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A structural equation model for three workers' capabilities

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1. Introduction.

This paper analyses the role of work in relation to the individual well-being. It based on the main assumptions that (i) individual well-being has a multidimensional nature (Böhnke, 2005; Saraceno, 2004; Diener & Suh, 1997) and (ii) its definition cannot refer to mere economic measures that are material means to achieve well-being rather than proper well-being achievements (Sen, 1985).

Sen and Nussbaum (Sen, 1985; 1992; Nussbaum & Sen, 1993) argue that well-being should be evaluated in the space of the real freedoms that people enjoy in achieving their well-being called *capabilities*[2]. According to the capabilities approach resources are evaluated as means to realize well-being in the several domains of human life; subjective perceptions of the domains of life simply reflect the individual ability to enjoy its own achievements as conditioned by mechanisms of adaptations, expectations and aspirations; differences in needs are accounted as differences in individual freedom to translate resources and opportunities in realizations of well-being. People's real freedoms are reflected by the individual capabilities to achieve valuable *functionings* which are all those things that individuals can choose to be or to do. The conversion function transforming resources into functionings and well-being achievements is individual specific and it reflects individual heterogeneity in needs and capability to exploit resources. The domains of well-being are interconnected: they affect each other and each of them contributes in making up the individuals' well-being as a whole.

Despite the variety of theoretical approaches on individual well-being in the literature, there exists some kind of consensus regarding the identification of the main domains of human life which turn out to be also recurrent in the theoretical and empirical research and in the social monitoring research carried out at national level (Poggi et al., 2009). They are: social inclusion, education, housing, physical and psychological health, employment and working conditions, transport, income and income distribution and consumption[3].

Employment and working conditions are in most cases accounted as instrumental to economic well-being. However, work is a central activity in individual life: it requires the greatest time spent and it often represents an individual's main income source, but it is also an important source for individual identity building. Following the suggestions of Arendt's though, work is the human capability to realize the individual identity in reproducing its own existence (Arendt, 1958). It consists in continuously transforming resources in survival's means. Human beings enjoy this activity as reproducing and founding their existence. In this sense the value of work goes beyond its products that are mere means rather than ends. Under such a perspective, work appears to be a proper domain of the individual well-being rather than an external determinant of the individual well-being.

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[2] In order to delve into the capabilities approach, see Sen (1985, 1992, 1997); Nussbaum (1999); Nussbaum & Sen (1993)

[3] Interesting lists of relevant domains of human life to be considered in evaluating well-being according to the capabilities approach can be found in (Robeyns, 2003), Nussbaum (2003), Alkire and Black (1997); according to the Scandinavian level of living approach in Erikson (1974; 1993), Erikson and Uusitalo (1987). A reappraisal of the Scandinavian approach can be found in Allardt (1993). Cummins (1996) identifies seven quality of life domains grouping 173 domains. Schalock (2004) selects eight core domains. Reviews of national social monitoring researches can be found in Fahey et al. (2003), Sharpe and Smith (2005), Fahey, Nolan, and Whelan (2003).

This paper purposes to (i) account for work as one of the multiple domains of individual well-being and (ii) to investigate if and how it interacts with other domains of individual well-being.

Recent econometric applications exploit structural equation models to represent human well-being, its components and other aspects of human life that are not directly observable[4]. Structural equation models let representing capabilities as interdependent latent variables that are measured by a system of indicators acting as signals and that are influenced by a set of exogenous variables. According with the claim that individual well-being is not directly observable, structural equation models allow modelling capabilities as latent variables and letting them to impact one on each other at the same time, as the simultaneous nature of well-being requires. The latent variables are signalled by multiple indicators of various natures that might be interpreted as functionings or as information about functionings: the observable counterpart of capabilities. Coherently with the fundamental role of individual freedom and the non-mechanic nature of capabilities, such indicators can be introduced in the model through a factor analysis[5]. All personal, social and environmental characteristics, which might condition individual freedom of choice in the considered capability or well-being domain, enter as exogenous causes in the simultaneous equations of the latent variables.

This paper proposes a model that represents three important domains of human life: the capabilities physical well-being, mental well-being and work. Since many relevant domains and important interrelations among them are neglected, the model does not pretend to be a complete representation of well-being. Rather the main aim is to investigate whether the domain of work –conceived as a capability– has relevant impact on other domains and how it interacts with them depending on personal characteristics and employment characteristics.

In the empirical part of the research the capabilities physical well-being, mental well-being and work are modelled. Physical well-being and mental well-being are chosen as representing the preliminary conditions of a serene and well-balanced survival. Other domains of human existence refer to the relation of the individual with something other than self, such as environment, other people or in general the external reality. Even if heavily influenced not only by external conditions but also by the other domains of well-being, the capabilities physical well-being and mental well-being are but proper attributes of the individual.

Physical well-being is very important not only because it represents the primary condition of survival but also because it widely conditions many other capabilities whose enhancement would be limited or even endangered by bad physical states. For example the Scandinavian approach to welfare accounts physical energies as fundamental resources in improving well-being (Erikson, 1993). In particular physical well-being could have a great impact on the capabilities mental well-being and work which are central to this research. The opposite effect also exists. Mental well-being can influence physical well-being through psycho-somatic mechanisms, while the impact of

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[4] See the seminal examples of Kuklys, 2003; Krishnakumar, 2007; Di Tommaso, 2007; Di Tommaso et al., 2009; Krishnakumar and Ballon, 2008.

[5] In the wider formulation of such models is also possible to include a system of causes for the indicators; this would allow better approaching the individual heterogeneity in converting resources into well-being achievements.

work can be also more direct for example because of dangerous working conditions. Many aspects of the capability of physical well-being are linked to work by a double causal relation. The general state of health may limit employment opportunities; kinds and amounts of work. On the other hand some jobs or working environments may be particularly unhealthy, noxious, dangerous or stressful. Aspects such as bodily integrity and safety may become relevant when the job-environment is characterized by high racism, violence or criminality rates. High levels of subordination may expose workers to personal threats that exceed the normal practice of work. Some employment forms may be associated with risky works. Functionings relative to the capability of physical well-being are being well-nourished, not suffering from chronic diseases or chronic pain, the ability to treat diseases and to cure one self, the ability to protect the body from diseases and accidents (Alkire & Black, 1997); aspects of bodily integrity and safety such as being protected by all sort of personal violence (Robeyns, 2003); the ability to move freely, the opportunities for sexual satisfaction and the freedom of choice in matters of reproduction (Nussbaum, 2003).

