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RESERVATION WAGES, LABOUR MARKET PARTICIPATION AND HEALTH

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***Abstract*:**

The concept of the reservation wage has played an important role in labour market theory; particularly in models of job search, labour supply and labour market participation. Despite this core theoretical role, there is a scarcity of empirical research which explores the setting of reservation wages at the individual level. In this paper, we focus on the determinants of reservation wages, with a particular focus on health, which has attracted very little attention despite its importance from a policy perspective. We use data for males from 14 waves of the British Household Panel Survey and estimate an endogenous switching model which predicts reservation wages for the unemployed and market wages for the employed. We employ methods to deal with the endogeneity of health, measurement errors in our self reported health variable and selection into economic activity. Our results suggest that health is an important determinant of selection, both into economic activity and into employment (versus unemployment) but that, once these participation effects are accounted for, health is not a significant determinant of either the reservation wage or the market wage. This casts doubt on the results of a number of previous studies that have failed to appropriately account for selection in models of male wages. Our results have important policy implications since they suggest that poor health is a major cause of economic inactivity.

Key Words: Endogenous switching models; Health status; Labour market participation; Reservation wages
JEL Classification: J13; J24

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1. Introduction

The relationship between health and labour market outcomes, such as participation and wages, is the subject of a growing literature fed by the increasing availability of longitudinal data sets that contain rich information on individual health as well as labour market status and a host of other socio-demographic variables. Attempting to estimate the causal effect of health on labour market outcomes is complex because health and work are jointly determined (Adams *et al*. 2003). In addition, issues such as selection into economic activity and justification bias in self-reported health, require multiple econometric solutions in order to obtain meaningful estimates of the true causal effects of health status. It is therefore very encouraging to see the normally disparate literatures of health economics and labour economics come together to tackle an issue which is of key policy relevance. While considerable progress in understanding the relationship between health and the labour market has been made via both theoretical and empirical work (for example Adams *et al*. 2003; Stern, 1989), our study is motivated by an important gap in the existing literature. The two disciplines of health and labour economics do not yet seem to have met around the concept of the reservation wage.

The reservation wage is the lowest wage at which an individual is willing to work, and this concept has played an important role in labour market theory. In particular, the reservation wage is central to theoretical models of job search, labour supply and labour market participation (see, for example, Mortensen, 1986). Despite the key role played by the reservation wage in labour market theory, there is a scarcity of empirical research which explores the setting of reservation wages at the individual level, and this may be due to a scarcity of data relating to reservation wages. Much of the sparse existing literature tends to focus on how reservation wages affect the duration of unemployment, see, for example, Lancaster and Chesher (1983), Addison *et al*. (2004) and Blackaby *et al*. (2007). There are however theoretical reasons for expecting reservation wages to be influenced by the individual's state of health. Individuals in poor health are expected to have a higher reservation wage reflecting their greater disutility of work. This has direct policy consequences in relation to the increasing numbers of individuals in Europe who are classified as economically inactive due to health problems.

In this paper, we consider the determinants of reservation wages, with a particular focus on health, which has attracted very little attention in the existing empirical literature despite its importance from a policy perspective. We exploit the fact that in the British Household Panel Survey (*BHPS*) we have information on the stated reservation wages of the unemployed as well

as the market wages of employed individuals. We use an endogenous switching model to simultaneously estimate the probability of being employed versus unemployed alongside the continuous wage outcomes for each group. Of particular importance is the fact that we also allow for selection into labour market activity, where those who are unemployed but want to work are classified as economically active, whereas those who have very weak labour force attachment are viewed as inactive. We argue that this is a more appropriate classification for a study of health and labour market outcomes than that which is normally adopted in the literature, and results in findings that are in contrast to previous work. Our econometric analysis also attempts to deal with the endogeneity of health and with measurement errors in the self reported health information.

In contrast to much of the empirical literature, we find no effect of health on the market wages of the employed, and we find no evidence for the argument that has appeared in some papers (for example Walker and Thompson, 1996; Gordon and Blinder, 1980) that those with health problems will have higher reservation wages. Instead our results suggest that the main role of poor health is to weaken labour force attachment for those in the labour market (be it currently employed or unemployed), while excellent self-assessed health has a positive effect on the probability of employment (versus unemployment), the health effects on the wages of both groups are insignificant.

The structure of this paper is as follows: Section 2 reviews the previous work in this area; Section 3 explains our endogenous switching method, our models for health and treatment of selection into labour market activity; Section 4 describes the data and variables; Section 5 presents the results and Section 6 explains their relevance and concludes.

2. Previous Literature

Analysis of the relationship between health and labour market outcomes is theoretically grounded in the concept of human capital investment. While much of the early human capital literature focused on the returns to education (see Mincer 1958), increasingly health has also been recognised as a component of human capital[1], and a major theoretical contribution was made by Grossman's (1972) model of the demand for health capital. Early empirical studies identify important effects of health on labour market participation and wages (Grossman and Benham, 1973; Luft, 1975; Bartel and Taubman 1979; Berkowitz *et al*., 1983). However, these

[1] Becker (1962) and Mushkin (1962) are two of the earliest studies.

studies were usually limited by cross-sectional data, which made it hard to disentangle the complex interrelationships (see Section 3.1). More recently, the increased availability of panel data sets with rich information on health and socio-economic indicators means that the literature on health status and labour market outcomes, such as participation and earnings, has gained momentum.

One strand of the literature has focused on the implications of disability rather than health for labour market outcomes. In the US, Haveman *et al*. (1994) use eight waves of the Panel Study of Income Dynamics (*PSID*) to consider the effect of work limiting disability on working time and wages. They find that disability has a significantly negative effect on both outcomes and that this effect is larger once they have accounted for the endogeneity of health. For the UK, Walker and Thompson (1996) use the first 3 waves of the *BHPS* and find that, after controlling for the endogeneity of schooling, disability has a greater effect on labour market participation than on wages. In a similar vein, Kidd *et al*. (2000) compare the labour market outcomes of disabled and able-bodied men in the UK and find substantial wage and participation rate differences between the two groups with the disabled characterised by lower wages and lower participation rates with productivity related characteristics explaining approximately 50% of the differentials. In a more recent study, Jones (2006) states that whilst the average wages of the disabled are over 85% of their non disabled counterparts, the disabled participation rate is approximately half that of the non disabled.

Contoyannis and Rice (2001) use the first six waves of the *BHPS* to explore the effect of self-assessed general and psychological health rather than disability on wages in the UK and find that reduced psychological health reduces hourly wages for men and that excellent self-assessed health increases hourly wages for women. A number of reasons have been put forward to explain why health may influence wages, see Contoyannis and Rice (2001). For example, increased health may increase productivity and wages may rise accordingly. Employers may believe that health is correlated with unobserved characteristics which are positively associated with productivity or employers may simply discriminate against individuals perceived to be in poor health.

In sum, the existing literature suggests that poor health is associated with lower participation rates and, if employed, lower wages. As argued by Cai and Kalb (2006), if poor health leads to lower potential earnings, regardless of whether this is due to low productivity or employer discrimination, the opportunity cost of leisure falls, which impinges upon willingness to

participate in the labour market. In addition, high reservation wages may reflect benefit income associated with the disability thereby increasing the replacement ratio. Alternatively, individuals in poor health may value leisure time (i.e. time to look after one's health) more highly or the disutility associated with work may be high due to additional time or effort associated with working, which may lead to an increase in the individual's reservation wage. Hence, as argued by Jones (2006), low participation rates may partly reflect high reservation wages associated with poor health and/or certain types of disability.

Despite, hints in the literature about the potential role of reservation wages, to our knowledge there is only one existing empirical study that considers the role of health in determining reservation wages. Gordon and Blinder (1980) use US data from the early 1970s to study the retirement decisions of white men aged 58 to 67. They hypothesise that an individual retires when his reservation wage exceeds his market wage, acknowledging that failing health in old age may make work more difficult and/or less remunerative. Their results suggest that health impacts significantly positively on the reservation wage and negatively on the market wage. However, the health information used is very limited and is assumed to be exogenous, which the authors acknowledge probably results in a large upward bias in their estimates of the effect of health on wages.

3. Methodology

3.1 Health and Labour Market outcomes

There are three sources of potential endogeneity that exist when attempting to estimate the causal effect of health status on labour market outcomes. Firstly, there is true simultaneity between health and labour market outcomes, since while health may affect productivity and in turn wages, it is also the case that labour market status may have a direct effect on health. Secondly, it is likely that unobserved effects on both health and labour market outcomes are correlated; for example, those individuals who have a psychological disposition towards high levels of motivation may have higher labour market rewards and maintain better psychological health. Thirdly, as (in common with much of the empirical literature) we are using self-reported health measures, these are subject to reporting bias and measurement error. Labour market status might have a direct affect on own health perception (as distinct from actual health status). People may have incentives (financial and social) to report poor health in order to justify their labour market status (Kerkhofs and Lindeboom, 1995; Kreider, 1999). Also self –assessed health (SAH) measures are based on subjective judgements which may not be comparable across

individuals (Lindeboom and van Doorslaer 2004). While measurement error will lead to downward bias in our estimate of the effects of health on labour market outcomes, the other effects will lead to upward bias (Bound 1991). The common assumption in the literature seems to be that the latter outweighs the former but Bound *et al*. (1995) point out that the empirical evidence is mixed.

