Institute for Empirical Research in Economics
University of Zurich

Working Paper Series
ISSN 1424-0459

Working Paper No. 275

The Happiness Gains From Sorting and Matching in the Labor Market

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March 2006

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March 6, 2006

Abstract

Sorting of people on the labor market not only assures the most productive use of valuable skills but also generates individual utility gains if people experience an optimal match between job characteristics and their preferences. Based on individual data on reported satisfaction with life it is possible to assess these latter gains from matching. We introduce a two-equation ordered probit model with endogenous switching and study self-selection into government and private sector jobs. We find considerable gains from matching amounting to an increase in the fraction of very satisfied workers from 53.8 to 58.8 percent relative to a hypothetical random allocation of workers to the two sectors.

JEL Classification: D60, I31, J24, J45
Keywords: Matching, ordered probit, public sector employment, selection, switching regression, subjective well-being

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1 Introduction

The wealth and happiness of nations depend on the efficient allocation of labor. In order to get the most out of the resources available in an economy, people must find their proper employer and vice versa. Market forces are expected to bring about that skills are employed in their most productive use so that goods and services are supplied at lowest costs. Sorting thus increases the wealth of nations. This is the usual view about the importance of sorting and matching on the labor market and its benefits for society. There is, however, another important consequence of sorting for the happiness of nations. As the marginal worker determines the compensation for labor in its many specificities, other workers individually get a rent if they experience an optimal match between job characteristics and their preferences. They benefit from a utility premium, i.e. they get more utility than what they require to stay in their current job. These private benefits from sorting and matching are the larger the more heterogeneous the preferences are in a society ceteris paribus.[1]

Imagine the case of an individual for whom the service for society is close to her heart. She might enjoy great satisfaction from working in a specific government position. To the extent that she would be willing to do the job for a lower compensation than the actual salary received (in order to guarantee the provision of government services at large) she benefits from a utility premium due to optimal matching.

These arguments about the gains from self-selection involve fundamental aspects of individual well-being and utility maximization. On the one hand, rents from matching are seen as a substantive source of well-being. On the other hand, self-selection and accordingly assortative matching are claims about individual rational decision-making.

Both claims are inherently difficult to evaluate based on revealed behavior and compensating wage differentials. What are the job characteristics people have formed preferences about? How can these characteristics be measured and how are the respective preferences distributed?

In this paper, we take advantage of the recent revolution in economics: the measurement of

[1] An excellent account of the theory of equalizing differences in the labor market is provided in Rosen (1986).

individual subjective well-being and its application as a proxy measure for utility (e.g. Frey and Stutzer 2002). Reported life satisfaction is an "all-inclusive" measure or assessment of a situation based on individuals' subjective evaluation and weighting. This allows for directly studying the consequences of individual self-selection. In particular, it is possible to assess people's potential gains in well-being from working in their job rather than in some alternative one.[2]

We proceed in two steps. First, a new econometric tool is developed to study self-selection with data on reported subjective well-being which are ordinal in nature. The model we introduce is a two-equation ordered probit model with endogenous switching. This new model formalizes the idea that (i) the well-being experienced from working in a particular job is individual specific, and that (ii) people may select the job they work in based on relative advantage (i.e., maximize subjective well-being). The potential of the model in research on the determinants of individual well-being (and elsewhere) goes far beyond the application in this paper.

Second, the gains from matching in the labor market are quantified for the specific sorting of workers into either government or private sector jobs.[3] The gains in individual well-being from matching are obtained by comparing the actual distribution in reported life satisfaction with a hypothetical one, where workers are randomly allocated to government or private sector jobs, keeping the size of the two sectors equal to the actual size.

Sorting into government and private sector jobs is given priority in our study for several reasons. In many countries, an important part of the economic activity takes place in the government sector. More importantly, however, the government and private sector differ in various institutional and structural aspects with profound consequences for the workers in these two sectors. First, public agencies have some special features, most notably the multiplicity of principals and tasks and

[2]How specific job characteristics are evaluated by workers is studied in a rich related literature on job satisfaction (for a review, see Warr 1999).