Mental well-being relates to the absence of any negative mental states of beings and doings (Robeyns, 2003), such as not being able to sleep, being worried, depressed, being not able to react to difficulties. Mental well-being also depends on the individual abilities to perceive its own well-being and for this reason it could be easily influenced by all the other domains of well-being. On the other hand since the capability mental well-being determines the individual attitude towards it-self and towards the external world, it could exert a subtle but pervasive impact on other domains of individual well-being such as physical well-being and work. Workers' negative mental states could be caused by stress, by timing of work, by dissatisfaction and lack of self-realization and of stability of employment.

Under the suggestions of Arendt's thought, the domain of work implies not only the ability to physically perform working activities and to obtain from them the means of subsistence and flourishing. It also comprises opportunities for professional growth and for arranging and eventually changing job, according to the life that the individual chooses to live. Moreover it represents the capability of building its own identity and of recognizing itself in the performed working activities and of feeling satisfaction and proud for them.

The theoretical and the empirical specification of the model and the estimation issues are introduced in section 2. Section 3 presents data and estimation results while section 4 discusses the conclusions.

2. Model.

The paper presents a structural equation model for three domains of individual well-being: physical well-being, mental well-being and work. Each domain is represented by a latent variable y^* depending on a set of exogenous variables and on others latent variables (1) and signalled by a set of indicators (2). Such framework leads to the specification of two systems of equations. Following Krishnakumar and Ballon (2008) and Di Tommaso et al. (2009), their formalization is the following:

$$B y^* + \Gamma x + \varepsilon = 0. \tag{1}$$

$$y = \Lambda y^* + \zeta. \tag{2}$$

The first system of equation (1) represents the structural part of the model and it includes three equations. The second set of equations (2) models the measurement part linking the latent variables to their indicators.

The main features of the model are represented in Figure 1 that is a path diagram representing graphically the structure of the above model. The latent variables are included in circle boxes; the observed variables are the external causes and the indicators of the latent variables and they are included in square boxes. As usual the error terms are displayed out of boxes. The arrows indicate the direction of causality in the relations among variables.

The notation is summarized in Table 1. Table 2 lists the variables introduced in the empirical model.

2.1 Structural model.

The structural part of the model (1) includes three equations, one for each domain represented. The three domains of human life are represented as latent variables, they are included in the vector y* and they are: physical well-being (y^*_1), mental well-being (y^*_2), and work (y^*_3). Physical well-being impacts mental well-being and it enters in its equation as explanatory variable; work impacts both physical and mental well-being and then it enters in both the equations. The coefficients in matrix B^6 give the reciprocal influences among the latent variables. Physical well-being does not depend on mental well-being since psychosomatic mechanisms are too individual and particularly complex to be captured and modelled. The dependency of work on physical well-being and mental well-being is not represented for empirical reasons. Since the focus is on a population of working people[7], the minimum physical and psychological conditions to work are met.

The vector x groups the exogenous causes that explain the three dependent latent variables. It can be parted in three sub-vectors (Table 2). The first partition (x_1) includes personal characteristics that are introduced as explanatory variables in all the three equations. Instead the second partition (x_2) gathers household's characteristics, that are only allowed to impact the domain of work (y^*_3) since they are endogenous in the equations for physical well-being (y^*_1) and for mental well-being (y^*_2). Choices such as having children, caring for elderly people, housekeeping or in general taking more

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[6] The complete matrix specification of the model is available upon request from the author.

[7] See the description of the population selection in Section 3.

responsibilities within the household are likely to be influenced by physical and mental conditions. Finally the third partition (x_3) collects the employment characteristics that impact the domain of work (y^{*}_3) and that are the key elements in this research. Employment characteristics are not allowed to directly impact on physical well-being and mental well-being. Instead their effect comes from their impact on work since –at least in principle– contracts characteristics are not per se health depriving except than in relation with individual characteristics and preferences. The effects of the exogenous causes in the structural equations (1) are given by the coefficients in the matrix Γ; the error terms are given by the vector ε.

The simultaneous nature of such model let distinguish direct, indirect and total effects of each variable on the others (Bollen, 1989). The direct effects are those not mediated by any other variable; the indirect effects are mediated by at least one intervening variable; the total effects are the sum of direct and indirect effects.

Since they enter all the three equations, the personal characteristics included in the partition x_1 have a direct effect on the three dependent latent variables; but also an indirect effect on physical well-being (y^{*1}) operating through work (y^{*3}) and three indirect effects on mental well-being (y^{*2}) operating through physical well-being (y^{*1}); through work (y^{*3}) and through the impact that work has on physical well-being. Entering only the third equation, the household's characteristics included in x_2 and the employment characteristics included in x_3 have a direct effect only on work (y^{*3}), but they have indirect effects both on physical well-being (y^{*1}) and on mental well-being (y^{*2}) that are mediated by work (y^{*3}). The total effects reflect the simultaneous operating of each element[8].

Table 3, Table 4 and Table 5 describe the information included in the three illustrated groups of exogenous variables. The personal characteristics in the first partition (x_1) are: age ($x_{1.1}$), a discrete variable going from 16 to 64, since the sample only includes people of working age; gender ($x_{1.2}$), a dummy variable that identifies male against females; marital status ($x_{1.3}$), also a dummy variable that groups people living in a couple; education ($x_{1.4}$) a categorical variable increasing in the educational levels; race ($x_{1.5}$), a dummy variable referring to people of white race. These variables impact all the three dependent latent variables.

Household's characteristics in the second partition (x_2) collect: children ($x_{2.1}$), a dummy variable reporting whether the individual has children; the number of household activities and responsibilities ($x_{2.2}$) that concern the individual. These two variables are allowed to impact only work (y^{*}_3), because they were endogenous in the equations for physical well-being (y^{*}_1) and mental well-being (y^{*}_2).

Employment characteristics in the third partition (x_3) are mostly dummy variables. Part-time ($x_{3.1}$) groups people working less than 30 weekly hours; temporary ($x_{3.2}$) identifies fixed term employment contracts; flexible hours ($x_{3.3}$) refers to employment forms that are flexible in the working hours; and term-time ($x_{3.4}$) refers to particular employment contracts that allow workers to adapt their working time to scholastic engagements of their children; job-share ($x_{3.5}$) identifies workers sharing the same full-time employment contract. Finally there is the hourly wage rate ($x_{3.6}$).

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[8] The analytical computation of direct, indirect and total effects is available upon request from the author.