Our econometric approach to the problems of endogeneity and measurement error is to extend a method first used by Stern (1989) and Bound (1991). This uses specific measures of health (health problems) as instruments for the ordinal SAH measure. The idea is that more objective measures are used to instrument the endogenous and potentially error ridden subjective health measure[2]. We follow Bound *et al*. (1995) and Disney *et al*. (2006) in including socio-economic characteristics (alongside health problems) as predictors of SAH[3]. We then extend this approach by using generalised ordered probit (GOP) estimation to allow for the fact that individuals with the same underlying level of health may apply different thresholds when reporting SAH on an ordinal scale (Rice *et al*. 2007, Lindeboom and van Doorslaer 2004). This reporting bias may be due to 'index shift', whereby the shape of the SAH distribution stays the same but its location shifts reflecting a parallel shift in all reporting thresholds for sub-groups of the population; or 'cut-point shift', which implies a change in the relative positions of the reporting thresholds for particular sub-groups. The GOP model is appropriate here since it relaxes the assumption of constancy of threshold parameters that is a restriction of the standard ordered probit model.

$$H_i^* = \begin{cases} 0 \;\; poor\,/\,very\;poor\;health \\ 1 \;\; fair\;health \\ 2 \;\; good\,/\,very\;good\;health \\ 3 \;\; excellent\;health \end{cases} = \alpha + \theta K_i + \nu_i \qquad (1)$$

Equation (1) is estimated across individuals *i* and over time, where H^* is the unobserved health state of the individual and H_i is its observed counterpart, where $H_i = j$ if $\mu_{ij-1} < H_i^* \leq \mu_{ij}$ with μ's being thresholds. We estimate equation (1) via GOP analysis allowing for clustering to account for the panel aspect of our data. *K* is a vector of variables assumed to determine SAH (and reporting of SAH), such as specific health problems and socioeconomic characteristics such

[2] Bound *et al*. (1995) suggest a number of reasons why it may not be appropriate to use information on health problems directly in a labour market participation model, not least because these may not be highly correlated with ability to work.

[3] Campolieti (2002) takes a similar approach. This is distinct from Rice *et al*. (2007) who distinguish between health problems which are allowed to determine self-assessed health, and socio-economic variables which are assumed only to influence reporting bias.

as age, educational attainment and income[4]. We then define health stock dummy variables as predicted from equation (1):

$$HS_{i1} = \begin{cases} 1 & \textit{fair health} \\ 0 & \textit{other} \end{cases}; \; HS_{i2} = \begin{cases} 1 & \textit{good / very good health} \\ 0 & \textit{other} \end{cases}; \; HS_{i3} = \begin{cases} 1 & \textit{excellent health} \\ 0 & \textit{other} \end{cases}$$

where *poor/very poor health* is the omitted category. In order to explore the robustness of our empirical results, as well as dealing with health stock in this way, we also estimate models where health is treated as an exogenous variable.

3.2 Labour Force Participation

Having generated the health stock dummy variables we initially consider their effect upon labour market attachment (or participation); that is whether or not the individual is: (a) attached to the labour market, either being employed, self employed or currently unemployed but actively seeking work; or (b) not attached to the labour market, being for example long-term sick and disabled, retired (before the statutory retirement age of 65) or engaged in family care. Note that participation here includes unemployment. More details on the definition of non-participation, within the context of our data, are given in Section 4.

$$\begin{aligned} &PART_i = 1 \quad \textit{if} \quad PART_i^* = \gamma M_i + \sum_{j=1}^{3} \pi_j HS_{ijt-1} + \varsigma_i > 0 \quad \textit{i.e. in labour market}, \\ &PART_i = 0 \quad \textit{otherwise} \qquad\qquad\qquad\qquad\qquad\quad \textit{i.e. not in labour market} \end{aligned} \tag{2}$$

In equation (2) $PART_i^*$ is a latent variable which determines the outcome regime and $PART_i$ indicates the individual's observed labour market state. This is modelled across individuals and over time via a probit specification allowing for clustering conditional upon the (lagged) health stock dummy variables, modelled via equation (1), and a set of controls included in the vector *M* consisting of the number of hours per week that the individual cares for others (including those within and outside of the household), whether their partner is primarily responsible for child care, the number of children aged five and under, and the number of children aged between six and sixteen, which act as over-identifying instruments. The health dummy variables are lagged by one period to preclude the possibility of feedback from current labour market participation status to past health status, thus avoiding one potential cause of endogeneity. From equation (2) we calculate an inverse Mills ratio defined by:

$$\phi\left(\left\{\gamma M_i + \sum_{j=1}^{3} \pi_j HS_{ijt-1}\right\} / \sigma_\zeta\right) \Big/ \Phi\left(\left\{\gamma M_i + \sum_{j=1}^{3} \pi_j HS_{ijt-1}\right\} / \sigma_\zeta\right)$$

[4] The underlying assumption in equation (1) is that the specific health problems predict SAH while the other socioeconomic characteristics model the reporting cut-points.

where $\phi(.)$ and $\Phi(.)$ represent the standard normal density and cumulative distribution functions respectively. The inverse Mills ratio derived from estimation of (2) is used to control for sample selection bias into labour market participation when we analyse wage outcomes in equations (3) and (4) below.

3.3 The Determinants of Reservation and Market Wages

Our main focus in terms of labour market outcomes is to consider the determinants of both reservation wages and market wages, with a particular emphasis on health status. We adopt a full information maximum likelihood (FIML) approach to estimate an endogenous switching regression model (see Maddala, 1983; and Lokshin and Sajaia, 2004). The basic idea behind the switching model is that the outcome equation (reservation wages versus market wages) depends on a regime switch, in our case unemployment versus employment. Endogenous switching models have been used in a variety of contexts within labour economics. For example, Ransom (1987) adopts this approach to model household labour supply decisions whereby the simultaneity of the participation decision of the wife and the labour supply decision of the husband are accounted for. Heitmueller (2004) models the public-private sector wage gap in Scotland via an endogenous switching approach. Finally, Garcia Perez and Rebollo Sanz (2005) adopt a switching approach to explore the relationship between job mobility and wage mobility.

To our knowledge, the endogenous switching approach has not been applied to the analysis of reservation wages. It seems, however, particularly appropriate for the analysis of reservation wages at the individual level since the switching model sorts individuals into two groups: the unemployed and the employed. For the unemployed, we observe their reservation wages, whilst for the employed we observe their actual wages. It is apparent that the sample of unemployed (and employed) individuals is potentially non-randomly selected; for example, the high ability individuals are more likely to be in employment. However, selection issues have received very little attention in the empirical reservation wage literature. Some studies, such as Hogan (2004), have included an inverse Mills ratio term, i.e. they have taken a two stage approach to control for selection into unemployment, whilst other studies have not corrected for sample selection bias (for example Prasad, 2003).

The endogenous switching approach allows us to simultaneously estimate a binary indicator that determines the outcome regime (unemployment or employment) and the continuous outcome variables in the model: reservation wages for the unemployed and actual wages for the

employed. This approach yields consistent standard errors and relies on joint normality of the error terms in the binary and continuous equation (Maddala, 1983; and Lokshin and Sajaia, 2004). Simultaneous estimation is particularly important for our application since it is apparent that reservation wages reflect employment status and observed employment status reflects reservation wages. For example, an individual with an unrealistically high reservation wage given his/her skills is unlikely to find a suitable job. Thus, the simultaneous modelling approach corrects for the selection bias in the estimates of the reservation wage equation.

At time *t* equations (3) and (4) are estimated simultaneously across individuals, *i*, following Maddala (1983), Lokshin and Sajaia, (2004):

$$\begin{aligned} &d_i = 1 \quad if \quad d_i^* = \gamma Z_i + \sum_{j=1}^{3} \pi_j HS_{ijt-1} + u_i > 0 \quad i.e. \quad unemployment \\ &d_i = 0 \quad otherwise \qquad\qquad\qquad\qquad\qquad i.e. \quad employment \end{aligned} \tag{3}$$

$$\begin{aligned} &\ln w_{1i} = \beta_1 X_{1i} + \sum_{j=1}^{3} \lambda_j HS_{ijt-1} + \varepsilon_{1i} \qquad if\ d_i = 1 \\ &\ln w_{2i} = \beta_2 X_{2i} + \sum_{j=1}^{3} \phi_j HS_{ijt-1} + \varepsilon_{2i} \qquad if\ d_i = 0 \end{aligned} \tag{4}$$

where: d_i^* is a latent variable which determines the outcome regime; the variable d_i indicates the observed state for an individual (i.e. unemployment or employment); $\ln w_{li}$ denotes the continuous outcome (dependent) variables for states $l = 1, 2$, i.e. log reservation wages or log actual wages, where regime 1 denotes unemployment and regime 2 denotes employment. A vector of variables that determine regime switching is denoted by Z_i; X_{li} are vectors of exogenous variables that determine wages; and γ, β_1 and β_2 are the parameter vectors. The error terms u_i, ε_{1i} and ε_{2i} are assumed to have a trivariate normal distribution with mean vector zero and covariance matrix:

$$\Omega = \begin{bmatrix} \sigma_u^2 & \cdots & \\ \sigma_{21} & \sigma_1^2 & \vdots \\ \sigma_{31} & \cdots & \sigma_2^2 \end{bmatrix}.$$

