (0.04) |
| Stressors$_{t-1}$missing | -0.03 | -1.72** | -2.52** | -3.51** | -2.83 | -2.23* | -4.67** | -4.41** |
| | (0.40) | (0.40) | (0.40) | (0.43) | (1.91) | (1.08) | (0.78) | (0.49) |
| Percent white collar | -0.90 | -4.77** | -1.67 | -4.80** | 6.87 | -7.69 | -10.45** | -11.04** |
| | (1.13) | (1.22) | (1.19) | (1.43) | (3.99) | (5.64) | (3.47) | (2.07) |
| Percent full time | -5.17* | -9.28** | -8.01** | -6.00* | 14.25 | -5.64 | -7.96 | -7.49* |
| | (2.34) | (2.42) | (2.46) | (2.73) | (10.73) | (8.09) | (5.52) | (3.34) |
| Bartik Instrument | 6.51 | -2.14 | 1.51 | 3.53 | 23.24 | -18.52 | -5.96 | 1.17 |
| | (7.51) | (7.69) | (7.78) | (8.66) | (46.93) | (26.88) | (17.46) | (10.57) |
| Unemployment Rate | 0.12** | 0.09* | 0.07 | 0.19** | -0.39 | 0.23 | -0.08 | 0.25** |
| | (0.04) | (0.04) | (0.04) | (0.05) | (0.23) | (0.15) | (0.10) | (0.06) |

A */** next to coefficient indicates significance at the 5/2% level.

**TABLE 10**

Subjective Job Stressor Equations -Male Sample (No Heterogeneity)

| VARIABLES | Perceived Job Stress | Job Control | Job Demand | Job Security |
|---|---|---|---|---|
| Legislators, senior officials and managers | 0.07 | 0.22** | -0.38** | -0.26** |
| | (0.07) | (0.06) | (0.07) | (0.05) |
| Technicians and associate professionals | -0.05 | 0.09* | -0.38** | -0.13** |
| | (0.05) | (0.04) | (0.05) | (0.04) |
| Clerks | -0.09 | -0.43** | -0.83** | -0.33** |
| | (0.08) | (0.07) | (0.08) | (0.06) |
| Service Workers and market sales worker | -0.17* | -0.56** | -0.72** | -0.15** |
| | (0.07) | (0.06) | (0.07) | (0.06) |
| Skilled agricultural and fishery worker | -0.43** | 0.29** | -1.00** | 0.07 |
| | (0.12) | (0.10) | (0.12) | (0.09) |
| Craft and related trades workers | -0.23** | -0.23** | -0.70** | -0.37** |
| | (0.06) | (0.05) | (0.06) | (0.05) |
| Plant and machine operators and assembler | -0.38** | -0.57** | -1.14** | -0.54** |
| | (0.08) | (0.07) | (0.08) | (0.06) |
| Elementary occupations | -0.29** | -0.45** | -1.12** | -0.34** |
| | (0.09) | (0.08) | (0.09) | (0.07) |
| Hours Work | 0.02** | -0.00 | 0.02** | 0.00** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Work Experience ($E_{t-1}$) | -0.00 | 0.01** | 0.00 | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Firm tenure at beginning of t | 0.01** | -0.00 | 0.02** | 0.01** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Occupation tenure at beginning of t | -0.00 | 0.00 | 0.00* | 0.00** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| General Health$_{t-1}$ | -0.01** | 0.00** | -0.00** | 0.01** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Mental Health$_{t-1}$ | -0.02** | 0.01** | -0.00** | 0.01** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| SCQ$_{t-1}$missing | -2.02** | 0.97** | -0.43** | 1.63** |
| | (0.09) | (0.08) | (0.09) | (0.07) |
| Union | 0.13** | -0.30** | 0.14** | 0.10** |
| | (0.03) | (0.02) | (0.03) | (0.02) |
| Supervise | 0.27** | 0.40** | 0.32** | 0.12** |
| | (0.03) | (0.02) | (0.03) | (0.02) |
| Average Perceived Stress | 0.06 | -0.02 | -0.14** | 0.04 |
| | (0.03) | (0.03) | (0.03) | (0.03) |
| Average Job Demand | 0.01 | 0.12** | 0.04 | -0.09** |
| | (0.03) | (0.03) | (0.03) | (0.03) |
| Average Job Control | -0.03 | 0.07** | 0.16** | -0.07** |
| | (0.03) | (0.03) | (0.03) | (0.02) |
| Average Job Security | 0.03 | -0.10** | -0.12** | 0.10** |
| | (0.04) | (0.03) | (0.04) | (0.03) |
| Occupation Stressor$_t$ | -0.05 | 0.02 | 0.38** | 0.47** |
| | (0.12) | (0.11) | (0.12) | (0.10) |

A */** next to coefficient indicates significance at the 5/2% level.

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TABLE 11

## TABLE 11

Subjective Job Stressor Equations - Female Sample (No Heterogeneity)

| VARIABLES | Perceived Job Stress | Job Control | Job Demand | Job Security |
|---|---|---|---|---|
| Legislators, senior officials and managers | -0.04 | 0.26** | -0.47** | -0.26** |
| | (0.07) | (0.06) | (0.07) | (0.05) |
| Technicians and associate professionals | -0.23** | -0.05 | -0.41** | -0.14** |
| | (0.05) | (0.05) | (0.05) | (0.04) |
| Clerks | -0.28** | -0.05 | -0.65** | -0.20** |
| | (0.07) | (0.06) | (0.07) | (0.05) |
| Service Workers and market sales worker | -0.24** | -0.37** | -0.86** | -0.26** |
| | (0.08) | (0.07) | (0.08) | (0.06) |
| Skilled agricultural and fishery worker | -0.57* | 0.21 | -1.99** | 0.28 |
| | (0.28) | (0.25) | (0.28) | (0.20) |
| Craft and related trades workers | -0.61** | -0.24 | -0.70** | -0.17 |
| | (0.20) | (0.18) | (0.20) | (0.15) |
| Plant and machine operators and assembler | -0.60** | -0.41** | -1.08** | -0.59** |
| | (0.14) | (0.13) | (0.14) | (0.10) |
| Elementary occupations | -0.28** | -0.42** | -0.92** | -0.36** |
| | (0.10) | (0.09) | (0.10) | (0.07) |
| Hours Work | 0.03** | -0.00** | 0.03** | 0.00** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Work Experience ($E_{t-1}$) | -0.01** | 0.01** | -0.00 | -0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Firm tenure at beginning of t | 0.00* | -0.00 | 0.01** | 0.01** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Occupation tenure at beginning of t | 0.01** | -0.00 | 0.01** | 0.00* |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| General Health$_{t-1}$ | -0.01** | 0.00** | -0.00** | 0.01** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Mental Health$_{t-1}$ | -0.02** | 0.00** | -0.00** | 0.01** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| SCQ$_{t-1}$missing | -1.64** | 0.61** | -0.68** | 1.27** |
| | (0.10) | (0.09) | (0.10) | (0.07) |
| Union | 0.24** | -0.35** | 0.28** | 0.19** |
| | (0.03) | (0.03) | (0.03) | (0.02) |
| Supervise | 0.15** | 0.34** | 0.40** | 0.15** |
| | (0.03) | (0.03) | (0.03) | (0.02) |
| Average Perceived Stress | 0.15** | -0.03 | -0.09** | 0.03 |
| | (0.04) | (0.03) | (0.04) | (0.03) |
| Average Job Demand | -0.05 | 0.45** | 0.09** | -0.04* |
| | (0.03) | (0.02) | (0.03) | (0.02) |
| Average Job Control | 0.04 | 0.07* | 0.22** | -0.05* |
| | (0.03) | (0.03) | (0.03) | (0.03) |
| Average Job Security | 0.11** | -0.10** | -0.07 | 0.09** |
| | (0.04) | (0.04) | (0.04) | (0.03) |
| Occupation Stressor$_t$ | 0.14 | -0.58** | 0.65** | 0.32** |
| | (0.12) | (0.11) | (0.12) | (0.09) |

A */** next to coefficient indicates significance at the 5/2% level.