2.2 Measurement model.

The second set of equations (2) models the measurement part linking the latent variables (y^*) to their indicators that are included in the vector y. The measurement model includes eight equations, one for each indicator introduced in the model. The vector y can be parted in three groups of indicators: the first (y_1) signals physical well-being, the second (y_2) signals mental well-being and the third (y_3) signals work. The factor loadings in the matrix Λ give the magnitude of the expected change in the observed indicator for one unit change in the latent variable. The vector of error terms for the measurement part of the model (2) is ζ.

Table 6, Table 7 and Table 8 describe the information included in the three illustrated groups of indicators.

The first partition (y_1) includes the indicators of physical well-being (y^*_1). The first one ($y_{1.1}$) is a synthetic index of the number of limitations in the working activities that are due to physical health. The second is a pain measure ($y_{1.2}$), while the third ($y_{1.3}$) is a morbidity measure. The three indicators have been built as increasing measure of deprivation in physical well-being. The last two indicators are subjective measures, while the first one is more objective since it refers to practical consequences of physical health.

The indicators of mental well-being (y^*_2) are grouped in the sub-vector (y_2). The first one ($y_{2.1}$) is a derived variable summarizing the frequency of psychological difficulties such as feeling nervy, feeling worn out, etc. The second one ($y_{2.2}$) is a dummy variable indicating whether the individual suffers from anxiety, depression and similar pathologies. Both the variables are indicators of deprivation in the capability mental well-being.

The third partition (y_3) collects the indicators for work. They are three subjective indicators. The first indicator ($y_{3.1}$) is a measure of the satisfaction for the kind of work in the broad sense, the second one ($y_{3.2}$) is a measure of the satisfaction for job-security, the last indicator ($y^*_{3.3}$) is a measure of satisfaction for working hours. These indicators are also increasing measure of deprivation. They signal the individual perception of its own employment.

2.3 Estimation.

The model has been estimated using the structural equation modelling programs PRELIS and LISREL of Professors Karl Jöreskog and Dag Sörbom, University of Uppsala. They are advanced programs for analysis of large linear systems when both dependent and independent variables are subject to error and when qualitative variables are included in the analysis. Among other things, these programs allow performing path analysis, multiple indicator-multiple causes analysis, recursive and non-recursive modelling and analysis of covariance structures.

The estimation procedure derives from the relation of the covariance matrix of the observed variables to the structural parameters. The variance covariance matrices of the error terms allow to obtain the theoretical expressions of the variance matrix of y, ε, ζ in terms of Γ, Λ, Ψ and Φ, that is:

$$\sum(\theta) = \theta. \tag{3}$$

$\Sigma(\theta)$ is the population covariance matrix of the observed variables written as a function of the unknown parameters θ. The unknown parameters are estimated by minimizing the distance between the theoretical expression of the moment and their empirical counterparts (Krishnakumar & Ballon, 2008; Bollen, 1989).

Since several observed variables in the model are not continuous, the covariance matrix has been analyzed with the Weighted Least Square method (Jöreskog & Sörbom, 1993). The general function for fitting covariances structures is:

$$F(\theta) = (s - \sigma)^{W^{-1}}(s - \sigma) =$$
$$F(\theta) = \sum_{g=1}^{k}\sum_{h=1}^{g}\sum_{i=1}^{h}\sum_{j=1}^{i} w^{gh,ij}(s_{gh} - \sigma_{gh})(s_{ij} - \sigma_{ij}). \tag{4}$$

Where s is a vector of the elements in the lower half, including the diagonal, of the covariance matrix S used to fit the model to the data and σ is the vector of the corresponding elements of $\Sigma(\theta)$ reproduced from the model parameters. W is the correct weight matrix whose elements are consistent estimates of the asymptotic covariance between s_{gh} and s_{ij}. To estimate the model parameters θ, the fit function is minimized with respect to θ.

LISREL produces an information matrix associated with the estimation procedure (Jöreskog & Sörbom, 2001). It is an information matrix for the parameters whose order is equal to the number of free parameters in the model. Its elements are the expected values of the second derivates of the fit function at the solution point (i.e. the expected Hessian matrix). Its inverse contains the sampling variances of the parameters as diagonal elements and the covariances between all pairs of parameter estimates as off-diagonal elements (Jöreskog & Sörbom, 2001). The square roots of the diagonal elements give the standard errors of the LISREL estimates, while the off-diagonal elements divided by the corresponding pairs of standard errors give the correlations between the estimates (Jöreskog & Sörbom, 2001).

Since the information matrix is positive-definite, the model is identified (Jöreskog & Sörbom, 2001). Moreover it satisfies the two conditions for the admissibility of the parameter estimates: the matrix of coefficients for the regression of y on y* (Λ) has full column rank and no rows of only zeros; the covariance matrices for the residuals in the measurement model (Φ) and in the structural model (Ψ) are positive definite.

3. Data and estimation results.

The model has been estimated on data from the British Household Panel Survey (BHPS). BHPS is being carried out by the ESRC[9] UK Longitudinal Studies Centre with the Institute for Social and Economic Research (ISER) at the University of Essex. The main objective of the survey is to further understanding of social and economic change at the individual and household level in Britain. It was designed as an annual survey of each adult member[10] of a nationally representative sample of more than 5,000 households, making a total of approximately 10,000 individual interviews. The first wave is being carried out in the 1991. The same individuals will be re-interviewed in successive waves and, if they split-off from original households, all adult members of

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[9] Economic and Social research Council (ESRC).

[10] People older than 16.

their new households will also be interviewed. Children are interviewed once they reach the age of 16. Major topics in the first waves of the panel survey are household organization, the work market, income and wealth, housing, health and socio-economic values. The rich availability of quantitative and qualitative information on different aspects of individual life and in particular the availability of much information on employment led the choice to focus on British workers.

This research exploits the fourteenth wave of the BHPS that corresponds to the year 2004-2005. It has been selected a sample composed only by dependent working people of working age: it includes 7,140 observations out of an original population of 15,791 individuals[11].

The following sections present the estimates of the measurement and structural part of the model. Standardized factor loadings and standardized coefficient are displayed next to the estimates in the tables of results. Standardized factor loadings and standardized coefficients are made comparable among variables and they allow interpreting the relative magnitude of their impact, while common estimates with their computed standard errors allow deducing how much each variable is significant in explaining the model.

Firstly the measurement and the structural part are presented separately. The estimated coefficients of the exogenous causes (Γ) represent the direct effect of the observed variables on the dependent latent variables. The estimated coefficients of the latent variables entering in the equation of the others (B) represent the indirect effect of the exogenous causes on the dependent latent variables. Then the reduced model is introduced. The reduced model displays the total effects of the variables integrating direct and indirect of each element in a simultaneous outcome.