σ_u^2 is the variance of the error term from the selection equation, i.e. d_i, and σ_l^2 reflects the variance from the reservation wage and wage equations. The covariance between u_i and ε_{1i} is given by σ_{21}, similarly the covariance between u_i and ε_{2i} is given by σ_{31}. Two coefficients of correlation can then be defined as: $\rho_1 = \left[\sigma_{21}^2 / (\sigma_u \sigma_1)\right]$ and $\rho_2 = \left[\sigma_{31}^2 / (\sigma_u \sigma_2)\right]$. If $\rho_1\,(\rho_2)$ is significantly different from zero then the estimated model implies that unemployed (employed) individuals have a lower reservation wage (wage from employment) than a random individual

from the sample would have. Given that the *BHPS* provides information relating to our sample of individuals over time, we account for the panel aspect of our data set by allowing for observations to be independent across groups but not necessarily within groups, i.e. repeated observations for individuals over time.

3.4 Model Structure

To ease exposition, Figure 1 presents the structure of the participation, endogenous switching and wage equations described above. The participation equation (2) is shown on the left of the diagram. The switching equation (3) and wage equations (4), on the right of the diagram, are only estimated for those people who participate ($PART_i = 1$). Selection into participation is accounted for by including the inverse Mills ratio estimated from equation (2) as an additional covariate in the switching and wage equations. For those individuals who participate and are employed ($d_i = 0$), we estimate a market wage equation; whereas for those who participate but are unemployed ($d_i = 1$), we estimate a reservation wage equation. The switching and wage equations are estimated simultaneously by FIML.

This treatment of participation (or attachment) and selection is different to the approach that is normally taken in the literature. Most studies, either exclude from the analysis those individuals for whom $PART_i = 0$ (i.e. the bottom arm on the left in Figure 1 is ignored), or they inappropriately include them along with the unemployed (i.e. the bottom arm of the left and right hand sides are amalgamated); these studies then only take selection into employment (versus unemployment) into account (i.e. selection is only considered in relation to the right-hand side of Figure 1). This seems particularly inappropriate when investigating the relationship between health and labour market outcomes because health is potentially an important reason for non-participation, thus exclusion of those people with the weakest labour force attachment is likely to result in biased results.

Note that our conceptualisation of non-participation is different to unemployment; the unemployed in our model include only those who are actively seeking employment or state a positive desire to work[5]. Since we have reservation wage data for the unemployed we are able to estimate wage equations for both the employed and unemployed, and deal with selection into labour market participation (including unemployment) which should result in more appropriate

[5] This definition is supported by the survey routing for the reservation wage question shown in Section 4.1.

estimates of the effect of health on four different labour market outcomes: participation, the probability of gaining employment, wages and reservation wages.

4. Data and Variables

We use panel data available in the first 14 waves of the British Household Panel Survey (*BHPS*) 1991 to 2004. The *BHPS* is a longitudinal survey of private households in Great Britain, and was designed as an annual survey of each adult member of a nationally representative sample. The first wave achieved a sample of some 5,500 households, covering approximately 10,300 adults from 250 areas of Great Britain. Additional samples of 1,500 households for both Scotland and Wales were added in 1999, and in 2001 a sample of 2,000 households in Northern Ireland were also added. The same individuals are re-interviewed in successive waves and, if they split off from their original households are also re-interviewed along with all adult members of their new households. The *BHPS* includes rich information on labour market status, socio-demographic and health variables.

We use an unbalanced sample of males of working age (18 to 65 years). Sample sizes are shown in the model structure diagram in Figure 1. Overall sample size is n = 48,227; of these $PART_i = 1$ for n = 41,095 observations (where $n = i \times t$); and of these n = 37,224 are employed observations ($d_i = 0$) and n = 2,216 are unemployed observations ($d_i = 1$). For those n = 7,132 observations for which $PART_i = 0$; 38% are long-term sick and disabled; 36% are retired (before the statutory retirement age of 65); 18% are in full-time education and the majority of the remainder are on paternity leave, engaged in family care, or on a government training scheme.

The sections below describe the variables used in each equation and a full list of variables and definitions appears in Appendix 1. Summary statistics are reported in Table 1A (for variables in the participation and health stock equations) and Table 1B (for variables in the wage equations).

4.1 Wages

Equations (3) and (4) above show the specification of our endogenous switching model for outcome regime and wages. The defining feature of the *BHPS* for our study is that if the respondent '*is not currently working but has looked for work in last week or last four weeks or has not looked for work in last week or last four weeks but would like a job*', he/she is asked to specify: '*what is the lowest weekly take home pay you would consider accepting for a job?*'.

This is the net reservation wage (w_1) of equation (4). The net market wage (w_2) is defined as '*usual net pay per month*' which measures usual monthly wage or salary payment after tax and other deductions in current main job for employees (self employees), which we then convert to a weekly amount. Thus if the respondent is working we observe the market wage (w_2) and if the respondent is not working (but wants to work) we observe the reservation wage (w_1). The wage variables are used in natural log form in the estimating equations deflated to 1991 prices[6].

Histograms for the net reservation wage ($\ln w_1$) and net market wage ($\ln w_2$) are shown in Figure 2. The mean weekly net reservation wage is £162 and the mean weekly net market wage is £215. Figure 3 shows the evolution of the real mean net wages over time. Real mean market wages have increased by 7.7% from £208 in 1992 to £224 in 2004, whereas real mean reservation wages have increased by 49% from £140 to £208 in the same period. This convergence may be partly explained by the introduction of the national minimum wage in 1999 and welfare reforms following the change in government.

4.2 Health Status

The health stock dummy variables (HS_i) that appear in the participation equation (2), switching equation (3) and wage equations (4) are derived from GOP estimation of equation (1). Here the observed health state (H_i) is self-assessed health (SAH) given in answer to the question: '*please think back over the last 12 months about how your health has been. Compared to people of your own age, would you say that your health has on the whole been excellent/good/fair/poor/very poor?*'[7]

The vector K_i of explanatory variables in the health stock equation (1) includes information on specific health problems. Individuals are asked whether or not they have any of the following health problems: arms, legs or hands; sight; hearing; skin conditions or allergies;

[6] Hofler and Murphy (1994) question the validity of this type of reservation wage data arguing that individuals may not be well-informed enough to provide meaningful answers. Interestingly, investigating the *BHPS* we find that the reservation wage data behaves as one would expect. Individuals who have a reservation wage greater than their wage predicted on the basis of human capital characteristics, or greater than the actual wage prevailing in their region for the occupation they are looking for work in, have a lower chance of finding future employment. In addition, Hogan (2004) shows that reservation wages of the unemployed in the *BHPS* adjust relatively quickly to macroeconomic shocks. This provides support for the validity of this data and we are confident that it has useful informational content on reservation wages.

[7] A continuity problem arises with this 5-point SAH variable because in wave 9 (only) there was a change in the question and available response categories. To achieve consistency over all 14 waves we follow the method of Hernandez-Quevedo *et al.,* (2005) and recode SAH into the following 4-category scale: *very poor or poor; fair; good or very good; excellent.*

chest/breathing; heart/blood pressure; stomach or digestion; diabetes; anxiety or depression; alcohol or drugs; epilepsy or migraine; or other. We create a binary dummy for the presence of each specific problem, and given the broad set of health problems included, it seems likely that we are measuring most of the important aspects of health. In order to cover all aspects of health, we also include a dummy variable reflecting whether or not health limits daily activity[8].

The vector K_i also includes a set of socioeconomic characteristics assumed to affect heath reporting behaviour. These are: age dummy variables, with the youngest age category (18 to 24) as the omitted category; marital status; household size; educational attainment; labour market participation status ($PART_i$ as defined in Section 4.3 below); household labour income; whether or not the respondent is an immigrant or has a language problem that may have affected the *BHPS* interview.

In order to check the robustness of our empirical results we also estimate models where self-assessed health is assumed to be exogenous. Here we code the SAH dummy variables directly from the answers to the SAH reported above. There are four health dummy variables: excellent, good/very good, fair, poor/very poor; the bottom category acts as the baseline.

4.3 Participation Equation

The dependent variable for the participation probit equation (2) denotes whether or not the individual is attached to the labour market. The classification is taken from the response to the question on current labour market status. For individuals who are classified as employed, self-employed or unemployed, $PART_i = 1$; whereas for those individuals who are retired, on paternity leave, caring for family, in full-time education, long-term sick or disabled, on a government training scheme or 'other', $PART_i = 0$.

As well as the health stock dummy variables (HS_i) defined above, the vector M_i of explanatory variables in the participation equation also includes: age; marital status; race; educational attainment; caring responsibilities; number of school age and pre-school children; and household size.