[3]In our paper, the sorting is based on a full utility comparison, taking into account all relevant job attributes. This broader view is different from, and complementary to, the traditional focus on public-private sector wage differentials and related sorting issues (Gregory and Borland, 1999, Borjas, 2002).

the non-market nature of their output, which prevent the use of explicit incentives. Instead, the government sector is characterized by low powered incentives, a flat wage structure and promotions based on the principle of seniority (e.g. Dixit 2002). Second, mission-oriented occupations, i.e. occupations connected to the provision of collective goods, are highly concentrated in the public sector (Besley and Ghatak 2005). Finally, public sector employees enjoy a higher job security than their private sector counterparts. In most countries public servants are better protected against dismissal and the threat of bankruptcy is virtually absent. Therefore, it stands to reason that the government sector attracts workers with strong preferences for job security and a strong sense of responsibility for the society, but, probably less career concerns.[4]

Circumstantial evidence on heterogeneity in job characteristics and job holders' preferences in the public and private sector is provided in the International Social Survey Program on Work Orientations in 1997. It elicits respondents' preferences for various job characteristics. Figure 1 shows that government sector employees rate opportunities for advancement as less important, and job security and usefulness of their work to the society as more important on a six point scale than private sector employees. Figure 1 also reveals a second important fact. Public employees not only have different preferences regarding these job characteristics, they also perceive their jobs as more secure and more useful to society but with less prospects for advancement than employees in the private sector. It is exactly this match between preferences and job characteristics that entails potentially important gains in happiness.

[Figure 1 about here]

Given that many forces aggravate the proper sorting of people into government and private jobs, at least four different outcomes are possible. First, despite the obstacles in market adjustment and in workers' self-selection, an almost optimal sorting might be observed. Second, most people might

[4]The literature has, indeed, documented that civil servants are more risk averse than private sector employees (Bellante and Link 1981; Hartog et al. 2002) and show a specific public service motivation (e.g. Kelman 1987, Crewson 1997).

be better off in the government sector but only a fraction of people can actually work there. This might be due to rationing and indicates general sector specific rents. Third, the opposite might occur and almost everybody might be better off in the private sector. This might, for example be the case if efficiency wages in the private sector create advantages for the insiders but generate involuntary unemployment, and reduce the attractiveness of public sector employment. Finally, some people might be in their preferred sector while others are not. Thus there is a partial mismatch involving costs in terms of well-being.

In our empirical analysis based on the first two waves of the European Social Survey, we find strong evidence for self-selection, i.e. for correlation between the error terms of the selection and the outcome equations. The correlation pattern is one of selection based on comparative advantage. Government sector workers are those who gain the most from being in that sector. As a consequence, there are considerable gains in subjective well-being from matching. The actual allocation increases the overall fraction of "very satisfied" workers (reporting a life satisfaction score of 8 or above on a 0-10 response scale) by five percentage points relative to a hypothetical random allocation of workers to the two sectors.

In the next section, we present the empirical framework. At the core is a new ordered probit model with endogenous switching, the parameters of which can be estimated by maximum likelihood. A discussion of general issues regarding the measurement of well-being, and of the data used from the European Social Survey are part of Section 3. The results are presented in Sections 4. Section 5 offers concluding remarks.

2 The Model

The empirical framework is developed in two steps. First, a simple switching regression model for two sectors is introduced whereby the selection effect is initially non-negative and is then allowed to be affected in observed and unobserved ways. Second, the standard regression model is extended to ordinal dependent variables.

2.1 A switching regression model of public and private sector well-being

There are two sectors in our model, the government sector ($s = 1$), and the private sector ($s = 0$). The sector-specific equations for individual well-being in the two sectors are

$$y_s^* = x'\beta_s + u_s\,, \qquad s = 0, 1 \tag{1}$$

where x is a $(k \times 1)$ vector of explanatory variables that is the same in both equations, and β_s are conforming sector-specific parameter vectors. The sector specific error term u_s measures preference heterogeneity. Workers differ in their implicit valuation of the attributes of public and private sector jobs. For example, for workers with a strong preference for job security and a strong sense of responsibility for society, attributes typically associated with the public sector, we would observe in the framework of this model that $u_1 > u_0$.[5]

This is a typical switching regression framework. We observe either individual well-being in sector 1 (for workers who decided to work in sector 1), or individual well-being in sector 0 (for workers who decided to work in sector 0), but never both. It is a logical impossibility to know for sure what the well-being of workers in sector 1 would be if they worked in sector 0, and vice versa. However, the difference in an individual's well-being between the two sectors, one observed and one unobserved, is precisely the worker specific potential utility premium from matching we are interested in.