3.1   Measurement model. Estimates for factor loadings: Lambda.

The measurement part of the model consists of a factor analysis that measures the contribution of each selected indicators to the definition of the respective latent variable. Such indicators could be interpreted as information about individual functionings and indicators of the capabilities represented as latent variables.

Table 9 displays the factor loadings and the standardized factor loadings resulting from the factor analysis. The factor loadings (λ) give the magnitude of the expected change in the observed indicator for one unit change in the latent variable; they represent the effects of the capabilities on outcomes. The indicators for physical well-being, mental well-being and work have been built as an increasing measure of deprivation; they all have the same sign. Being all signs positive, the latent variables have to be interpreted as deprived capabilities or deprived well-being domains.

The indicators: limits in job activities due to physical health, psychological difficulties last month and satisfaction for work, are the base indicators respectively for physical well-being, mental well-being and work . They are the indicators which provide the scale of the others and of the latent variable. For this reason their coefficients are imposed to be equal to one and the standard errors are not computed.

All indicators turn out to be significantly different from zero. Among the indicators for physical well-being, limits in job activities due to physical health and physical pain

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contribute in a similar measure in defining the latent variable, while the contribution of the subjective indicator is smaller. In signalling mental well-being the greatest effect is due to the indicator suffering from anxiety, depression, etc. which captures the most serious psychological problems. With regard to the capability work the main contribution comes from the indicator satisfaction for work, while the contributions of the indicators satisfaction for job security and satisfaction for working hours are lower and similar.

3.2 Structural model. Estimates for coefficients of explanatory variables: Beta and Gamma.

The structural part of the model explains each of the latent variables in terms of a system of explanatory variables. They are both latent variables, since the model allows the dependent variables to impact one on each other, and observed variables that are the exogenous causes of the dependent latent variables. Some of the exogenous causes are allowed to directly impact all the three modelled capabilities; others directly impact only the capability work, while their effect on the other capabilities is indirect.

The impact of physical well-being on mental well-being has been modelled, but the opposite effect has been neglected. Instead the influence of work on both physical well-being and on mental well-being is represented. The estimated reciprocal influences (B) are illustrated in Table 10 and they turns out to be relevant and of great magnitude. Standardized coefficients are displayed next to the estimated coefficients. Such coefficients represent the indirect effects of the external causes on the latent dependent variables.

The impact of physical well-being on mental well-being is the greatest. Since both physical well-being and mental well-being have to be interpreted as deprived capabilities, the positive sign of such impact means that increasing deprivation in physical well-being leads to an increasing deprivation mental well-being.

The impact of work is greater on mental well-being than that on physical well-being. Since the three latent variables represent deprived capabilities, the positive sign of such effects means that increasing deprivation in work leads to increasing deprivation both in physical well-being and in mental well-being and that –vice versa– decreasing deprivation in the domain of work leads to decreasing deprivation in physical well-being and in mental well-being.

Table 11 presents the estimated coefficients and the standardized coefficients of the external causes, which influence the latent variables. These coefficients represent the direct effect of the considered cause on each capability. Such effect is net of the indirect effect of the same cause coming from its impact on the other latent variables.

Age turns out to be relevant in explaining all the three latent variables. In the equation of physical well-being and in the equation of mental well-being it has positive sign, meaning that ageing increases deprivation in both the domains. This effect is higher on physical well-being. In the equation of work age has negative sign, meaning that ageing reduces deprivation. Gender also is relevant in the three equations and it exercises the greatest effect on physical well-being. Being male implies better physical and psychological conditions, but it increases deprivation in work. Living in a couple is significant in explaining both physical well-being and work but not in explaining mental well-being. It decreases physical well-being and it increases well-being in the domain of

work. Its greatest effect operates on work. Education is significant in explaining physical well-being, mental well-being and work. While it turns out in depriving work, it improves physical well-being and mental well-being. Race is significant in the equation of physical well-being and work only. Being white increases deprivation in physical well-being, but it decreases deprivation in work.

Children and household's activities only enter as explanatory variables in the equation of work, but only children is significant. It turns out to deprive the domain of work.

Employment characteristics enter the only equation for work. They are part-time; temporary; flexible hours; term-time; job-share; and hourly wage-rate. They all turn out to be significant. Part-time; temporary; flexible hours; and job-share lowers well-being in work, while term-time and hourly wage-rate increase well-being in that domain.

3.3 Reduced form model

The reduced form of model reports the total effects of each variable on the dependent latent variables. The total effect is the sum of the direct effect and the indirect effect. The indirect effect is the impact on the dependent variable that is mediated by the direct impact on the other dependent variable. The results of the reduced form reflect the simultaneous nature of the model planning that the well-being dimensions influence one each other and that deprivation in one well-being's dimension had a relapse in terms of the other well-being's dimensions.

Table 12 shows the estimated results of the reduced form of the model. They represent the total effects of the exogenous variables on the three latent dependent variables. As before estimates are displayed next to the standardized estimates. The firsts allow understanding the significance of each variable in explaining the model; the seconds allow interpreting the relative magnitude of their impact. Table 13 synthetically reports the signs of direct, indirect and total effects for each variable in the model. Signs are in brackets if they turn out to be not significant. Sometimes direct and indirect effects have same signs and the total effects result in being stronger than the direct effect. More often direct and indirect effects have but opposite signs. In this case if they have similar magnitude, the resulting total effect turns out to be not significant, otherwise one effect prevails on the other.

In the model physical well-being depend on work. The exogenous causes entering the equation of physical well-being are only personal characteristics. Their total effect sums their direct impact on physical well-being and their impact on work as transmitted by the impact that work exercises on physical well-being. Household's characteristics and employment characteristics do not enter the equation of physical well-being, but the equation of work. Their total effects coincide with their effect on work mediated by the effect that work exercises on physical well-being.

Mental well-being depends both on physical well-being and work; work in turn impacts physical well-being. Personal characteristics enter the three equations. Their total effects sum four elements: the direct effect on mental well-being, the effect on physical well-being transmitted by the impact of physical well-being on mental well-being (first indirect effect), the effect on work transmitted by the impact of work on mental well-being (second indirect effect) and the effect on work mediated by the impact of work on physical well-being and by the impact of physical well-being on mental well-being (third indirect effect). Household's characteristics and employment characteristics only

enter the equation of work. Then their total effects on mental well-being are given by the sum of two elements: the effect on work transmitted by the impact of work on mental well-being and the effect on work transmitted by the impact of work on physical well-being and by the impact of physical well-being on mental well-being.

Since work does not depend on the other two latent variables, there are not indirect effects. Total effects coincide with the direct effects resulting in its equation and still presented in the previous section.