## TABLE 12
## Estimation Results: Health Outcomes - Heterogeneity Model

| VARIABLES | Male (6-5) | | Female (6-6) | |
|---|---|---|---|---|
| | Mental Health | General Health | Mental Health | General Health |
| General Health$_{t-1}$ | 0.08*** | 0.71*** | 0.07*** | 0.69*** |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Mental Health$_{t-1}$ | 0.48*** | 0.00 | 0.44*** | -0.01 |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Health Shock in t | -2.42*** | -5.71*** | -3.16*** | -8.44*** |
| | (0.42) | (0.44) | (0.43) | (0.45) |
| SCQ$_{t-1}$missing | 42.90*** | 50.58*** | 36.45*** | 45.14*** |
| | (1.21) | (1.21) | (1.41) | (1.37) |
| Perceived Stress$_t$ | -1.14*** | -0.50*** | -2.41*** | -1.76*** |
| | (0.11) | (0.12) | (0.31) | (0.27) |
| Perceived Job Demand$_t$ | 0.01 | -0.13 | -1.12*** | -1.26*** |
| | (0.10) | (0.11) | (0.16) | (0.16) |
| Perceived Job Control$_t$ | 0.26** | 0.31*** | 0.09 | 0.07 |
| | (0.10) | (0.11) | (0.15) | (0.13) |
| Perceived Job Security$_t$ | 1.24*** | 1.11*** | 0.92*** | 0.55*** |
| | (0.24) | (0.24) | (0.13) | (0.13) |
| Stressors$_t$missing | 3.76** | 4.30** | -6.92*** | -6.62*** |
| | (1.75) | (1.80) | (1.62) | (1.48) |
| Hours Work | 0.03 | 0.04 | 0.32*** | 0.32*** |
| | (0.02) | (0.03) | (0.04) | (0.04) |
| Job Switch$_t$ | 0.48 | 0.57 | 1.23*** | -0.15 |
| | (0.31) | (0.34) | (0.38) | (0.39) |
| Occupation Switch$_t$ | 0.11 | -0.10 | -0.19 | 0.44 |
| | (0.23) | (0.24) | (0.25) | (0.26) |
| Legislators, senior officials and managers | 1.17*** | 1.38*** | 0.64 | 0.59 |
| | (0.42) | (0.45) | (0.84) | (0.70) |
| Technicians and associate professionals | 3.39*** | 2.54*** | -2.51*** | -2.46*** |
| | (0.51) | (0.55) | (0.89) | (0.75) |
| Clerks | 0.26 | 0.63 | -3.56*** | -3.73*** |
| | (0.60) | (0.56) | (1.09) | (1.04) |
| Service Workers and market sales worker | 0.85 | 0.96 | -3.99*** | -3.54*** |
| | (0.78) | (0.82) | (1.12) | (0.96) |
| Skilled agricultural and fishery worker | 3.80** | 3.14** | -10.35*** | -9.22** |
| | (1.68) | (1.40) | (3.53) | (3.72) |
| Craft and related trades workers | 0.69 | 0.80 | -4.88 | -4.13** |
| | (0.63) | (0.69) | (3.91) | (2.06) |
| Plant and machine operators and assembler | 1.26 | 1.04 | -1.44 | -2.09 |
| | (0.71) | (0.74) | (1.43) | (1.30) |
| Elementary occupations | 1.13 | 1.54 | -3.97*** | -3.71*** |
| | (0.82) | (0.83) | (0.96) | (0.77) |
| Not Employed$_t$ | 5.24*** | 5.23*** | -0.85 | -1.84 |
| | (1.75) | (1.74) | (1.79) | (1.60) |
| New Child in t | -0.08 | -0.38 | -0.25 | 0.96** |
| | (0.36) | (0.41) | (0.38) | (0.40) |
| Divorce in t | -3.34*** | 1.26 | -3.19*** | 3.28*** |
| | (1.27) | (1.09) | (1.19) | (0.89) |
| Household Income | 0.37** | 0.40** | 0.34*** | 0.19 |
| | (0.17) | (0.17) | (0.12) | (0.12) |

A */**/*** next to coefficient indicates significance at the 5/2/1 % level.

# TABLE 13
## Subjective Job Stressor Equations -Male Sample (Heterogeneity Model)

| VARIABLES | Perceived Job Stress | Job Control | Job Demand | Job Security |
|---|---|---|---|---|
| Legislators, senior officials and managers | 0.56*** | 0.01 | 0.02 | -0.38*** |
| | (0.13) | (0.13) | (0.13) | (0.11) |
| Technicians and associate professionals | 0.09 | -0.01 | -0.31*** | -0.07 |
| | (0.10) | (0.12) | (0.10) | (0.13) |
| Clerks | -0.29 | -0.43*** | -1.09*** | -0.30** |
| | (0.19) | (0.12) | (0.19) | (0.12) |
| Service Workers and market sales worker | -0.64*** | -0.24 | -1.10*** | 0.08 |
| | (0.20) | (0.19) | (0.17) | (0.18) |
| Skilled agricultural and fishery worker | -0.53** | 0.13 | -1.31*** | 0.23 |
| | (0.24) | (0.26) | (0.30) | (0.59) |
| Craft and related trades workers | 0.00 | -1.01*** | -1.15*** | -0.78*** |
| | (0.13) | (0.13) | (0.14) | (0.12) |
| Plant and machine operators and assembler | -0.15 | -1.11*** | -1.41*** | -0.83*** |
| | (0.16) | (0.15) | (0.18) | (0.18) |
| Elementary occupations | -0.44*** | -0.84*** | -1.70*** | -0.52*** |
| | (0.15) | (0.16) | (0.17) | (0.16) |
| Hours Work | 0.07*** | -0.01 | 0.07*** | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Work Experience ($E_{t-1}$) | -0.04*** | 0.02*** | -0.04*** | 0.01 |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Firm tenure at beginning of t | 0.01** | 0.00 | 0.01*** | 0.01*** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Occupation tenure at beginning of t | -0.01*** | 0.01** | 0.00 | 0.01*** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| General Health$_{t-1}$ | -0.01*** | 0.00** | -0.01*** | 0.01*** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Mental Health$_{t-1}$ | -0.02*** | 0.01*** | 0.00 | 0.01*** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| SCQ$_{t-1}$missing | -1.81*** | 0.72*** | -0.41** | 1.40*** |
| | (0.16) | (0.14) | (0.16) | (0.12) |
| Union | 0.10 | -0.27*** | 0.12** | 0.11*** |
| | (0.05) | (0.05) | (0.05) | (0.04) |
| Supervise | 0.24*** | 0.36*** | 0.26*** | 0.10*** |
| | (0.04) | (0.04) | (0.04) | (0.03) |
| Average Perceived Stress | 0.08** | -0.02 | -0.11*** | 0.03 |
| | (0.04) | (0.03) | (0.04) | (0.03) |
| Average Job Demand | 0.02 | 0.11*** | 0.06 | -0.09*** |
| | (0.04) | (0.04) | (0.04) | (0.03) |
| Average Job Control | -0.05 | 0.06 | 0.11*** | -0.06** |
| | (0.03) | (0.03) | (0.04) | (0.03) |
| Average Job Security | 0.01 | -0.09** | -0.13*** | 0.09*** |
| | (0.05) | (0.04) | (0.05) | (0.03) |
| Occupation Stressor$_t$ | -0.28 | 0.20 | 0.26 | 0.57*** |
| | (0.17) | (0.21) | (0.20) | (0.15) |

A **/*** next to coefficient indicates significance at the 5/1%
level.