[8] This variable is not available in wave 9 of the BHPS. We impute missing values by setting wave 9 values to equal wave 8 values.

4.4 Switching Equation

The switching equation determines the outcome regime, and thus whether reservation wages or market wages are modelled in the wage equation. As in the case of participation (see Section 4.3) d_i is defined from the question on current labour market status. For individuals who are unemployed $d_i = 1$ (and we observe reservation wages) for individuals who are employed or self-employed $d_i = 0$ (and we observe market wages).

As well as the health stock dummy variables (HS_i) defined above, the vector Z_i of explanatory variables in the switching equation also includes: age; marital status; race; educational attainment; number of people employed in the household; number of children; household income from various sources (labour, asset and benefit); wage in previous employment; monthly housing/mortgage costs; labour market experience (years in unemployment in the reservation wage equation and years in employment in the market wage equation); the regional unemployment rate[9]; and, finally, the inverse Mills ratio from the participation equation (2) to control for selection into active labour market participation.

4.5 Wage equations

The dependent variables are described in Section 4.1. As well as the lagged health stock dummy variables (HS_i) defined above, the vector X_i of explanatory variables in the wage equations also includes: age; marital status; race; educational attainment; number of people employed in the household; number of children; household asset and benefit income; household labour income (excluding own wage in the market wage equation); wage in previous employment; monthly housing/mortgage costs; number of years of current labour market status; the regional unemployment rate; dummy variables for firm size, occupation and industry (of current main employment in the market wage equation and last/previous job in the reservation wage equation); and the inverse Mills ratio from the participation equation (2).

All variables which appear in X_{li} are also included in Z_i and instruments used are obtained by non-linearities (Lokshin and Sajaia, 2004), and whether the interviewer observed that the respondent had problems during the interview process, along with dummy variables for region and year.

[9] The regional unemployment rate data was obtained from the Office for National Statistics.

5. Results

Table 2 presents the results of the GOP models (see equation (1)) for health stock[10]. In general these results are as expected. The presence of specific health problems and health limitation to daily activity increases the probability of reporting poor health. After conditioning on these health problems, age is associated with increased probability of reporting better health; education, labour market status and household income are also positively associated with health reporting; immigrants are more likely to report excellent health and people with language problems are less likely to do so.

In Table 3 we consider how health and other covariates impact upon the probability of labour market participation i.e. either employed, self employed or unemployed but actively looking for work. In Panel A of Table 3 the full set of estimates are reported where the health stock has been generated, see Section 3.1, and Panel B shows results from treating health as an exogenous variable. Focusing upon Panel A it is clear that health has a positive and significant effect on the probability of participation in the labour market and the effects are large. Being in good/very good health (versus poor/very poor health) means the individual has a 61% greater chance of participating in the labour market. This compares to a 1.6% greater chance of participation if he has GCSEs (versus no qualifications) and around a 9% greater chance if he is aged 35-44 (versus being aged 18-24). In addition to these effects, the individual is more likely to participate if he is married (or living as a couple), and/or white; and less likely to participate if he is in the oldest age category (aged 55-64), has caring responsibilities for an adult, and has children of school age. In comparison to the estimated health effects in Panel B, where health is exogenous, the effects are noticeably larger for endogenous health, suggesting the importance of measurement error and reporting heterogeneity, as discussed above. For example, being in good/very good health (versus poor/very poor health) means the individual has a 22% greater chance of participating in the labour market[11].

To provide a benchmark for the results of our endogenous switching model, we present OLS estimates for the wage equations in Table 4. The table is split into four panels where Panels A and B show the market wage and reservation wage equations respectively with no control for selection into participation; the final two panels (C and D) present results with selection, i.e. the inverse Mills ratio estimated from equation (2) is included as an additional covariate in both of

[10] For the health stock equations the sample size is n = 58,149 as no observations are lost due to lags (in contrast to the participation equation where health stock is lagged by one period in an effort to control for simultaneity).
[11] Region and year controls which are included in the participation equation are jointly significant.

the wage equations. Panel A presents results with health stock dummy variables generated via the GOP models reported in Table 2; Panel B reports the coefficients on health dummy variables where health is assumed to be exogenous and the dummy variables are coded directly from the answers to the self-assessed health question reported in Section 4.2. When we do not control for sample selection, health appears to have an important positive effect on the market wage whether we measure health as the estimated latent health stock or use the self-assessed measure directly (i.e. assuming it is exogenous). The estimated effects are slightly larger for endogenous health, suggesting that measurement error and reporting heterogeneity bias outweighs the other potential sources of endogeneity bias in self-assessed health. For example being in excellent health (versus poor/very poor health) means that such an individual has a market wage around 23% higher than a corresponding individual in the reference category. Once selection into participation is controlled for, via the inverse Mills ratio (see Panel C), the health effects upon market wages are reduced to around a 7% higher wage for an individual in excellent health in comparison to poor/very poor health. No effect is found from health upon the reservation wage regardless of how health is measured, i.e. via GOP or exogenously, or whether selection is controlled for.

Having considered the standard OLS approach commonly used in the majority of the existing literature, we now explore how health affects wages allowing for endogenous switching. The results from the endogenous switching model (equations (3) and (4)) are shown in Tables 5 and 6. Table 5 presents the results with no control for selection into participation (comparable to Table 4 Panels A and B under OLS), and Table 6 presents the results with sample selection controls included (comparable to Table 4 Panels C and D under OLS). As in Table 4, Panel A presents results with the latent health stock, whereas Panel B reports the marginal effects on the exogenous health dummy variables in both Tables 5 and 6.

When selection into participation is not accounted for, see Table 5, health has a significant adverse effect on the probability of being unemployed ($d_i = 1$). For example, being in excellent health (relative to the omitted category) lowers the probability of being unemployed by approximately 1%. Once we control for selection into the labour market, see Table 6, only being in excellent health results in a lower probability of being unemployed (compared to the poor/very poor health baseline). The finding that health status affects labour market participation and employment status accords with much of the existing literature.

Turning to the wage equations (Tables 5 and 6), significant positive effects on market wages are found for being white and married (or living as a couple). Also positive effects are found for having more children, better education, higher housing costs, higher other household labour income, higher asset income and pay from last/previous employment. In addition, wages peak at age 35-44. The only significant negative effects on market wages are found from higher benefit income and the higher the number of employed people in the household. Analogous to market wages, reservation wages also peak at age 35-44; they also increase with education, housing costs, and previous wages. Factors which decrease the reservation wage include household labour income and the regional unemployment rate. Such findings are consistent with Prasad (2003) and Hogan (2004)[12].

We have already seen that health has an important influence on the probability of participating in the labour market (including being unemployed), and when we control for this selection in the switching and wage equations the health effects in these equations are much reduced, see Table 6. Indeed, there are no health effects in the either of the wage equations and this finding is robust to defining health either exogenously or endogenously. This contrasts with the bulk of evidence from the existing literature and the most likely explanation is that we have controlled for the selecting out of a group who are usually excluded (or inappropriately classified) in analysis of health and labour market outcomes because they have very weak attachment to the labour market. This is consistent with the findings in Tables 4 (OLS) and 5 (endogenous switching model) in that there is a positive health effect upon market wages for both endogenous and exogenous health in the absence of controlling for selection into the labour market.

6. Conclusion

As stated above, our results are in contrast with those found in most of the existing literature, and this is likely to be because we have controlled for the selecting out of a group who are usually excluded from analysis of health and labour market outcomes or inappropriately classified with the 'unemployed'. The unemployed in our model include only those who are actively seeking employment or state a positive desire to work. The non-participating group has a much weaker labour market attachment and, furthermore, health is the most important reason for their non-participation. Once this selection is controlled for, while excellent health still has a residual effect on the probability of employment (versus unemployment), as evident from the

[12] Note, although not reported both ρ_1 and ρ_2 are both statistically significant at the 1 per cent level (see Section 3.3).

switching equations, there are no remaining effects of health on the wages of the employed, or the reservation wages of the unemployed. The main effect of poor health appears to be keeping people away from the labour market, but for those in the labour market (be it currently employed or unemployed), health effects are insignificant once selection is addressed.

Our results have implications for policies targeted at getting the economically inactive back into work. We point to a clear distinction between those who are currently unemployed, but desire to work, and those who are unattached to the labour market, and for this latter group poor health is the most likely explanation for inactivity. It may be that some of this group are able to work but getting them into employment will require coordinated health and labour market policy.