The total effect of age on physical well-being and mental well-being is significant and positive. This means that age results in increasing deprivation both in physical well-being and in mental well-being. On the contrary ageing decreases deprivation in the domain of work. The total effect of gender on both physical well-being and mental well-being results in significantly reducing deprivation. Instead being male increases deprivation in work. The total effect of marital status on physical well-being is no longer significant. On the contrary its total effect on mental well-being and on work is significant and negative: being married or living as a couple significantly decreases deprivation in these two domains of well-being. The total effect of education on the three capabilities is significant and positive: it turns out to increase deprivation in all the three cases. Being white increases deprivation in physical well-being, while it decreases deprivation in work. Instead the total effect of race on mental well-being is not significant.

Having children significantly increases deprivation in the three domains: physical well-being, mental well-being and work. The total effect of household's activities does not result significant.

All the total effects of the employment characteristics are significant. Part-time; temporary; flexible hours; and job-share turn out to increase deprivation in physical well-being, mental well-being and work. Instead term-time directly decreases deprivation in work and then indirectly decreases deprivation in physical well-being and mental well-being. As expected, increasing hourly wage rate also decreases deprivation in work and it consequently decreases deprivation in physical well-being and mental well-being.

4.   Conclusions[12].

The selected indicators for signalling physical well-being cover both objective and subjective aspects of individual physical health. The high significance of the estimated factor loadings and the concordance among their signs confirm the choice. The greater contribution is due to the more objective indicators, but the significance of the subjective aspects of this capability tell that it is important to consider how this dimension of well-being is perceived and lived by individuals. Subjective aspects contribute to calibrate more objective aspects. Further research should integrate among the indicators information about diseases and disabilities and in particular about fertility. This latter aspect of the capability physical well-being could be very important to be considered in relation with the capability work. The estimated effects of the

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[12] The dependency of work on physical well-being and mental well-being is not represented for empirical reasons. Since the focus is on a population of working people[12], the minimum physical and psychological conditions to work are met. For this reason the representation of the dependency of the work on physical well-being and on mental well-being would require more detailed data e possibly longitudinal data.

employment characteristics confirm this intuition. Indeed term-time is the only non-standard employment form that enhances the capability work and both the capability physical well-being and mental well-being by reflex. Term-time is an employment form that let workers to adapt their working time to schooling requirements of their children. This result lets think that the working conditions influence fertility decisions and that if the freedom of choice in matter of work –i.e. the capability work – is limited, this also limits freedom of choice in matter of reproduction. To develop this result, further research should not only widen the range of indicators of the capability physical well-being, but it should also integrate a model of the capability family and household's relations.

The indicators for the capability mental well-being signal both pathological statuses and psychological difficulties in the daily life. Also in this case, the significance of the estimated factor loadings and their concordance confirm the choice. The indicator of psychological pathologies such as anxiety and depression results in having the greater factor loading. This finding shows that it is relevant to consider separately more serious psychological difficulties and more common psychological difficulties. It also suggests studying more deeply the impact of different pathologies. As previously discussed, further research should pay more concern to the individual ability to react to psychological difficulties.

The indicators of the capability work mainly signal the individual perception of some aspects of its own employment. They are all significant, but the greatest impact is given by the satisfaction for type of work. This confirms the importance of self-realization in the kind of working activity rather than in its outcome. Considering only satisfaction, these indicators neglect that individuals often adapt to circumstances rather act to change them. A complete representation of the capability work would need more information about individual actual ability to change and improve their employment circumstances according to their preferences and expectation. This would permit to better evaluate awareness and freedom of choice in matter of work.

The empirical results confirm the interdependency of the dimensions of well-being. The model lets some of the dependent latent variables to enter as endogenous explanatory variables in the equations of the others. More precisely, the capability work enters as explanatory variable in the equation of the latent dependent variable physical well-being; both the capability physical well-being and the capability work enter as explanatory variables in the equation of the latent dependent variable mental well-being. The statistical relevancy and the magnitude of their estimated coefficients demonstrate the simultaneous nature of well-being and the importance of considering the reciprocal influences among capabilities. As expected, deprivation in one dimension of well-being leads to deprivation in the other dimensions. Increasing deprivation in the capability physical well-being implies increasing deprivation in the capability mental well-being and increasing deprivation in the capability work causes deprivation both in the capability physical well-being and in the capability mental well-being. As previously discussed, a complete representation of individual well-being would require modelling all the relevant dimensions. First of all it is important to introduce concern for the capabilities family care and social relations because they are aspects of individual life highly influenced by the other capabilities and that highly influence them, in particular those represented in the model. For this reason many information about household and

human relations are endogenous in the model and they have not been appropriately accounted.

The model encompasses a system of exogenous causes that impact directly or indirectly the capabilities represented as latent variables.

Ageing deprives the capability physical well-being and the capability mental well-being, since it is associated with a gradual physical impairment and psychological fatigue. Instead it improves the capability work , probably as an effect of the experience and of the achievements.

Being male associates with better physical and mental conditions, improving both the capability physical well-being and mental well-being. Such result reflects both the lower male awareness about health –coherent with the literature confirming the higher female propensity to care of themselves and of others– and a limit of the model. Since reasons of endogeneity prevent to introduce concern for children and fertility in the equation for physical well-being, such aspects are captured in the effect estimated for gender. Instead being male reduces well-being in matter of employment. This result depends on the indicators for the capability work that are indicators of satisfaction for different aspects of employment. The result could depend on a lower male tendency to adapt or on a lower male ability to feel satisfaction and self realization. In order to solve this ambiguity, more pieces of information on opportunities and freedom of choice in matter of employment should be included.

Being married or living in couple results in increasing deprivation in the capability physical well-being, probably because the strict relation with someone, receiving their care and taking care for them, also increases awareness about themselves and their own physical conditions. On the contrary the support that is possible to receive from the partner improves the capability work and the magnitude of such influence is so important that it also improves the capability mental well-being and it compensate the negative effect on physical well-being.

Education is significant in explaining well-being in matter of physical and psychological conditions. Higher educational levels imply better access to information and consequently to care. Education also increases professional, personal and civic responsibilities and it makes individual expectations and satisfaction's mechanisms more complex. These last aspects could explain the negative effect on work. Since education also increases individual opportunities to find a better work; to professionally progress; and to identify themselves in their activity, this result confirms that the model requires indicators for further functionings relative to the capability work .