## TABLE 14

### Subjective Job Stressor Equations - Female Sample (Heterogeneity Model)

| VARIABLES | Perceived Job Stress | Job Control | Job Demand | Job Security |
|---|---|---|---|---|
| Legislators, senior officials and managers | -0.01 | 0.85*** | -0.05 | -0.04 |
| | (0.14) | (0.12) | (0.15) | (0.10) |
| Technicians and associate professionals | -0.45*** | 0.67*** | -0.59*** | -0.16** |
| | (0.17) | (0.09) | (0.11) | (0.07) |
| Clerks | -0.70*** | 0.22 | -1.05*** | -0.17 |
| | (0.23) | (0.18) | (0.17) | (0.12) |
| Service Workers and market sales worker | -0.58*** | 0.07 | -1.09*** | -0.03 |
| | (0.21) | (0.14) | (0.21) | (0.14) |
| Skilled agricultural and fishery worker | -0.81 | 0.79** | -2.61*** | 0.18 |
| | (1.05) | (0.31) | (0.72) | (0.42) |
| Craft and related trades workers | -0.13 | -0.59** | -0.53 | -0.18 |
| | (0.35) | (0.30) | (0.28) | (0.21) |
| Plant and machine operators and assembler | -0.11 | -0.69*** | -0.72*** | -0.53*** |
| | (0.22) | (0.21) | (0.22) | (0.16) |
| Elementary occupations | -0.27 | -0.59*** | -1.06*** | -0.32*** |
| | (0.17) | (0.16) | (0.17) | (0.12) |
| Hours Work | 0.06*** | 0.01** | 0.08*** | 0.02*** |
| | (0.02) | (0.01) | (0.01) | (0.00) |
| Work Experience $(E_{t-1})$ | -0.02** | 0.00 | -0.02*** | 0.00 |
| | (0.01) | (0.01) | (0.01) | (0.00) |
| Firm tenure at beginning of t | 0.00 | 0.00 | 0.00 | 0.01*** |
| | (0.00) | (0.01) | (0.00) | (0.00) |
| Occupation tenure at beginning of t | 0.00 | 0.00 | 0.00 | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| General Health$_{t-1}$ | -0.01*** | 0.00** | -0.01*** | 0.00*** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Mental Health$_{t-1}$ | -0.02*** | 0.00 | -0.01*** | 0.01*** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| SCQ$_{t-1}$missing | -1.65*** | 0.39 | -1.14*** | 1.06*** |
| | (0.31) | (0.23) | (0.20) | (0.11) |
| Union | 0.17*** | -0.36*** | 0.20*** | 0.18*** |
| | (0.04) | (0.05) | (0.04) | (0.04) |
| Supervise | 0.06 | 0.32*** | 0.29*** | 0.15*** |
| | (0.03) | (0.04) | (0.04) | (0.03) |
| Average Perceived Stress | 0.10** | -0.04 | -0.09** | 0.05 |
| | (0.05) | (0.04) | (0.04) | (0.03) |
| Average Job Demand | -0.07** | 0.35*** | 0.06 | -0.04 |
| | (0.03) | (0.04) | (0.03) | (0.03) |
| Average Job Control | 0.03 | 0.06 | 0.18*** | -0.06** |
| | (0.04) | (0.04) | (0.04) | (0.03) |
| Average Job Security | 0.05 | -0.09 | -0.11** | 0.09** |
| | (0.05) | (0.05) | (0.04) | (0.04) |
| Occupation Stressor$_t$ | 0.06 | -0.70*** | 0.43*** | 0.17 |
| | (0.16) | (0.18) | (0.16) | (0.15) |

A **/*** next to coefficient indicates significance at the 5/1%
level.

## TABLE 15

Estimation Results: Employment Outcomes and Hours Worked - Male Sample (Heterogeneity Model)

| VARIABLES | Employment Outcome Conditional on being employed in t-1 ($b_t^j|e_{t-1}=1$) (relative to same job ) | | | Employment Outcome Conditional on not being employed in t-1 ($b_t^j|e_{t-1} \neq 1$) (relative to employed) | | Hours Worked |
|---|---|---|---|---|---|---|
| | New job | Unemployed | OLF | Unemployed | OLF | |
| Work Experience ($E_{t-1}$) | 0.02 | -0.10*** | -0.13*** | -0.14*** | -0.14*** | 0.68*** |
| | (0.01) | (0.02) | (0.02) | (0.02) | (0.02) | (0.05) |
| Firm Tenure ($T_{t-1}^j$) | -0.11*** | -0.09*** | -0.02 | | | -0.03 |
| | (0.01) | (0.02) | (0.01) | | | (0.02) |
| Occupation Tenure ($T_{t-1}^o$) | 0.00 | 0.00 | 0.00 | | | 0.08*** |
| | (0.00) | (0.01) | (0.01) | | | (0.02) |
| General Health$_{t-1}$ | 0.00** | 0.00 | -0.01 | 0.00 | -0.02*** | 0.03*** |
| | (0.00) | (0.00) | (0.00) | (0.01) | (0.01) | (0.01) |
| Mental Health$_{t-1}$ | 0.00 | -0.01 | -0.01 | 0.00 | 0.02** | 0.01 |
| | (0.00) | (0.01) | (0.00) | (0.01) | (0.01) | (0.01) |
| SCQ$_{t-1}$missing | -0.92*** | -1.60** | -3.54*** | 0.43 | -0.22 | 4.16*** |
| | (0.28) | (0.64) | (0.51) | (0.60) | (0.57) | (1.26) |
| Perceived Stress$_{t-1}$ | 0.04** | 0.12** | 0.01 | | | 1.07*** |
| | (0.02) | (0.05) | (0.06) | | | (0.08) |
| Perceived Job Demand$_{t-1}$ | -0.07*** | -0.07 | -0.08 | | | 1.23*** |
| | (0.02) | (0.06) | (0.05) | | | (0.09) |
| Perceived Job Control$_{t-1}$ | -0.05** | -0.10 | -0.16*** | | | -0.08 |
| | (0.02) | (0.07) | (0.05) | | | (0.11) |
| Perceived Job Security$_{t-1}$ | -0.35*** | -0.42*** | -0.36*** | | | 0.09 |
| | (0.02) | (0.06) | (0.06) | | | (0.11) |
| Stressors$_{t-1}$missing | -1.14*** | -1.09 | -0.31 | | | 8.25*** |
| | (0.27) | (0.62) | (0.48) | | | (1.14) |
| Percent white collar | -1.25 | 0.44 | 1.18 | 7.29 | 2.62 | -7.11 |
| | (1.02) | (2.81) | (3.05) | (3.95) | (4.70) | (4.85) |
| Percent full time | 1.99 | 2.54 | 3.84 | -11.72 | -15.84** | 11.22 |
| | (1.97) | (5.84) | (4.69) | (7.98) | (7.53) | (8.90) |
| Bartik Instrument | 11.81 | -15.33 | -3.69 | 19.85 | 41.73** | -48.94*** |
| | (6.31) | (19.47) | (15.66) | (23.61) | (20.21) | (17.45) |
| Unemployment Rate | -0.12*** | 0.12 | 0.07 | 0.05 | 0.08 | -0.04 |
| | (0.03) | (0.08) | (0.08) | (0.13) | (0.11) | (0.13) |

A **/*** next to coefficient indicates significance at the 5/1% level.