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Figure 1: Model Structure

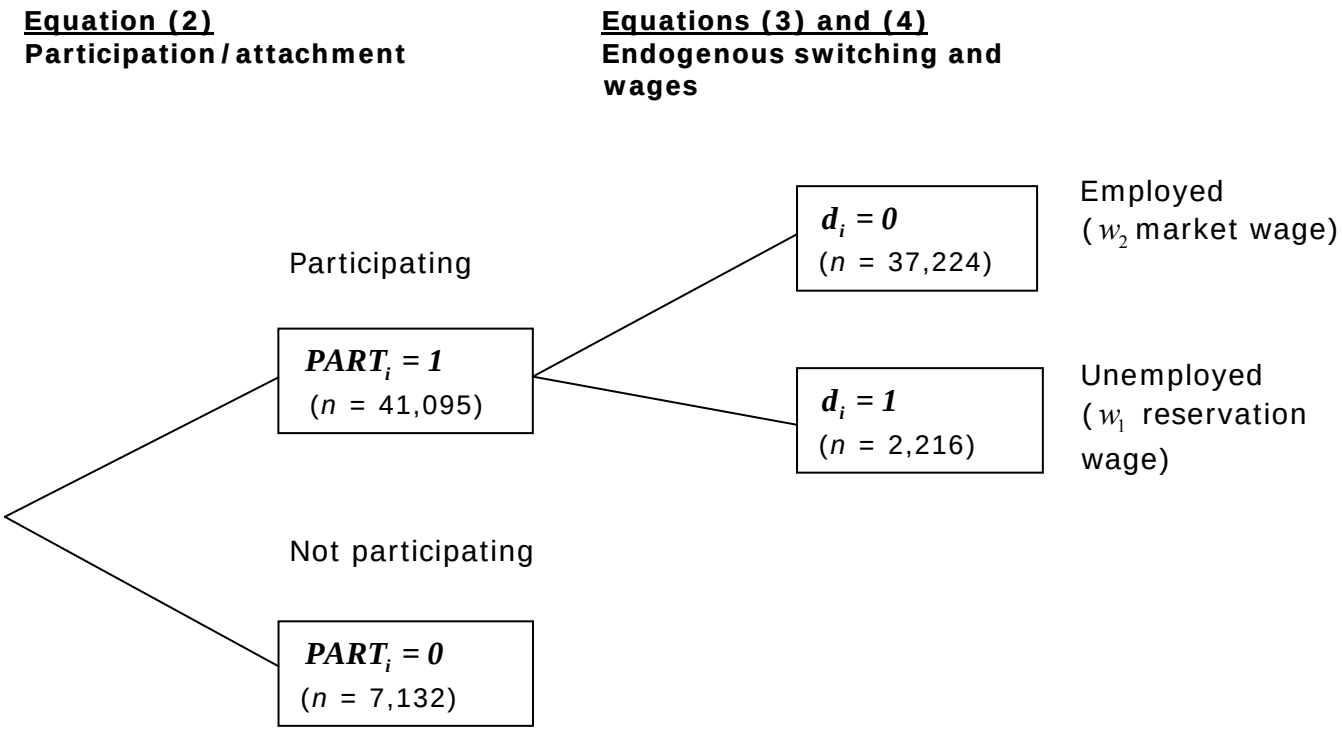
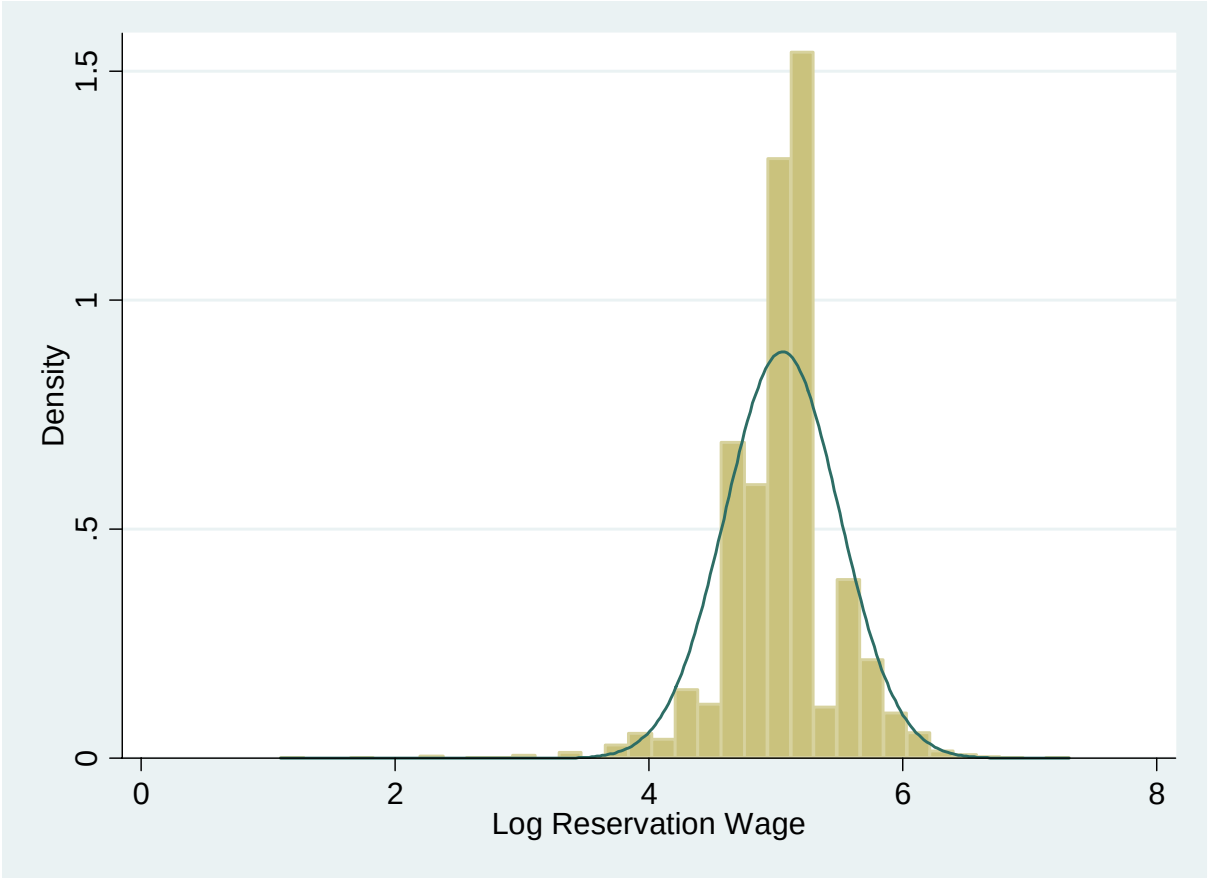


Figure 2: Log Reservation Wage (Unemployed) & Log Wage (Employed/Self Employed) – Males.