Being of white race turns out to increase deprivation in the capability physical well-being. Probably it captures different ability or opportunities to detect health problems. If white race people have more access to health services they are also more likely to be aware of their health problems. This result confirms that it is necessary to consider information about individual freedom to access health services and health information and about their ability to manage them, in order to distinguish the elements that directly affect health from the elements that increase the detection of diseases because they improve the access to health care and health awareness.

Having children deprives the capability work because it limits freedom in managing time and material resources. This effect also leads to a reduction in the other two

capabilities. Having children and caring about them and elderly; household's activities such as housework are important aspects of individual life that imply some costs in terms of well-being but that are also resources enhancing it. Under this light they shape an autonomous capability that should be considered in relation with the others. Social and family relations and activities directly influence the other dimensions of well-being and they are also influenced by them.

Key results of the model are related to the employment characteristics. Non-standard employment conditions such as part-time work, temporary work, flexible hours work and job-sharing work mainly limit well-being. They imply low employment protection, low ability to plan for the future, low employment certainty, low opportunity to enhance careers. Such conditions are alternative to the standard permanent and full-time employment and possibly they should improve the opportunity to reconcile life time and working time. Nevertheless this opportunity works only if people can choose the working conditions that better suite their life conditions. Indeed the only employment characteristic that results in supporting well-being is term-time. It is an employment form that allows workers matching working time with schooling time of their children.Aas expected, the wage turns out to enhance the capability work, improving individual control over resources and access to services and also supporting the capabilities physical well-being and mental well-being.

This paper proposed and discussed a model representing the relations among three capabilities: physical well-being, mental well-being and work. It suffers from some limitations, in particular attributable to the available indicators for signalling the capabilities, but mainly to the lack of a model for a well-being dimension accounting for households and social relations and activities. Further research should address such issues. However the model is able to highlight some important results. First of all it confirms the simultaneous relations linking different dimensions of well-being and it draws attention to the consequences of the deprivation in a dimension of well-being in term of deprivation of the others. Moreover it has been found evidence about the significance of the capability work and of the employment characteristics in impacting individual well-being. The key aspect in explaining the role of the employment characteristics are the life balance opportunities that they are able to open.

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Tables and figures.

<div align="center">Table 1: Notation[13]</div>

Symbol	Dim.	Definition
Variables		
y*	3x1	Vector of latent endogenous capabilities
Elements of y:*		
y_1^*	1x1	Latent capability: Physical well-being
y_2^*	1x1	Latent capability: Mental well-being
y_3^*	1x1	Latent capability: Work
x	13x1	Vector of exogenous causes
Partitions of x:		
x₁	4x1	Vector of exogenous causes: Personal characteristics
x₂	3x1	Vector of exogenous causes: Household's characteristics and activities
x₃	6x1	Vector of exogenous causes: Employment characteristics
y	8x1	Vector of functionings, indicators of capabilities
Partitions of y:		
y₁	3x1	Vector of functionings, indicators of Physical well-being
y₂	2x1	Vector of functionings, indicators of Mental well-being
y₃	3x1	Vector of functionings, indicators of Work
Coefficients		
B	3x3	Coefficients matrix of endogenous latent variables
Partitions of B:		
β₁	1x3	Coefficient vector of latent variables entering in the equation for Physical well-being.
β₂	1x3	Coefficient vector of latent variables entering in the equation for Mental well-being.
β₃	1x3	Coefficient vector of latent variables entering in the equation for Work.
Γ	3x13	Coefficients matrix of exogenous causes
Partitions of Γ:		
γ₁.₁	1x4	Coefficients vector of exogenous causes for Physical well-being: Personal characteristics
γ₁.₂	1x3	Coefficients vector of exogenous causes for Physical well-being: Household's characteristics and activities
γ₁.₃	1x6	Coefficients vector of exogenous causes for Physical well-being: Employment characteristics
γ₂.₁	1x4	Coefficients vector of exogenous causes for Mental well-being: Personal characteristics
γ₂.₂	1x3	Coefficients vector of exogenous causes for Mental well-being: Household's characteristics and activities
γ₂.₃	1x6	Coefficients vector of exogenous causes for Mental well-being: Employment characteristics
γ₃.₁	1x4	Coefficients vector of exogenous causes for Work: Personal characteristics
γ₃.₂	1x3	Coefficients vector of exogenous causes for Work: Household's characteristics and activities
γ₃.₃	1x6	Coefficients vector of exogenous causes for Work: Employment characteristics
Λ	8x3	Matrix of measurement loadings
Partitions of Λ:		
Λ₁	3x3	Matrix of measurement loadings for Physical well-being
Λ₂	2x3	Matrix of measurement loadings for Mental well-being
Λ₃	3x3	Matrix of measurement loadings for Work
Error terms		
ε	3x1	Vector of error terms of the structural model
ζ	8x1	Vector of error terms of the measurement model
Partitions of ζ:		
ζ₁	3x1	Vector of error terms of the measurement model relating to Physical well-being
ζ₂	2x1	Vector of error terms of the measurement model relating to Mental well-being
ζ₃	3x1	Vector of error terms of the measurement model relating to Work
Covariance matrices		
Φ	8x8	Covariance matrix for the residuals in the measurement equations
Ψ	3x3	Covariance matrix for the residuals in the structural equations

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[13] The subscript of the elements in y^* and in ε and the first subscript of the elements in B and Γ identifies the equation in which they enter. The second subscript of the elements in B indicates the latent variable entering in the equation as explicative variable. The second subscript of the elements in the coefficient matrix Γ identifies the partition of the vector x, i.e. the kind of external cause to which they refer. Indeed, the subscript of the elements in x identifies the partition of the vector x, i.e. the kind of external cause. The first subscript in y, Λ and ζ indicates the latent variable to which they are linked.

Figure 1: Path diagram
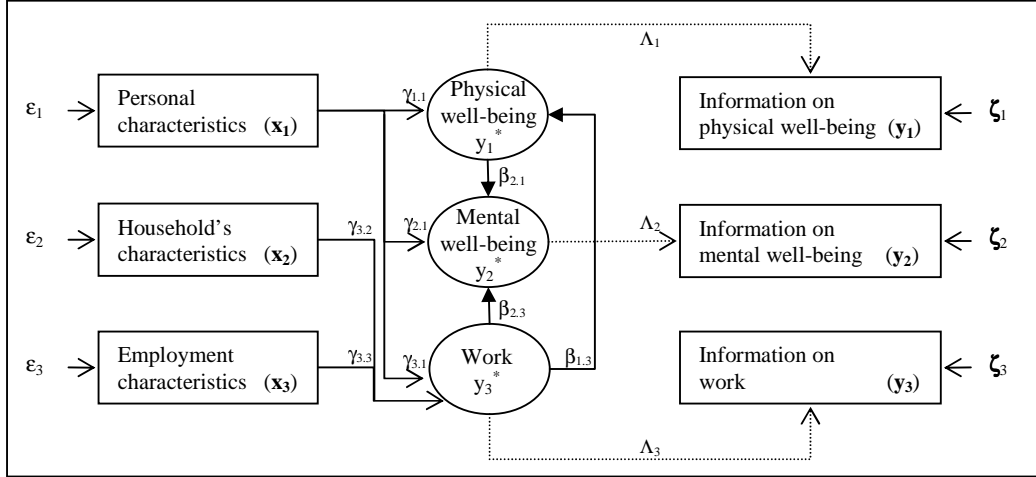
Table 2: Variables in the empirical model