**TABLE 16**

Estimation Results: Employment Outcomes and Hours Worked - Female Sample (Heterogeneity Model)

| VARIABLES | Employment Outcome Conditional on being employed in t-1 ($b_t^j\|e_{t-1}=1$) (relative to same job ) | | | Employment Outcome Conditional on not being employed in t-1 ($b_t^j\|e_{t-1}\neq1$) (relative to employed) | | Hours Worked |
|---|---|---|---|---|---|---|
| | New job | Unemployed | OLF | Unemployed | OLF | |
| Work Experience ($E_{t-1}$) | 0.02*** | -0.04*** | -0.01 | -0.09*** | -0.06*** | 0.34*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.05) |
| Firm Tenure ($T_{t-1}^j$) | -0.11*** | -0.14*** | -0.05*** | | | 0.12*** |
| | (0.01) | (0.03) | (0.01) | | | (0.04) |
| Occupation Tenure ($T_{t-1}^o$) | -0.01 | -0.03 | -0.01 | | | 0.00 |
| | (0.01) | (0.02) | (0.01) | | | (0.03) |
| General Health$_{t-1}$ | 0.00 | -0.01*** | -0.01** | -0.01*** | -0.01** | 0.02** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.01) |
| Mental Health$_{t-1}$ | 0.00 | 0.00 | -0.02*** | 0.00 | 0.00 | 0.05*** |
| | (0.00) | (0.01) | (0.00) | (0.00) | (0.00) | (0.01) |
| SCQ$_{t-1}$missing | -0.98*** | -1.96*** | -3.34*** | -0.61 | -0.09 | 11.51*** |
| | (0.26) | (0.61) | (0.40) | (0.36) | (0.29) | (1.45) |
| Perceived Stress$_{t-1}$ | 0.06*** | 0.22*** | -0.17*** | | | 1.03*** |
| | (0.02) | (0.06) | (0.04) | | | (0.21) |
| Perceived Job Demand$_{t-1}$ | -0.05** | -0.16*** | -0.14*** | | | 1.76*** |
| | (0.02) | (0.06) | (0.03) | | | (0.11) |
| Perceived Job Control$_{t-1}$ | -0.04 | -0.05 | 0.03 | | | 0.53*** |
| | (0.02) | (0.06) | (0.04) | | | (0.16) |
| Perceived Job Security$_{t-1}$ | -0.27*** | -0.40*** | -0.03 | | | 0.80*** |
| | (0.03) | (0.07) | (0.05) | | | (0.16) |
| Stressors$_{t-1}$missing | -0.44 | -0.77 | 0.73 | | | 12.07*** |
| | (0.25) | (0.65) | (0.50) | | | (1.31) |
| Percent white collar | -1.34 | -0.29 | -4.55** | 8.62*** | 2.98 | 0.78 |
| | (1.22) | (2.57) | (1.96) | (2.39) | (2.18) | (9.46) |
| Percent full time | 0.35 | 2.24 | 0.07 | 6.62 | -3.57 | 28.42*** |
| | (2.20) | (4.82) | (2.98) | (4.98) | (3.49) | (10.35) |
| Bartik Instrument | 5.79 | 27.02 | -23.02*** | 1.62 | -7.01 | -35.18** |
| | (5.73) | (16.66) | (8.88) | (13.98) | (8.63) | (14.78) |
| Unemployment Rate | -0.11*** | 0.02 | -0.02 | 0.21*** | 0.10** | -0.43*** |
| | (0.03) | (0.09) | (0.05) | (0.07) | (0.05) | (0.16) |

A **/*** next to coefficient indicates significance at the 5/1% level.

**TABLE 17**

Estimation Result: Occupation - Male (Heterogeneity Model)

| VARIABLES | Professionals | Technicians | Clerks | Service Workers | Skilled Agricult | Craft-Trade Work | Machine Operator | Elementary Occ. |
|---|---|---|---|---|---|---|---|---|
| | | | | **Occupation** | | | | |
| | | | | (base cat- Legislators) | | | | |
| Work Experience ($E_{t-1}$) | -0.17*** | -0.07*** | -0.14*** | -0.02 | -0.13*** | 0.01 | -0.03 | -0.10*** |
| | (0.03) | (0.02) | (0.03) | (0.04) | (0.05) | (0.04) | (0.04) | (0.03) |
| Firm Tenure ($T_{t-1}^{j}$) | 0.01 | -0.02 | 0.00 | -0.01 | -0.01 | -0.02 | -0.01 | 0.01 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.03) | (0.01) | (0.01) | (0.01) |
| Occupation Tenure ($T_{t-1}^{o}$) | 0.05*** | 0.02 | 0.02 | 0.02 | 0.07*** | 0.11*** | 0.07*** | 0.00 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.03) | (0.01) | (0.01) | (0.01) |
| Not Work$_{t-1}$ | -0.71 | -1.67*** | -4.55*** | -2.16*** | -2.09 | -5.40*** | -7.23*** | -7.09*** |
| | (0.55) | (0.54) | (0.63) | (0.74) | (1.63) | (0.65) | (0.73) | (0.70) |
| General Health$_{t-1}$ | -0.01** | 0.00 | -0.01 | 0.00 | 0.01 | -0.01 | -0.01 | -0.01 |
| | (0.00) | (0.00) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Mental Health$_{t-1}$ | -0.01 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | -0.01 |
| | (0.00) | (0.00) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| SCQ$_{t-1}$missing | -1.83*** | 0.84 | -2.17*** | -1.16 | -0.08 | -1.09 | -1.32 | -1.98*** |
| | (0.60) | (0.62) | (0.71) | (0.78) | (1.21) | (0.75) | (0.76) | (0.69) |
| Perceived Stress$_{t-1}$ | -0.27*** | -0.14*** | -0.28*** | -0.32*** | -0.17 | -0.22*** | -0.23*** | -0.25*** |
| | (0.05) | (0.04) | (0.06) | (0.06) | (0.10) | (0.06) | (0.07) | (0.06) |
| Perceived Job Demand$_{t-1}$ | 0.03 | -0.20*** | -0.59*** | -0.50*** | -0.64*** | -0.51*** | -0.66*** | -0.85*** |
| | (0.06) | (0.05) | (0.08) | (0.07) | (0.12) | (0.06) | (0.08) | (0.07) |
| Perceived Job Control$_{t-1}$ | -0.16** | -0.17*** | -0.43*** | -0.34*** | 0.02 | -0.64*** | -0.83*** | -0.69*** |
| | (0.06) | (0.06) | (0.08) | (0.08) | (0.13) | (0.07) | (0.08) | (0.07) |
| Perceived Job Security$_{t-1}$ | 0.05 | 0.04 | -0.05 | 0.26** | 0.10 | -0.34*** | -0.24*** | -0.23*** |
| | (0.07) | (0.07) | (0.07) | (0.10) | (0.27) | (0.08) | (0.09) | (0.09) |
| Stressors$_{t-1}$missing | -0.76 | -2.81*** | -5.23*** | -3.23*** | -2.80 | -7.43*** | -8.20*** | -7.78*** |
| | (0.65) | (0.67) | (0.73) | (0.95) | (1.53) | (0.73) | (0.84) | (0.77) |
| Percent white collar | 1.68 | -4.48 | -3.55 | -2.48 | -19.08** | -18.46*** | -8.48** | -6.29 |
| | (2.41) | (2.46) | (3.22) | (3.94) | (7.69) | (5.94) | (4.25) | (4.06) |
| Percent full time | -6.21 | 1.37 | -12.88** | 12.04 | -0.44 | -0.20 | -5.57 | -1.33 |
| | (4.38) | (4.64) | (5.53) | (6.22) | (13.55) | (7.12) | (6.39) | (6.19) |
| Bartik Instrument | 4.09 | 1.44 | 9.54 | -4.78 | 4.28 | -13.38 | -2.38 | -4.47 |
| | (8.36) | (8.33) | (11.05) | (12.52) | (21.21) | (12.11) | (12.34) | (12.36) |
| Unemployment Rate | 0.00 | -0.07 | -0.18** | 0.26*** | 0.47*** | 0.05 | 0.20** | 0.11 |
| | (0.07) | (0.07) | (0.08) | (0.10) | (0.14) | (0.09) | (0.10) | (0.09) |