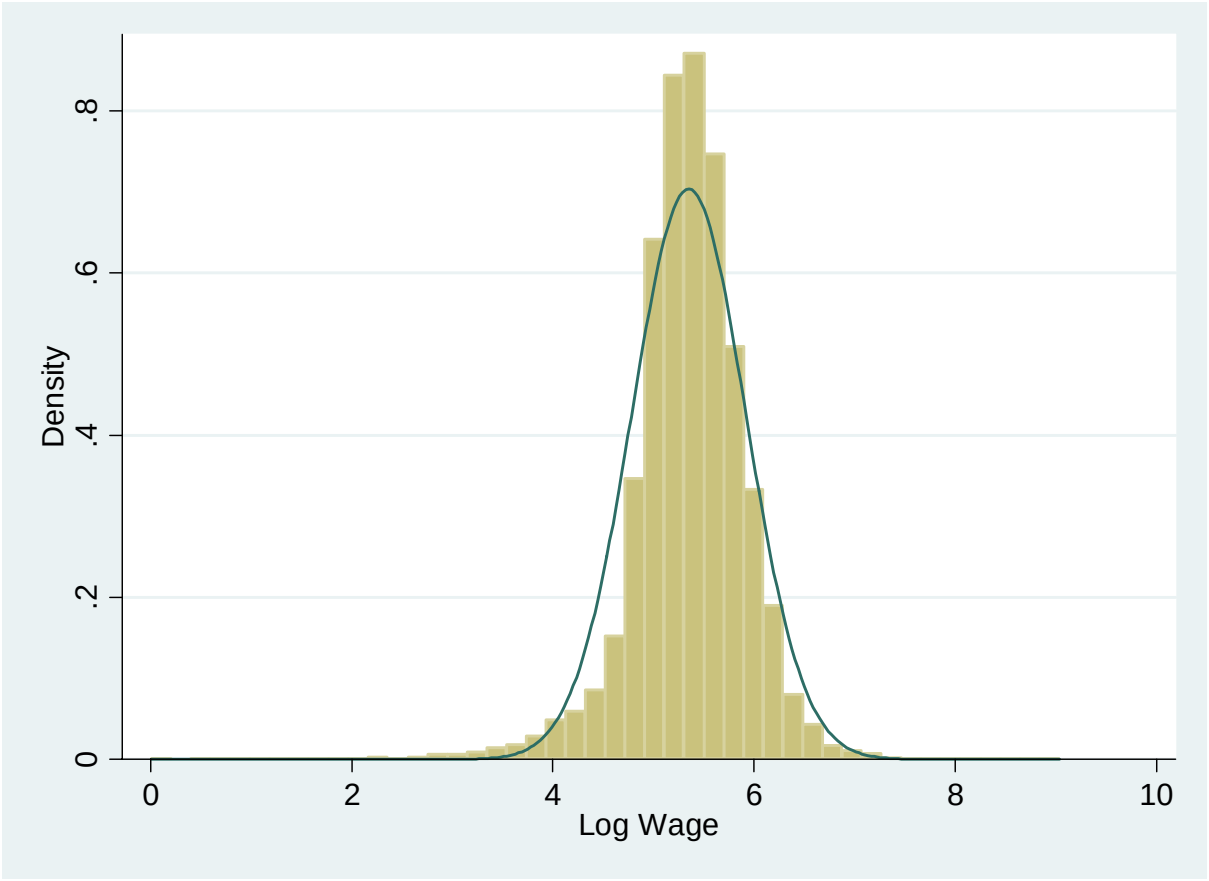


Figure 3: Real Market Wages and Reservation Wages by *BHPS* Wave - Males

Table 1A: Summary Statistics

	HEALTH STOCK		PARTICIPATION	
	MEAN	STD	MEAN	STD
Health Status *H* (0=poor,…,3=excellent)	1.928	0.867	–	–
Labour Market Participation *PART* (0=not in labour market, 1=participant)	0.842	0.364	0.852	0.355
Aged 25-34 (0=no, 1=yes)	0.239	0.426	0.237	0.426
Aged 35-44 (0=no, 1=yes)	0.238	0.426	0.249	0.432
Aged 45-54 (0=no, 1=yes)	0.202	0.401	0.214	0.410
Aged 55+ (0=no, 1=yes)	0.168	0.374	0.178	0.383
Married/Co-habiting (0=no, 1=yes)	0.704	0.456	0.726	0.446
Household Size (1-10)	3.032	1.348	2.995	1.328
Degree (First or Higher) (0=no, 1=yes)	0.140	0.347	0.146	0.354
Teaching or Nursing (0=no, 1=yes)	0.271	0.444	0.288	0.453
A Levels (0=no, 1=yes)	0.149	0.356	0.139	0.346
GCSE (0=no, 1=yes)	0.174	0.379	0.168	0.374
Immigrant (0=no, 1=yes)	0.008	0.091	–	–
Language Problem (0=no, 1=yes)	0.009	0.092	–	–
Health Problem – Arms, Legs, Hands etc. (0=no, 1=yes)	0.208	0.406	–	–
Health Problem – Sight (0=no, 1=yes)	0.032	0.177	–	–
Health Problem – Hearing (0=no, (1=yes)	0.065	0.246	–	–
Health Problem – Skin Condition/Allergy (0=no, 1=yes)	0.095	0.294	–	–
Health Problem – Chest/Breathing (0=no, 1=yes)	0.110	0.313	–	–
Health Problem – Heart/Blood Pressure (0=no, 1=yes)	0.098	0.297	–	–
Health Problem – Stomach or Digestion (0=no, 1=yes)	0.058	0.234	–	–
Health Problem – Diabetes (0=no, 1=yes)	0.022	0.146	–	–
Health Problem – Anxiety, Depression etc. (0=no, 1=yes)	0.050	0.217	–	–
Health Problem – Alcohol or Drugs (0=no, 1=yes)	0.008	0.087	–	–
Health Problem – Epilepsy (0=no, 1=yes)	0.008	0.089	–	–
Health Problem – Migraine (0=no, 1=yes)	0.047	0.211	–	–
Health Limits Daily Activity (0=no, 1=yes)	0.104	0.305	–	–
Log Household Labour Income (excluding own wage if not unemployed)	8.699	3.048	–	–
Partner Cares for Dependent Children (0=no, 1=yes)	–	–	0.147	0.354
Index Number of Hours Caring for Others [0=none, 6=100 hrs+ per week)	–	–	0.169	0.781
Number of Children Aged ≤5 (0-3)	–	–	0.170	0.781
Number of Children Aged ≥6 & ≤16 (0-4)	–	–	0.166	0.441
Fair Health Over Past 12 Months (0=no, 1=yes) *[t-1]*	–	–	0.096	0.295
Very Good/Good Over Past 12 Months (0=no, 1=yes) *[t-1]*	–	–	0.824	0.380
Excellent Health Over Past 12 months (0=no, 1=yes) *[t-1]*	–	–	0.030	0.170
OBSERVATIONS	58,149		48,227	

Table 1B: Summary Statistics

	RESERVATION WAGE; *d=1*		WAGE; *d=0*	
	MEAN	STD	MEAN	STD
Log Reservation Wage	5.088	0.452	–	–
Log Wage	–	–	5.371	0.562
White	0.605	0.489	0.678	0.467
Aged 25-34 (0=no, 1=yes)	0.270	0.444	0.268	0.443
Aged 35-44 (0=no, 1=yes)	0.203	0.402	0.283	0.450
Aged 45-54 (0=no, 1=yes)	0.156	0.363	0.224	0.417
Aged 55+ (0=no, 1=yes)	0.113	0.316	0.119	0.323
Number Employed in Household (0 to 5)	0.704	0.917	1.965	0.832
Number of Children (0 to 7)	0.803	1.172	0.714	1.009
Married/Co-habiting (0=no, 1=yes)	0.540	0.499	0.758	0.428
Degree (First or Higher) (0=no, 1=yes)	0.096	0.295	0.163	0.369
Teaching or Nursing (0=no, 1=yes)	0.184	0.388	0.311	0.463
A Levels (0=no, 1=yes)	0.103	0.304	0.133	0.340
GCSE (0=no, 1=yes)	0.183	0.387	0.177	0.381
Log Household Labour Income	6.111	3.048	9.632	1.274
Log Household Asset Income	1.985	2.808	3.673	2.963
Log Household Benefit Income	7.187	2.679	4.048	3.576
Log Wage in Previous Employment	3.067	3.340	1.636	2.953
Log Household Monthly Mortgage/Rent Costs	4.208	2.013	4.427	2.114
Years of Current Labour Market Status[#]	2.836	7.139	7.764	11.330
Years of Current Labour Market Status Squared	58.989	288.201	188.630	431.636
Fair Health Over Past 12 Months (0=no, 1=yes) *[t-1]*	0.137	0.344	0.068	0.251
Very Good/Good Over Past 12 Months (0=no, 1=yes) *[t-1]*	0.812	0.391	0.888	0.316
Excellent Health Over Past 12 months (0=no, 1=yes) *[t-1]*	0.008	0.090	0.034	0.181
OBSERVATIONS	2,216		37,224	

Note: [#] i.e. self employed; employed; or unemployment

Table 2: Health Stock Equation

DEPENDENT VARIABLE = H_i	VERY POOR OR POOR HEALTH		FAIR HEALTH		VERY GOOD OR GOOD HEALTH		EXCELLENT HEALTH	
	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT	M.E.	TSTAT
Aged 25-34	-0.0012	*(0.40)*	-0.0137	*(1.63)*	-0.0036	*(0.38)*	0.0185	*(2.11)*
Aged 35-44	-0.0069	*(2.38)*	-0.0199	*(2.16)*	0.0161	*(1.54)*	0.0106	*(1.07)*
Aged 45-54	-0.0044	*(1.43)*	-0.0331	*(3.47)*	0.0109	*(0.96)*	0.0267	*(2.40)*
Aged 55+	-0.0217	*(9.50)*	-0.0645	*(6.46)*	0.0405	*(3.14)*	0.0458	*(3.44)*
Married/Co-habiting	-0.0004	*(0.15)*	-0.0020	*(0.28)*	-0.0027	*(0.34)*	0.0051	*(0.68)*
Household Size	0.0002	*(0.27)*	-0.0002	*(0.11)*	0.0024	*(0.98)*	-0.0023	*(1.03)*
Degree (First or Higher)	-0.0126	*(5.02)*	-0.0888	*(10.43)*	0.0238	*(2.13)*	0.0776	*(6.30)*
Teaching or Nursing	-0.0031	*(1.26)*	-0.0625	*(8.24)*	0.0244	*(2.67)*	0.0411	*(4.44)*
A Levels	-0.0049	*(1.71)*	-0.0547	*(6.38)*	0.0284	*(2.70)*	0.0312	*(2.81)*
GCSE	-0.0046	*(1.70)*	-0.0374	*(4.53)*	0.0297	*(3.02)*	0.0123	*(1.23)*
Labour Market Participant i.e. Employee, Self Employed or Unemployed	-0.0029	*(7.69)*	-0.0248	*(2.97)*	0.0442	*(4.63)*	0.0094	*(1.12)*
Log Household Labour Income	-0.0005	*(1.86)*	-0.0045	*(4.85)*	0.0018	*(1.64)*	0.0031	*(3.07)*
Immigrant	0.0076	*(0.96)*	-0.0536	*(2.87)*	-0.0162	*(0.67)*	0.0622	*(2.87)*
Language Problem	0.0170	*(1.70)*	0.0641	*(2.40)*	-0.0123	*(0.43)*	-0.0688	*(2.97)*
Health Problem – Arms, Legs, Hands etc. (0=no, 1=yes)	0.0337	*(11.00)*	0.1265	*(17.27)*	-0.0266	*(3.45)*	-0.1336	*(23.83)*
Health Problem – Sight (0=no, 1=yes)	0.0146	*(2.97)*	0.0492	*(3.31)*	-0.0192	*(1.24)*	-0.0446	*(3.44)*
Health Problem – Hearing (0=no, (1=yes)	0.0037	*(1.05)*	0.0727	*(6.02)*	-0.0158	*(1.19)*	-0.0606	*(5.53)*
Health Problem – Skin Condition/Allergy (0=no, 1=yes)	-0.0003	*(0.13)*	0.0272	*(3.07)*	0.0093	*(0.96)*	-0.0362	*(4.05)*
Health Problem – Chest/Breathing (0=no, 1=yes)	0.0413	*(10.07)*	0.1478	*(14.58)*	-0.0570	*(5.52)*	-0.1321	*(17.75)*
Health Problem – Heart/Blood Pressure (0=no, 1=yes)	0.0383	*(8.13)*	0.1676	*(14.64)*	-0.0532	*(4.60)*	-0.1528	*(19.65)*
Health Problem – Stomach or Digestion (0=no, 1=yes)	0.0693	*(10.69)*	0.1965	*(15.09)*	-0.0929	*(6.83)*	-0.1729	*(24.02)*
Health Problem – Diabetes (0=no, 1=yes)	0.0468	*(4.44)*	0.1655	*(7.12)*	-0.0709	*(2.82)*	-0.1414	*(8.89)*
Health Problem – Anxiety, Depression etc. (0=no, 1=yes)	0.0685	*(9.52)*	0.2285	*(15.53)*	-0.1349	*(9.11)*	-0.1620	*(20.06)*
Health Problem – Alcohol or Drugs (0=no, 1=yes)	0.0417	*(3.25)*	0.1781	*(5.32)*	-0.1120	*(3.04)*	-0.1078	*(4.38)*
Health Problem – Epilepsy (0=no, 1=yes)	0.0140	*(1.33)*	0.1071	*(2.58)*	-0.0333	*(0.78)*	-0.0879	*(3.35)*
Health Problem – Migraine (0=no, 1=yes)	0.0223	*(4.12)*	0.0867	*(6.47)*	-0.0243	*(1.67)*	-0.0846	*(7.76)*
Health Limits Daily Activity	0.1812	*(20.93)*	0.1997	*(14.55)*	-0.2213	*(20.69)*	-0.1897	*(31.28)*
CONTROLS	Year Dummy Variables							
Wald Test $\chi^2(114)$	8,528.98 *p=[0.000]*							
Pseudo R Squared	0.1568							
OBSERVATIONS	58,149							