Vector	Partition	Element	Description
Latent Variables			
y*		y^*_1	Physical well-being
		y^*_2	Mental well-being
		y^*_3	Work
Indicators			
y	**y₁**	$y_{1.1}$	Limits in job activities due to physical health
		$y_{1.2}$	Physical pain
		$y_{1.3}$	Perception of physical health
	y₂	$y_{2.1}$	Psychological difficulties last month
		$y_{2.2}$	Suffering from anxiety, depression etc.
	y₃	$y_{3.1}$	Satisfaction for work
		$y_{3.2}$	Satisfaction for job security
		$y_{3.3}$	Satisfaction for working hours
External Causes			
x	**x₁**	$x_{1.1}$	Age
		$x_{1.2}$	Gender (Male)
		$x_{1.3}$	Marital status (Couple)
		$x_{1.4}$	Education
		$x_{1.5}$	Race (White)
	x₂	$x_{2.1}$	Children
		$x_{2.2}$	Household activities
	x₃	$x_{3.1}$	Part-time
		$x_{3.2}$	Temporary
		$x_{3.3}$	Flexible Hours
		$x_{3.4}$	Term-time
		$x_{3.5}$	Job-share
		$x_{3.6}$	Hourly wage rate

Table 3: Personal characteristics, x_1

Variables	Description	Values	*mean*	*sd*	*min*	*max*
Age	Age at the time of interview Discrete bounded variable		38.101	11.899	15	64
Gender	It indicates whether male or female Dummy variable	1 = male 0 = female	0.478	0.500	0	1
Marital status	It indicates whether living as a couple or not Dummy variable	1 = married or living as a couple 0 = otherwise	0.693	0.461	0	1
Education	Educational level Ordered categorical variable	0 = very low or no education 1 = low educational level 2 = medium educational level 3 = high educational level	1.782	0.855	0	3
Race	It indicates whether of white race or otherwise Dummy variable	1 = white race 0 = otherwise	0.948	0.222	0	1

Number of observations: 7140
Source: BHPS data – 2004/05.

Table 4: Household's characteristics, x_2

Variables	Description	Values	*mean*	*sd*	*min*	*max*
Children	It indicates whether there are children younger than 16 in household Dummy variable	1 = there are children in household 0 = otherwise	0.636	0.938	0	1
Household's activities	It indicates the level of involvement in activities such as cleaning, ironing, etc. Sum of 5 categorical variables	from 0 to 10, where 0 = no involvement at all 10 = respondent is the only responsible for all hh's activities	5.752	3.105	0	10

Number of observations: 7140
Source: BHPS data – 2004/05.

Table 5: Employment characteristics, x_3

Variables	Description	Values	*mean*	*sd*	*min*	*max*
Part-time	It indicates whether part-time employment contract or not Dummy variable	1 = part-time empl. contract 0 = otherwise	0.218	0.413	0	1
Temporary	It indicates whether temporary employment contract or not Dummy variable	1 = temporary empl. contract 0 = otherwise	0.005	0.219	0	1
Flexible hours	It indicates whether flexible hours employment contract or not Dummy variable	1 = flexible hours empl. contract 0 = otherwise	0.234	0.424	0	1
Job-sharing	It indicates whether job-sharing employment contract or not Dummy variable	1 = job-sharing empl. contract 0 = otherwise	0.011	0.106	0	1
Hourly wage rate	Net hourly wage rate (averaged)		9.575	6.117	0.333	142.749

Number of observations: 7140
Source: BHPS data – 2004/05.

Table 6: Information on physical well-being

Variables	Description	Values	mean	sd	min	max
Limits in job activities	Number of limitations in job activities due to bad physical health Sum of 4 dummy variables	from 0 to 4, where 0 = job activities are not limited by health 4 = job activities limited in 4 aspects	0.336	0.983	0	4
Physical pain	Amount of bodily pain in last 4 weeks Ordered categorical variable	from 0 to 5, where 0 = none 5 = very severe	0.947	1.259	0	5
Perception of physical health	It indicates the intensity of individual's morbidity Sum of 4 ordered categorical variables	from 0 to 4, where 0 = health perceived as very good 4 = health perceived as very bad	3.618	2.983	0	16

Number of observations: 7140

Source: BHPS data – 2004/05.

Table 7: Information on mental well-being

Variables	Description	Values	mean	sd	min	max
Psychological difficulties last month	It indicates the frequency of some psychological problems during the last month Sum of 9 ordered categorical variables	from 0 to 45, where 0 = the individual never suffered from any of the listed psychological problems 45 = the individual suffered very often from all the problems	11.875	6.851	0	44
Suffering from anxiety, depression, addiction, etc.	It indicates whether the individual suffers from psychological problems at pathological level Dummy variable	1 = suffering from anxiety, depression… 0 = otherwise	0.053	0.224	0	1

Number of observations: 7140

Source: BHPS data – 2004/05.

Table 8: Information on work

Variables	Description	Values	mean	sd	min	max
Dissatisfaction with work	It indicates the level of dissatisfaction with kind of work Ordered categorical variable	from 0 to 6, where 0 = completely satisfied 6 = completely dissatisfied	1.566	1.297	0	6
Dissatisfaction with job security	It indicates the level of dissatisfaction with security of employment Ordered categorical variable	from 0 to 6, where 0 = completely satisfied 6 = completely dissatisfied	1.460	1.436	0	6
Dissatisfaction with working hours	It indicates the level of dissatisfaction with working hours Ordered categorical variable	from 0 to 6, where 0 = completely satisfied 6 = completely dissatisfied	1.736	1.400	0	6

Number of observations: 7140

Source: BHPS data – 2004/05.