A **/*** next to coefficient indicates significance at the 5/1% level.

**TABLE 18**
Estimation Result: Occupation - Female (Heterogeneity Model)

| VARIABLES | Occupation (base cat- Legislators) | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Professionals | Technicians | Clerks | Service Workers | Skilled Agricult | Craft-Trade Work | Machine Operator | Elementary Occ. |
| Work Experience ($E_{t-1}$) | -0.17*** | -0.07*** | -0.14*** | -0.02 | -0.13*** | 0.01 | -0.03 | -0.10*** |
| | (0.03) | (0.02) | (0.03) | (0.04) | (0.05) | (0.04) | (0.04) | (0.03) |
| Firm Tenure ($T_{t-1}^{j}$) | 0.01 | -0.02 | 0.00 | -0.01 | -0.01 | -0.02 | -0.01 | 0.01 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.03) | (0.01) | (0.01) | (0.01) |
| Occupation Tenure ($T_{t-1}^{o}$) | 0.05*** | 0.02 | 0.02 | 0.02 | 0.07*** | 0.11*** | 0.07*** | 0.00 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.03) | (0.01) | (0.01) | (0.01) |
| Not Work$_{t-1}$ | -0.71 | -1.67*** | -4.55*** | -2.16*** | -2.09 | -5.40*** | -7.23*** | -7.09*** |
| | (0.55) | (0.54) | (0.63) | (0.74) | (1.63) | (0.65) | (0.73) | (0.70) |
| General Health$_{t-1}$ | -0.01** | 0.00 | -0.01 | 0.00 | 0.01 | -0.01 | -0.01 | -0.01 |
| | (0.00) | (0.00) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Mental Health$_{t-1}$ | -0.01 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | -0.01 |
| | (0.00) | (0.00) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| SCQ$_{t-1}$missing | -1.83*** | 0.84 | -2.17*** | -1.16 | -0.08 | -1.09 | -1.32 | -1.98*** |
| | (0.60) | (0.62) | (0.71) | (0.78) | (1.21) | (0.75) | (0.76) | (0.69) |
| Perceived Stress$_{t-1}$ | -0.27*** | -0.14*** | -0.28*** | -0.32*** | -0.17 | -0.22*** | -0.23*** | -0.25*** |
| | (0.05) | (0.04) | (0.06) | (0.06) | (0.10) | (0.06) | (0.07) | (0.06) |
| Perceived Job Demand$_{t-1}$ | 0.03 | -0.20*** | -0.59*** | -0.50*** | -0.64*** | -0.51*** | -0.66*** | -0.85*** |
| | (0.06) | (0.05) | (0.08) | (0.07) | (0.12) | (0.06) | (0.08) | (0.07) |
| Perceived Job Control$_{t-1}$ | -0.16** | -0.17*** | -0.43*** | -0.34*** | 0.02 | -0.64*** | -0.83*** | -0.69*** |
| | (0.06) | (0.06) | (0.08) | (0.08) | (0.13) | (0.07) | (0.08) | (0.07) |
| Perceived Job Security$_{t-1}$ | 0.05 | 0.04 | -0.05 | 0.26** | 0.10 | -0.34*** | -0.24*** | -0.23*** |
| | (0.07) | (0.07) | (0.07) | (0.10) | (0.27) | (0.08) | (0.09) | (0.09) |
| Stressors$_{t-1}$missing | -0.76 | -2.81*** | -5.23*** | -3.23*** | -2.80 | -7.43*** | -8.20*** | -7.78*** |
| | (0.65) | (0.67) | (0.73) | (0.95) | (1.53) | (0.73) | (0.84) | (0.77) |
| Percent white collar | 1.68 | -4.48 | -3.55 | -2.48 | -19.08** | -18.46*** | -8.48** | -6.29 |
| | (2.41) | (2.46) | (3.22) | (3.94) | (7.69) | (5.94) | (4.25) | (4.06) |
| Percent full time | -6.21 | 1.37 | -12.88** | 12.04 | -0.44 | -0.20 | -5.57 | -1.33 |
| | (4.38) | (4.64) | (5.53) | (6.22) | (13.55) | (7.12) | (6.39) | (6.19) |
| Bartik Instrument | 4.09 | 1.44 | 9.54 | -4.78 | 4.28 | -13.38 | -2.38 | -4.47 |
| | (8.36) | (8.33) | (11.05) | (12.52) | (21.21) | (12.11) | (12.34) | (12.36) |
| Unemployment Rate | 0.00 | -0.07 | -0.18** | 0.26*** | 0.47*** | 0.05 | 0.20** | 0.11 |
| | (0.07) | (0.07) | (0.08) | (0.10) | (0.14) | (0.09) | (0.10) | (0.09) |

A **/*** next to coefficient indicates significance at the 5/1% level.