Table 3: Labour Market Participation

DEPENDENT VARIABLE = $PART_i$

PANEL A: HEALTH STOCK	M.E.	T STAT
Intercept	-1.1042	*(11.43)*
Aged 25-34	0.0878	*(16.13)*
Aged 35-44	0.0868	*(14.41)*
Aged 45-54	0.0532	*(8.44)*
Aged 55+	-0.1534	*(14.45)*
Married/Co-habiting	0.0631	*(10.03)*
White	0.0164	*(2.82)*
Degree (First or Higher)	-0.0075	*(0.85)*
Teaching or Nursing	0.0067	*(1.05)*
A Levels	-0.0719	*(8.46)*
GCSE	0.0157	*(2.11)*
Partner Cares for Dependent Children	0.0532	*(7.72)*
Index Number of Hours Caring for Others	-0.0235	*(9.28)*
Number of Children Aged ≤5	-0.0087	*(1.78)*
Number of Children Aged ≥6 & ≤16	-0.0134	*(3.93)*
Household Size	0.0043	*(2.00)*
Fair Health Over Past 12 Months (0=no, 1=yes) *[t-1]*	0.0957	*(23.50)*
Very Good/Good Over Past 12 Months (0=no, 1=yes) *[t-1]*	0.6067	*(38.77)*
Excellent Health Over Past 12 months (0=no, 1=yes) *[t-1]*	0.0907	*(23.96)*
CONTROLS	Year and Region	
Wald Test $\chi^2(d)$	3,825.04 *p=[0.000]*	
PANEL B HEALTH EXOGENOUS	M.E.	T STAT
Fair Health Over Past 12 Months (0=no, 1=yes) *[t-1]*	0.1073	*(21.89)*
Very Good/Good Over Past 12 Months (0=no, 1=yes) *[t-1]*	0.2181	*(30.03)*
Excellent Health Over Past 12 months (0=no, 1=yes) *[t-1]*	0.1626	*(29.54)*
OBSERVATIONS	48,227	

Note: M.E. denotes marginal effect.

Table 4: OLS Wage and Reservation Wage Equations

DEPENDENT VARIABLE =	Wage $\ln w_2$		Reservation Wage $\ln w_1$	
PANEL A: HEALTH STOCK, NO SELECTION	COEF	T STAT	COEF	T STAT
Intercept	3.8416	*(8.11)*	5.0666	*(7.55)*
Aged 25-34	0.1616	*(16.61)*	0.1743	*(6.86)*
Aged 35-44	0.2372	*(23.12)*	0.2785	*(9.86)*
Aged 45-54	0.2322	*(21.69)*	0.2547	*(8.34)*
Aged 55+	0.1008	*(7.98)*	0.1586	*(4.41)*
Married/Co-habiting	0.0826	*(12.14)*	0.0867	*(3.96)*
White	0.0193	*(3.57)*	-0.0262	*(1.35)*
Degree (First or Higher)	0.2341	*(24.67)*	0.2102	*(5.52)*
Teaching or Nursing	0.1124	*(15.78)*	0.1166	*(4.65)*
A Levels	0.0554	*(6.40)*	0.1108	*(3.57)*
GCSE	0.0391	*(5.02)*	0.0615	*(2.49)*
Number Employed in Household	-0.0614	*(19.06)*	0.0121	*(0.98)*
Number of Children	0.0352	*(10.63)*	0.0115	*(1.23)*
Log Household Labour Income	0.1040	*(9.95)*	-0.0143	*(4.29)*
Log Household Asset Income	0.0151	*(16.84)*	-0.0034	*(0.95)*
Log Household Benefit Income	-0.0045	*(5.32)*	-0.0065	*(1.78)*
Log Wage in Previous Employment	0.0112	*(11.80)*	0.0206	*(5.50)*
Log Household Monthly Mortgage/Rent Costs	0.0213	*(17.08)*	0.0249	*(5.61)*
Years of Current Economic Status	0.0064	*(7.53)*	-0.0020	*(0.45)*
Years of Current Economic Status squared	-0.0001	*(3.75)*	-0.0001	*(0.87)*
Regional Unemployment Rate	-0.0142	*(12.50)*	-0.0418	*(9.94)*
Fair Health Over Past 12 Months (0=no, 1=yes) *[t-1]*	0.0982	*(3.91)*	0.0151	*(0.32)*
Very Good/Good Over Past 12 Months (0=no, 1=yes) *[t-1]*	0.1291	*(5.47)*	0.0403	*(0.93)*
Excellent Health Over Past 12 months (0=no, 1=yes) *[t-1]*	0.2254	*(8.22)*	0.1084	*(1.02)*
Adjusted R Squared	0.3321		0.2244	
	Wage $\ln w_2$		Reservation Wage $\ln w_1$	
PANEL B HEALTH EXOGENOUS, NO SELECTION	COEF	T STAT	COEF	T STAT
Fair Health Over Past 12 Months (0=no, 1=yes) *[t-1]*	0.0693	*(4.83)*	-0.0025	*(0.07)*
Very Good/Good Over Past 12 Months (0=no, 1=yes) *[t-1]*	0.0867	*(6.34)*	0.0141	*(0.40)*
Excellent Health Over Past 12 months (0=no, 1=yes) *[t-1]*	0.1176	*(8.43)*	0.0430	*(1.15)*
Adjusted R Squared	0.3323		0.2250	
	Wage $\ln w_2$		Reservation Wage $\ln w_1$	
PANEL C HEALTH STOCK, SELECTION	COEF	T STAT	COEF	T STAT
Fair Health Over Past 12 Months (0=no, 1=yes) *[t-1]*	-0.0222	*(0.63)*	-0.0174	*(0.23)*
Very Good/Good Over Past 12 Months (0=no, 1=yes) *[t-1]*	-0.0360	*(0.87)*	-0.0055	*(0.06)*
Excellent Health Over Past 12 months (0=no, 1=yes) *[t-1]*	0.0668	*(2.56)*	0.0627	*(0.46)*
Adjusted R Squared	0.3325		0.2242	
	Wage $\ln w_2$		Reservation Wage $\ln w_1$	
PANEL D HEALTH EXOGENOUS, SELECTION	COEF	T STAT	COEF	T STAT
Fair Health Over Past 12 Months (0=no, 1=yes) *[t-1]*	-0.0171	*(0.86)*	-0.0166	*(0.31)*
Very Good/Good Over Past 12 Months (0=no, 1=yes) *[t-1]*	-0.0222	*(1.00)*	-0.0041	*(0.07)*
Excellent Health Over Past 12 months (0=no, 1=yes) *[t-1]*	0.0057	*(0.25)*	0.0242	*(0.38)*
Adjusted R Squared	0.3330		0.2246	
OBSERVATIONS	37,224		2,216	