Under some additional identifying assumptions, it becomes possible to reconstruct the counterfactual well-being using econometric techniques. In particular, we assume that

$$u_0 \sim N(0, 1)$$
$$u_1 \sim N(0, 1)$$
$$\text{corr}(u_0, u_1) = \rho$$

[5] A broader concept of preference heterogeneity allows for heterogeneity in the slope parameters β_s as well. In a polar case, $\beta_{si} = \beta_i$, i.e., differences in slopes across sectors are entirely due to worker heterogeneity. Such heterogeneity would have some effect on the interpretation, as indicated in the results section below, but would not invalidate the model structure *per-se*.

The normalization of the variances is introduced already at this stage in anticipation of the fact that only class membership of a partition of the real line is observed, i.e. the estimable model will have an ordered probit structure. Otherwise, the model has all the features of the standard Roy model for two continous outcomes (see Roy, 1951, Borjas, 1987). If $\rho > 0$, then workers with an above average well-being in sector 1 also enjoy above average well-being in sector 0. The extreme case would be a perfect positive correlation, such that $\rho = +1$. In this case, $u_0 = u_1$; this is tantamount to assuming that people differ in their unobserved intrinsic well-being level (e.g., personality), but that these differences are completely unrelated to the sector they might work in. If ρ is less than one, there are sector specific gains to be made, i.e., people have comparative well-being gains in one of the sectors, and we would expect that people self-select into the sectors based on this comparative advantage. Workers with a positive preference for sector 1 will end up in sector 1, and workers with a positive preference for sector 0 will work in sector 0.

This idea can be formalized by assuming that individuals self-select into sectors 0 and 1 based on maximization of their well-being. In its strictest form, the maximization hypothesis implies that we observe workers in sector 1 whenever $y_1^* > y_0^*$, and in sector 0 whenever $y_0^* > y_1^*$. In this case, the selection equation is

$$s = \begin{cases} 1 & \text{if } u_1 - u_0 > x'(\beta_0 - \beta_1) \\ 0 & \text{if } u_1 - u_0 \leq x'(\beta_0 - \beta_1) \end{cases} \tag{2}$$

To answer the question whether workers who chose to work in sector s have a higher or lower well-being than a worker randomly assigned to that sector, i.e., whether they are positively or negatively selected, the key parameter is the correlation between $u_1 - u_0$ and u_s. As is well known, in this set-up,

$$\begin{aligned} \mathrm{E}(y_s^*|x, s=1) &= x'\beta_1 + \mathrm{E}(u_1|u_1 - u_0 > x'(\beta_0 - \beta_1)) \\ &= x'\beta_1 + \mathrm{corr}(u_1, u_1 - u_0)\frac{\phi(x'(\beta_1 - \beta_0)/\sigma)}{\Phi(x'(\beta_1 - \beta_0)/\sigma)} \end{aligned} \tag{3}$$

and

$$\mathrm{E}(y_s^*|x, s=0) = x'\beta_0 + \mathrm{E}(u_0|u_1 - u_0 \leq x'(\beta_0 - \beta_1))$$

$$= \quad x'\beta_0 - \text{corr}(u_0, u_1 - u_0)\frac{\phi(x'(\beta_1 - \beta_0)/\sigma)}{1 - \Phi(x'(\beta_1 - \beta_0)/\sigma)} \tag{4}$$

where $\sigma = \sqrt{\text{Var}(u_1 - u_0)}$. Under the assumptions of the model,

$$\text{corr}(u_s, u_1 - u_0) = (2s - 1)\sqrt{(1 - \rho)/2} \qquad s = 0, 1$$

If $s = 1$, the correlation is bounded from below at zero and the overall selection effect is nonnegative. Those more likely to select into sector 1 have an above average well-being in that sector. For example, for $\rho = 0$, $\text{corr}(u_1, u_1 - u_0) = 1/\sqrt{2}$.