# 11 Model Fits

## 11.1 Male Sample

**Figure 1**
**General Health Profile**
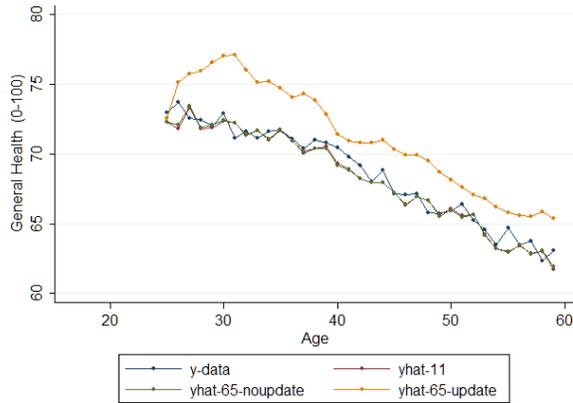


**Figure 2**
**Mental Health Profile**
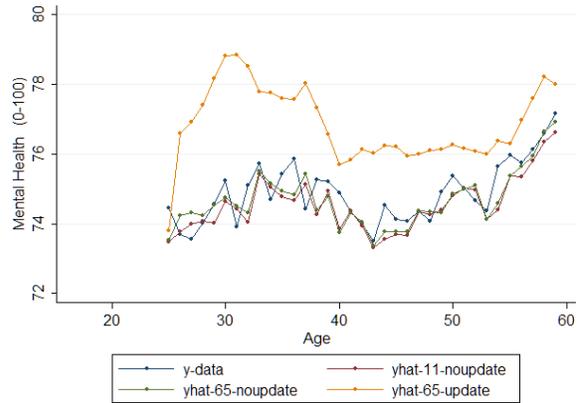


**Figure 3**
**Job Demand Profile**
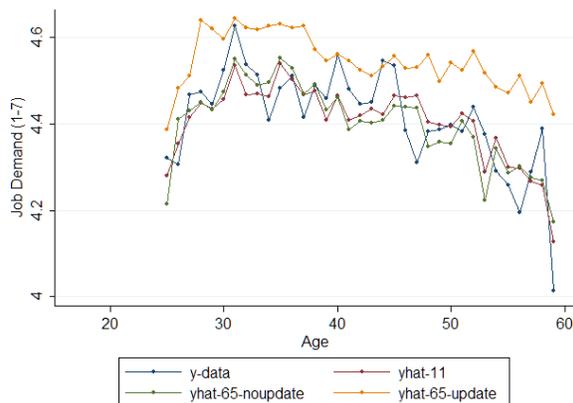


**Figure 4**
**Job Control Profile**
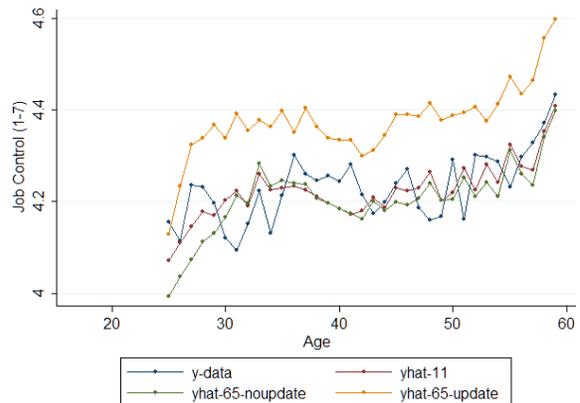
**Figure 5**
**Job Security Profile**
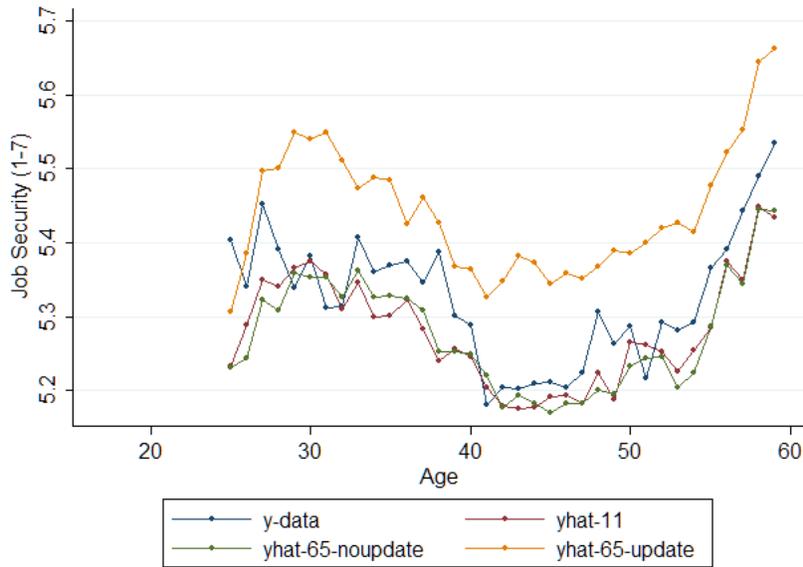