Note: Additional controls in each panel are firm size; occupation; industry [current job if d=0, last/previous job if d=1]

Table 5: Endogenous Switching Model of Reservation Wages (With Clustering) – No Control for Selection

DEPENDENT VARIABLE =	SWITCHING: d		Wage $\ln w_2$		Reservation Wage $\ln w_1$	
PANEL A: HEALTH STOCK	M.E.	T STAT	COEF	T STAT	COEF	T STAT
Intercept	3.3265	*(11.73)*	3.8107	*(5.70)*	5.0803	*(63.60)*
Aged 25-34	-0.0054	*(10.16)*	0.1650	*(14.58)*	0.1475	*(5.43)*
Aged 35-44	-0.0059	*(9.82)*	0.2411	*(18.58)*	0.2480	*(7.54)*
Aged 45-54	-0.0033	*(4.80)*	0.2348	*(16.19)*	0.2389	*(5.77)*
Aged 55+	-0.0039	*(4.81)*	0.1035	*(5.27)*	0.1421	*(3.04)*
Married/Co-habiting	-0.0019	*(3.99)*	0.0831	*(7.74)*	0.0747	*(2.65)*
White	-0.0017	*(3.68)*	0.0198	*(2.30)*	-0.0309	*(1.43)*
Degree (First or Higher)	-0.0028	*(4.10)*	0.2364	*(13.33)*	0.1953	*(4.07)*
Teaching or Nursing	-0.0039	*(7.01)*	0.1144	*(9.27)*	0.0970	*(2.93)*
A Levels	-0.0025	*(3.76)*	0.0574	*(3.85)*	0.1007	*(3.05)*
GCSE	-0.0020	*(3.48)*	0.0409	*(3.03)*	0.0552	*(2.08)*
Number Employed in Household	-0.0066	*(14.50)*	-0.0587	*(11.82)*	-0.0325	*(1.42)*
Number of Children	-0.0015	*(6.80)*	0.0365	*(7.11)*	0.0046	*(0.41)*
Log Household Labour Income	-0.0010	*(14.19)*	0.1050	*(21.29)*	-0.0181	*(3.77)*
Log Household Asset Income	-0.0002	*(2.50)*	0.0152	*(11.03)*	-0.0044	*(1.01)*
Log Household Benefit Income	0.0011	*(17.11)*	-0.0052	*(4.40)*	0.0009	*(0.36)*
Log Wage in Previous Employment	0.0006	*(10.97)*	0.0109	*(10.26)*	0.0237	*(4.81)*
Log Household Monthly Mortgage/Rent Costs	0.0000	*(0.08)*	0.0214	*(9.35)*	0.0247	*(4.16)*
Years of Current Economic Status	-0.0007	*(9.21)*	0.0066	*(5.18)*	-0.0057	*(0.82)*
Years of Current Economic Status squared	0.0000	*(8.02)*	-0.0001	*(2.57)*	-0.0001	*(0.15)*
Regional Unemployment Rate	-0.0003	*(1.17)*	-0.0147	*(8.95)*	-0.0369	*(7.01)*
Fair Health Over Past 12 Months (0=no, 1=yes) *[t-1]*	-0.0002	*(2.07)*	0.0980	*(2.69)*	0.0067	*(0.14)*
Very Good/Good Over Past 12 Months (0=no, 1=yes) *[t-1]*	-0.0044	*(4.03)*	0.1300	*(3.61)*	0.0209	*(0.46)*
Excellent Health Over Past 12 months (0=no, 1=yes) *[t-1]*	-0.0080	*(4.53)*	0.2268	*(5.70)*	0.0636	*(0.62)*
CONTROLS	Firm size; occupation; industry [current job if d=0, last/previous job if d=1]					
Wald Test $\chi^2(z)$	504.47, *p=[0.000]*					
PANEL B HEALTH EXOGENOUS	M.E.	T STAT	COEF	T STAT	COEF	T STAT
Fair Health Over Past 12 Months (0=no, 1=yes) *[t-1]*	-0.0017	*(2.25)*	0.0720	*(3.42)*	-0.0072	*(0.17)*
Very Good/Good Over Past 12 Months (0=no, 1=yes) *[t-1]*	-0.0032	*(4.28)*	0.0904	*(4.29)*	0.0010	*(0.02)*
Excellent Health Over Past 12 months (0=no, 1=yes) *[t-1]*	-0.0041	*(5.16)*	0.1216	*(5.63)*	0.0249	*(0.58)*
OBSERVATIONS	39,440					

Note: M.E. denotes marginal effect.

Table 6: Endogenous Switching Model of Reservation Wages (With Clustering) – Controlling for Selection

DEPENDENT VARIABLE =	SWITCHING: d		Wage $\ln w_2$		Reservation Wage $\ln w_1$	
PANEL A: HEALTH STOCK	M.E.	T STAT	COEF	T STAT	COEF	T STAT
Intercept	2.5857	*(6.42)*	4.0220	*(42.34)*	5.1202	*(29.42)*
Aged 25-34	-0.0044	*(6.88)*	0.1339	*(9.04)*	0.1399	*(3.77)*
Aged 35-44	-0.0049	*(7.02)*	0.2116	*(13.46)*	0.2406	*(5.74)*
Aged 45-54	-0.0027	*(3.77)*	0.2154	*(13.69)*	0.2349	*(5.32)*
Aged 55+	-0.0056	*(5.55)*	0.1523	*(6.37)*	0.1523	*(2.54)*
Married/Co-habiting	-0.0013	*(2.44)*	-0.0667	*(5.75)*	0.0712	*(2.49)*
White	-0.0016	*(3.37)*	0.0147	*(1.67)*	-0.0323	*(1.43)*
Degree (First or Higher)	-0.0028	*(4.21)*	0.2382	*(13.44)*	0.1946	*(4.05)*
Teaching or Nursing	-0.0039	*(6.91)*	0.1128	*(9.13)*	0.0963	*(2.90)*
A Levels	-0.0031	*(4.60)*	0.0737	*(4.73)*	0.1050	*(2.93)*
GCSE	-0.0019	*(3.23)*	0.0369	*(2.71)*	0.0538	*(2.01)*
Number Employed in Household	-0.0066	*(14.46)*	-0.0591	*(11.90)*	-0.0339	*(1.45)*
Number of Children	-0.0015	*(7.07)*	0.0372	*(7.27)*	0.0048	*(0.42)*
Log Household Labour Income	-0.0010	*(14.18)*	0.1050	*(21.32)*	-0.0181	*(3.77)*
Log Household Asset Income	-0.0002	*(2.49)*	0.0151	*(10.95)*	-0.0043	*(1.01)*
Log Household Benefit Income	0.0011	*(17.02)*	-0.0050	*(4.30)*	0.0012	*(0.20)*
Log Wage in Previous Employment	0.0006	*(10.91)*	0.0108	*(10.23)*	0.0239	*(4.83)*
Log Household Monthly Mortgage/Rent Costs	0.0000	*(0.18)*	0.0214	*(9.36)*	0.0246	*(4.15)*
Years of Current Economic Status	-0.0007	*(9.28)*	0.0066	*(5.22)*	-0.0055	*(0.82)*
Years of Current Economic Status squared	0.0000	*(8.07)*	-0.0001	*(2.63)*	0.0001	*(0.16)*
Regional Unemployment Rate	-0.0003	*(1.21)*	-0.0138	*(8.31)*	-0.0365	*(6.87)*
Inverse Mills Ratio	0.0050	*(2.71)*	-0.1693	*(3.27)*	-0.0301	*(0.29)*
Fair Health Over Past 12 Months (0=no, 1=yes) *[t-1]*	0.0014	*(0.80)*	-0.0224	*(0.41)*	-0.0163	*(0.16)*
Very Good/Good Over Past 12 Months (0=no, 1=yes) *[t-1]*	0.0009	*(0.39)*	-0.0351	*(0.55)*	-0.0119	*(0.10)*
Excellent Health Over Past 12 months (0=no, 1=yes) *[t-1]*	-0.0027	*(2.03)*	0.0582	*(0.89)*	0.0307	*(0.20)*
CONTROLS	Firm size; occupation; industry [current job if d=0, last/previous job if d=1]					
Wald Test $\chi^2(z)$	508.22, *p=[0.000]*					
PANEL B HEALTH EXOGENOUS	M.E.	T STAT	COEF	T STAT	COEF	T STAT
Fair Health Over Past 12 Months (0=no, 1=yes) *[t-1]*	-0.0001	*(0.10)*	-0.0149	*(0.52)*	-0.0185	*(0.26)*
Very Good/Good Over Past 12 Months (0=no, 1=yes) *[t-1]*	-0.0013	*(0.97)*	-0.0193	*(0.60)*	-0.0138	*(0.17)*
Excellent Health Over Past 12 months (0=no, 1=yes) *[t-1]*	-0.0021	*(2.62)*	0.0089	*(0.27)*	0.0094	*(0.11)*
OBSERVATIONS	39,440					

Note: M.E. denotes marginal effect.