Table 9: Lambda. Factor loadings

		y^*_1 Physical well-being		y^*_2 Mental well-being		y^*_3 Work	
		λ	std. λ	λ	std. λ	λ	std. λ
$y_{1.1}$	Limits in job activities (due to physical health)	1.000	0.886	- -		- -	
$y_{1.2}$	Physical pain	0.808***	0.718	- -		- -	
		0.005					
$y_{1.3}$	Perception of physical health	0.586***	0.206	- -		- -	
		0.014					
$y_{2.1}$	Psychological difficulties last month	- -		1.000	0.099	- -	
$y_{2.21}$	Suffering from anxiety, depression etc.	- -		0.815***	0.408	- -	
				0.042			
$y_{3.1}$	Satisfaction for work	- -		- -		1.000	0.662
$y_{3.2}$	Satisfaction for job security	- -		- -		0.752***	0.414
						0.01	
$y_{3.3}$	Satisfaction for working hours	- -		- -		0.732***	0.499
						0.013	

Source: BHPS data – 2004/05.
LISREL Estimates
*** Significant at least at 1% level.

Table 10: Beta. Coefficients of endogenous latent variables

		y^*_1 Physical well-being		y^*_2 Mental well-being		y^*_3 Work	
		β	std. β	β	std. β	β	std. β
y^*_1	Physical well-being	- -		- -		0.349***	0.224
						0.015	
y^*_2	Mental well-being	0.555***	0.935	- -		0.674***	0.731
		0.029				0.047	
y^*_3	Work	- -		- -		- -	

Source: BHPS data – 2004/05.
LISREL Estimates
*** Significant at least at 1% level.

Table 11: Gamma. Coefficients of exogenous variables

		y^*_1 Physical well-being		y^*_2 Mental well-being		y^*_3 Work	
		γ	std. γ	γ	std. γ	γ	std. γ
$x_{1.1}$	Age	0.011***	0.141	0.006***	0.137	-0.006***	-0.132
		0.000		0.001		0.001	
$x_{1.2}$	Gender (Male)	-0.433***	-0.241	-0.231***	-0.217	0.172***	0.149
		0.008		0.019		0.025	
$x_{1.3}$	Marital status (Couple)	0.063***	0.032	0.017	0.015	-0.204***	-0.164
		0.012		0.021		0.033	
$x_{1.4}$	Education	-0.048***	-0.046	-0.087***	-0.141	0.184***	0.272
		0.005		0.011		0.017	
$x_{1.5}$	Race (White)	0.168***	0.039	0.035	0.014	-0.122***	-0.044
		0.027		0.050		0.080	
$x_{2.1}$	Children	- -	- -	- -	- -	0.114***	0.096
						0.015	
$x_{2.2}$	Household activities	- -	- -	- -	- -	-0.002	-0.013
						0.003	
$x_{3.1}$	Part-time	- -	- -	- -	- -	0.033**	0.025
						0.016	
$x_{3.2}$	Temporary	- -	- -	- -	- -	0.449***	0.174
						0.039	
$x_{3.3}$	Flexible Hours	- -	- -	- -	- -	0.041***	0.029
						0.014	
$x_{3.4}$	Term-time	- -	- -	- -	- -	-0.450***	-0.153
						0.040	
$x_{3.5}$	Job-share	- -	- -	- -	- -	0.112***	0.024
						0.043	
$x_{3.6}$	Hourly wage rate	- -	- -	- -	- -	-0.040***	-0.433
						0.002	

Table 12: Reduced form model

		y*₁ Physical well-being	std.	y*₂ Mental well-being	std.	y*₃ Work	std.
x₁.₁	Age	0.009*** *0.000*	0.111	0.007*** *0.001*	0.145	-0.006*** *0.001*	-0.132
x₁.₂	Gender (Male)	-0.372*** *0.007*	-0.208	-0.321*** *0.021*	-0.302	0.172*** *0.025*	0.149
x₁.₃	Marital status (Couple)	-0.008 *0.008*	-0.005	-0.125*** *0.017*	-0.109	-0.204*** *0.033*	-0.164
x₁.₄	Education	0.016*** *0.004*	0.015	0.045*** *0.007*	0.072	0.184*** *0.017*	0.272
x₁.₅	Race (White)	0.126*** *0.016*	0.029	0.023 *0.026*	0.009	-0.122*** *0.080*	-0.044
x₂.₁	Children	0.040*** *0.005*	0.022	0.099*** *0.013*	0.090	0.114*** *0.015*	0.096
x₂.₂	Household activities	-0.001 *0.001*	-0.003	-0.002 *0.003*	-0.012	-0.002 *0.003*	-0.013
x₃.₁	Part-time	0.012** *0.006*	0.006	0.029** *0.014*	0.024	0.033** *0.016*	0.025
x₃.₂	Temporary	0.157*** *0.011*	0.039	0.390*** *0.032*	0.164	0.449*** *0.039*	0.174
x₃.₃	Flexible Hours	0.014*** *0.005*	0.006	0.036** *0.013*	0.027	0.041*** *0.014*	0.029
x₃.₄	Term-time	-0.157*** *0.012*	-0.034	-0.391*** *0.034*	-0.144	-0.450*** *0.040*	-0.153
x₃.₅	Job-share	0.039*** *0.015*	0.005	0.098*** *0.037*	0.023	0.112*** *0.043*	0.024
x₃.₆	Hourly wage rate	-0.014*** *0.001*	-0.097	-0.035*** *0.002*	-0.407	-0.040*** *0.002*	-0.433

Table 13: Results summary

	Dependent latent	y*₁			y*₂					y*₃	
	Effect	D.	I.	T.	D.	I.	I.	I.	T.	D.	T.
	Intervening latent		y*₃			y*₁	y*₃	y*₃ y*₁			
x₁.₁	Age	+	-	+	+	+	-	-	+	-	-
x₁.₂	Gender (Male)	-	+	-	-	-	+	-	-	+	+
x₁.₃	Marital status (Couple)	+	-	(-)	(+)	+	-	-	-	-	-
x₁.₄	Education	-	+	+	-	-	+	-	+	+	+
x₁.₅	Race (White)	+	-	+	(+)	+	-	-	(+)	-	-
x₂.₁	Children		+	+		+	+	+	+	+	+
x₂.₂	Household activities		(-)	(-)		(-)	(-)	(-)	(-)	(-)	(-)
x₃.₁	Part-time		+	+		+	+	+	+	+	+
x₃.₂	Temporary		+	+		+	+	+	+	+	+
x₃.₃	Flexible Hours		+	+		+	+	+	+	+	+
x₃.₄	Flexi-Term		-	-		-	-	-	-	-	-
x₃.₅	Job-share		+	+		+	+	+	+	+	+
x₃.₆	Hourly wage rate		-	-		-	-	-	-	-	-