**Figure 6**
**Same Employer**
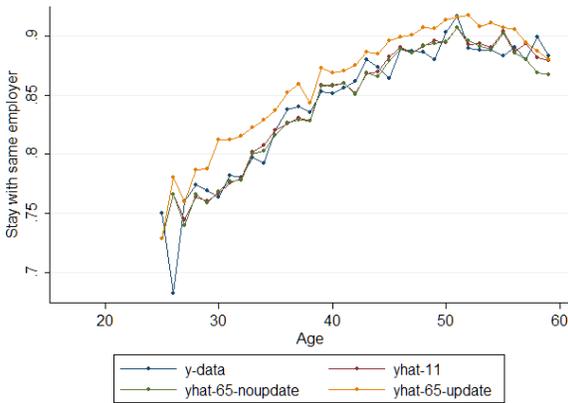


**Figure 7**
**Switch employer**
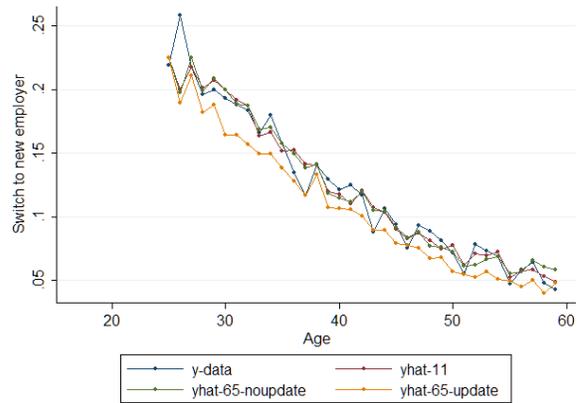


**Figure 8**
**Re-enter employment**
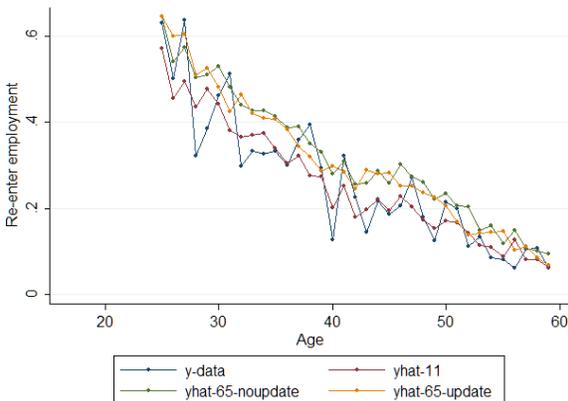


**Figure 9**
**Stay Unemployed**



44
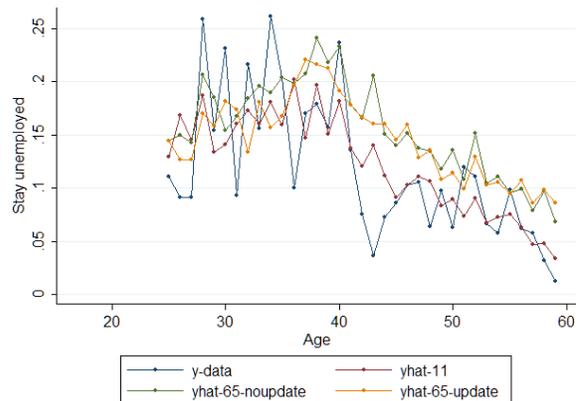
**Figure 10**
**Hours Work**
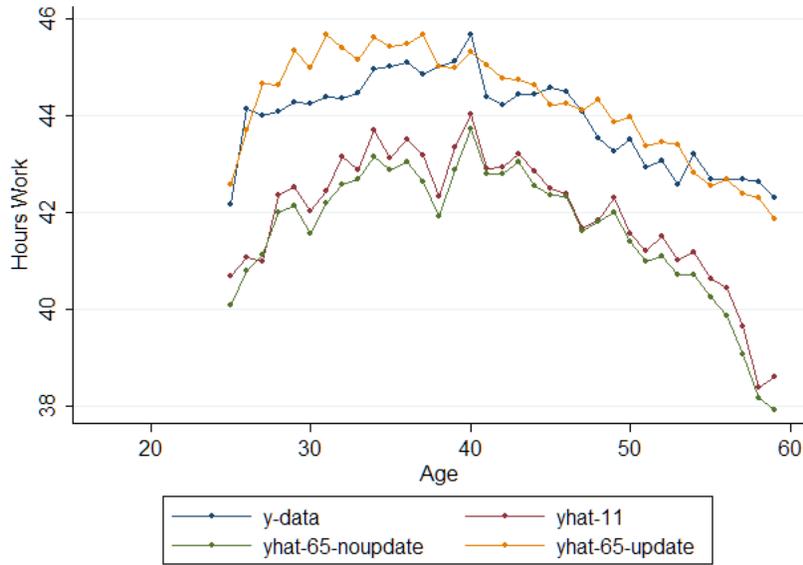


## 11.2  Female Sample

**Figure 11**
**General Health Profile**
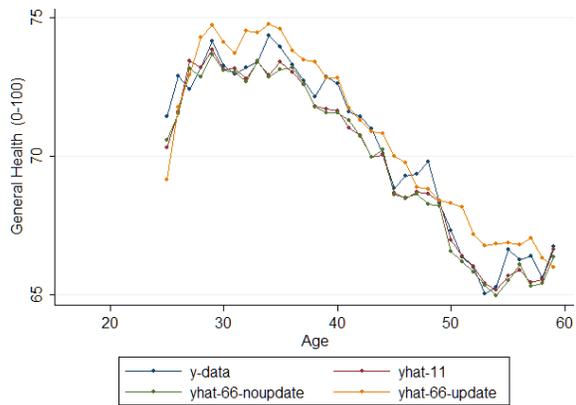


**Figure 12**
**Mental Health Profile**



45
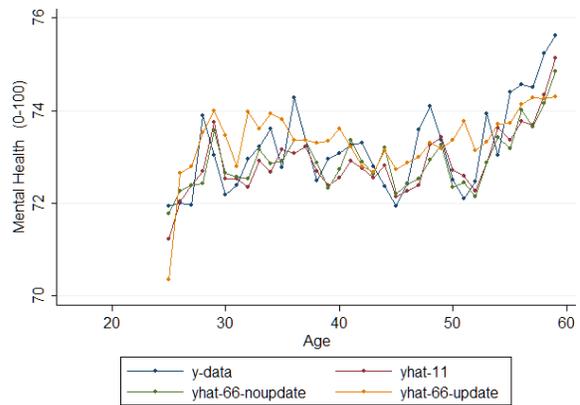
**Figure 13**
**Job Demand Profile**
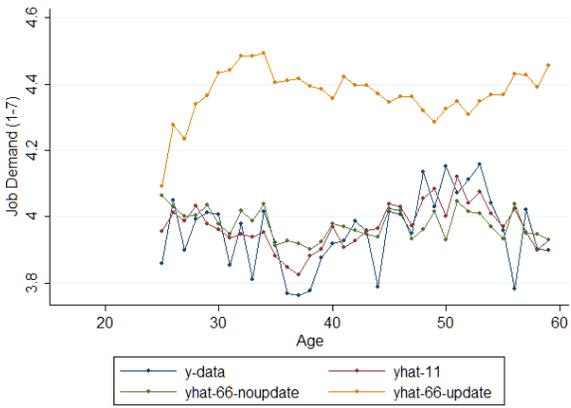