If $s = 0$, the correlation is bounded from above at zero. Again, the overall selection effect is nonnegative. Those less likely to select into sector 1, and more likely into sector 0, have above average well-being in sector 0. Hence, both groups are positively selected for all interior values of ρ. Only if $\rho = +1$ does the correlation, and thus the self-selection bias, disappear.[6]

In important ways, this selection model is too restrictive. At an empirical level, we would prefer a model that does not restrict the selection effect to be non-negative *a priori*. At a theoretical level, individual maximization of well-being may not be the only determinant of sector allocation, for example due to demand constraints. If the number of people wanting to work in a given sector (the labor supply) exceeds the number of available jobs (the labor demand), the selection rule depends on a rationing mechanism. While we do not model this mechanism explicitly, we can allow for the possibility that it affects selection both in observed and unobserved ways. Let

$$s = \begin{cases} 1 & \text{if } \varepsilon > -z'\gamma \\ 0 & \text{if } \varepsilon \leq -z'\gamma \end{cases} \tag{5}$$

where

$$\varepsilon \sim N(0, 1)$$
$$\text{corr}(\varepsilon, u_1) = \rho_1$$
$$\text{corr}(\varepsilon, u_0) = \rho_0$$

[6]This result differs from the Roy model, where negative selection is possible. Negative selection in sector 0 requires that $\rho > 0$ and $\sigma_0 < \sigma_1$. With variances normalized to one, this case is precluded in the present setup.

Such a model allows for rather general forms of selection. z should include all variables that determine well-being (i.e., x). In addition, it can include variables that affect the demand for workers in a given sector, but not the supply. One example would be citizenship if, as is the case in many countries, all or a part of employment in the government sector is reserved to citizens of that country. In addition, the model allows for very general patterns of selection on unobservables. Thus demand restrictions may also operate on workers' characteristics that are not observed by the analyst, and there may be individual specific random effects on top of that. Econometrically, it is possible to estimate ρ_0 and ρ_1 separately.

The following cases can be distinguished:

a) there is self-selection based on comparative advantage. This occurs whenever $\rho_1 > \rho_0$.

b) there is self-selection based on comparative disadvantage. This occurs whenever $\rho_1 < \rho_0$.

c) there is no self-selection based on comparative advantage or disadvantage. This occurs whenever $\rho_1 = \rho_0$.[7] This is not the same as saying that there is no selection problem. The well-being of private sector workers is still not a valid counterfactual for the wellbeing of public sector worker in the private sector. As long as $\rho_1 = \rho_0 \neq 0$ there is selection based on absolute advantage or disadvantage. In this case, the simple model does not estimate the causal effect. There is, however, no gain from matching on unobservables. I.e., reallocating workers across sectors will not make a difference to aggregate well-being.

2.2 An ordered response model with endogenous switching

In this section, we present an extension of the standard regression model to ordinal dependent variables. This is necessary since the outcomes y_0^* and y_1^* are unobserved, in our case people's true well-being. Instead, we observe the ordered discrete responses $y_s = 0, \ldots, 10$, i.e., people's

[7] This point is easiest understood from the conditional expectations in the latent model, displayed in equations (3) and (4), from where we see that moving a sector 1 worker to sector 0 leads to a well-being change $\mathrm{E}(y_0^*|x, s = 1) - \mathrm{E}(y_1^*|x, s = 1) = x'(\beta_0 - \beta_1)$ that is equal to minus the well-being change of moving a sector 0 worker to sector 1, as long as $\rho_1 = \rho_0$.