**Figure 14**
**Job Control Profile**
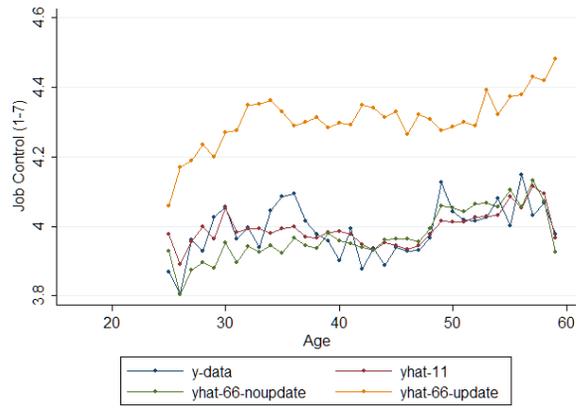

**Figure 15**
**Job Security Profile**
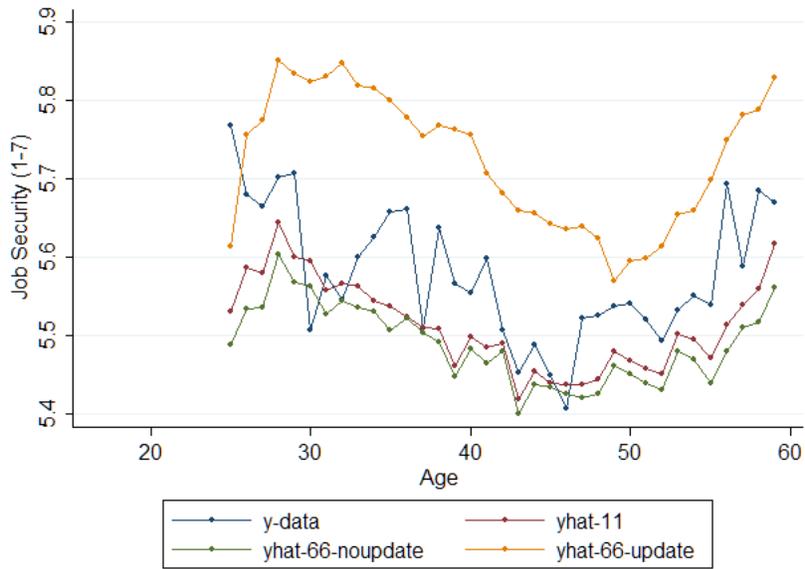

**Figure 16**
**Same Employer**
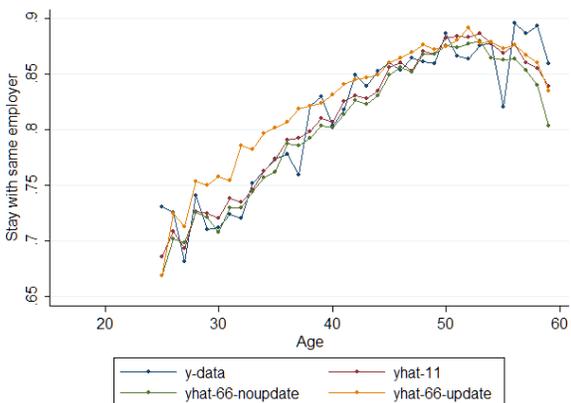

**Figure 17**
**Switch employer**
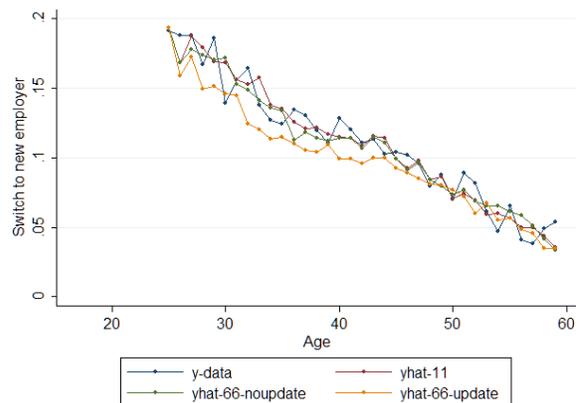
**Figure 18**
**Re-enter employment**
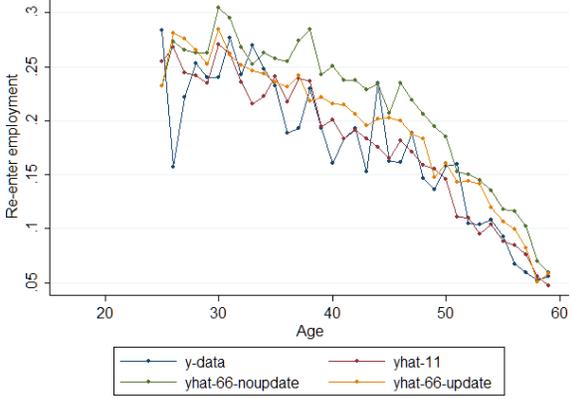


**Figure 19**
**Stay Unemployed**
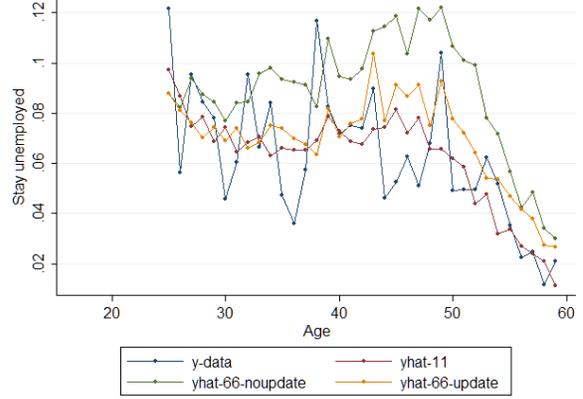
**Figure 20**
**Hours Work**
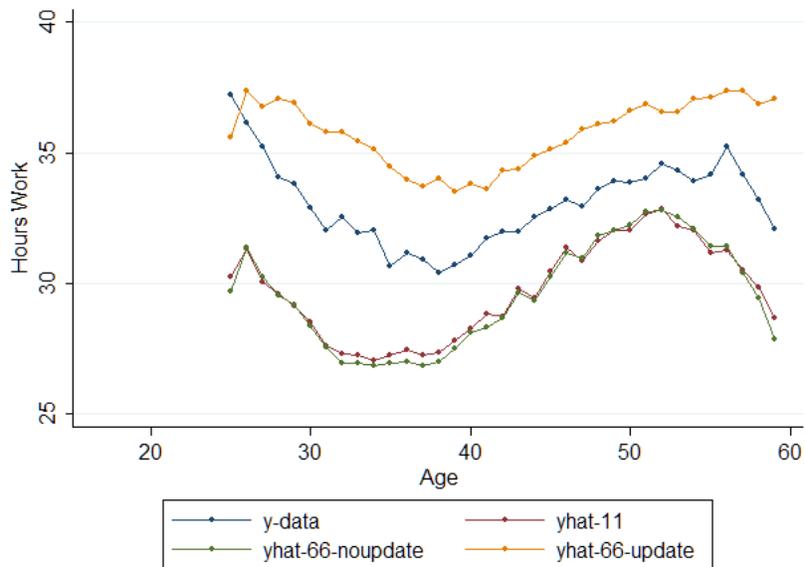
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# 12   Appendix: Data Description

| Variable | Description |
| --- | --- |
| **Mental Health** | A continuous variable ranging from 0 to 100. The variable is the average of the following five categorical variables on the scale from 1 (all the time) to 6 (none of the time) : Have you been a very nervous person?, Have you felt so down in the dumps that nothing could cheer you up?, Have you felt calm and peaceful?, Have you felt downhearted and blue?, and Have you been a happy person?. The scores of the third and fifth variables are reversed before the transformation. The final transformation uses the following formula: ( total raw scores - min(total raw scores)) $\div$ Possible raw score range x 100. |
| **General Health** | A continuous variable ranging from 0 to 100. The variable is the average of the following five categorical variables :  In general, would you say your health is:  , I seem to get sick a little easier than other people, I am as healthy as anybody I know, I expect my health to get worse, My health is excellent. The first item is recorded on the scale from 1 (poor) to 5 (excellent) , and the following four variables are recorded on the scale from 1 (definitely true) to 5 (definitely false). The scores of the third and fifth items are reversed before the transformation. The final transformation uses the following formula: ( total raw scores - min(total raw scores)) $\div$ possible raw score range x 100. |
| **Perceived Stress** | An ordinal categorical variable on the scale from 1 (strongly disagreed) to 7 (strongly agreed) response to the statement: My job is more stressful than I had ever imagined. |
| **Job Demand** | An ordinal categorical variable on the scale from 1 (strongly disagreed) to 7 (strongly agreed) response to the statement: My job is complex and difficult |

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|---|---|
| **Job Control** | The average of the following three ordinal categorical variables on the scale from 1 (strongly disagreed) to 7 (strongly agreed) responses to the statements: I have a lot of freedom to decide how I do my own work, I have a lot of say about what happens on my job, I have a lot of freedom to decide when I do my work. |
| **Job Security** | The average of the following three ordinal categorical variables on the scale from 1 (strongly disagreed) to 7 (strongly agreed) responses to the statements: I have a secure future in my job, the company I work for will still be in business in 5 years from now, I worry about the future of my job. The score of the last variable is reversed before calculating the average. |
| **Employment** | Provides information on individual labor force status: employed, unemployed, or out of labor force. |
| **Occupation** | A categorical variable that provides information on individual occupation using 1 digit International Standard Classification of Occupation-88 (ISCO-88) codes. |
| **Hours worked** | A continuous variable reporting number of hours work in main job. |
| **Attrition** | A binary variable takes on value 1 if individual exits the survey in the next period; equals 0 otherwise. |
| **Earning** | Hourly wage is calculated using current weekly wages and weekly hours of work. |
| **Work Experience** | Measures the total years worked. |
| **Firm tenure** | Measures the total years of working with current employer. |
| **Occupation tenure** | Measures the total years of working with current employer. |

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|---|---|
| **Occupation Stressors index** | The variable is a summarized measure (first component of principal component analysis) of the following O\* NET items: deal with physically aggressive people, deal with angry people, frequency of conflict situations, consequence of error, coordinate or lead others, frequency of decision making, impact of decisions on coworker, responsibility for outcomes, level of competition, and time pressure. The variable is normalize to the scale 0 and 1 using the following formula: ( actual raw score- minimum raw score) ÷ (maximum raw score - minimum raw score). |
| **Schooling** | it is a categorical variable with five categories: less than high school, high school, certificates or diplomas, bachelor, and graduate. |
| **Health Shock** | A binary variable equals 1 if a person experiences a major injury or illness in the past year. |