judgements about their subjective well-being, such that

$$y_s = j \quad \text{if and only if} \quad \kappa_{s,j} < y_s^* \leq \kappa_{s,j+1} \tag{6}$$

where $y_s^* = x'\beta_s + u_s$, $s = 0, 1$, and the threshold values $\kappa_{s,j}$, $j = 0, 1, \ldots, 10$ form a partition of the real line i.e., $\kappa_0 = -\infty$, $\kappa_{11} = \infty$, and $\kappa_{s,j+1} > \kappa_{s,j}$ $\forall j$. This is not an ordinary ordered probit model since the probability of observing $y_s = j$ depends on the outcome of the selection variable, and the two are correlated. We have

$$\begin{aligned} P(y_1 = j, s = 1) &= P(\kappa_{1,j} - x'\beta_1 < u_1 \leq \kappa_{1,j+1} - x'\beta_1, \varepsilon > -z'\gamma) \\ &= P(\kappa_{1,j+1} - x'\beta_1 < u_1, -\varepsilon < z'\gamma) - P(\kappa_{1,j} - x'\beta_1 < u_1, -\varepsilon < z'\gamma) \end{aligned}$$

$$\begin{aligned} P(y_0 = j, s = 0) &= P(\kappa_{0,j+1} - x'\beta_0 < u_0 \leq \kappa_{0,j} - x'\beta_0, \varepsilon \leq -z'\gamma) \\ &= P(\kappa_{0,j+1} - x'\beta_0 < u_0, \varepsilon \leq -z'\gamma) - P(\kappa_{0,j} - x'\beta_0 < u_0, -\varepsilon \leq -z'\gamma) \end{aligned}$$

If u_1 and u_0 were both uncorrelated with ε, the joint probabilities could be factored into a standard ordered probit part and a standard probit part. With correlation, such a factorization is not possible. Then, for $\varepsilon \sim N(0,1)$, $u_1 \sim N(0,1)$, $u_0 \sim N(0,1)$, $\text{corr}(\varepsilon, u_1) = \rho_1$, and $\text{corr}(\varepsilon, u_0) = \rho_0$,

$$P(y_1 = j, s = 1|x, z) = \Phi_2(\kappa_{1,j+1} - x'\beta_1, z'\gamma, -\rho_1) - \Phi_2(\kappa_{1,j} - x'\beta_1, z'\gamma, -\rho_1)) \tag{7}$$

$$P(y_0 = j, s = 0|x, z) = \Phi_2(\kappa_{0,j+1} - x'\beta_0, -z'\gamma, \rho_0) - \Phi_2(\kappa_{0,j} - x'\beta_0, -z'\gamma, \rho_0) \tag{8}$$

where Φ_2 denotes the cumulative density function of the standard bivariate normal distribution.[8] The parameters of the model, $\theta = (\kappa_1, \kappa_0, \beta_1, \beta_0, \gamma, \rho_1, \rho_0)'$, can be estimated by maximum likelihood without much difficulty. Given a sample of tuples of independent observations (y_i, s_i, x_i, z_i), the likelihood function is simply

$$L(\theta; y, s, x, z) = \prod_{i=1}^{n} P(y_s, s|x, z) \tag{9}$$

Under the assumptions of the model, the ML estimator has all the desirable large sample properties.

[8]The trivariate normal assumptiuon for the errors in the latent model, if combined with a threshold mechanism, allows for very general distributions for the discrete outcomes, including skewed and multi-model distributions. The main restriction implied by the normal assumption is the linearity of the conditional expectation function (cef) of the outcome error given the selection error. Linear cef's are, of course, routinely used in econometrics.

2.3 Implementation Issues

First, we estimate for each sector a cardinalized ordered probit model by OLS, as suggested by van Praag and Ferrer-i-Carbonell (2004).[9] Based on this method, the threshold values κ_1-κ_{10} are obtained from the marginal distribution of y. Let p_k denote the proportion of observations in the sample with $y < k$. Then $\tilde{\kappa}_k = \Phi^{-1}(p_k)$. Moreover, the conditional expectation of $y^*|y = k$ can be estimated as $(\phi(\tilde{\kappa}_k) - \phi(\tilde{\kappa}_{k+1}))/(\Phi(\tilde{\kappa}_{k+1}) - \Phi(\tilde{\kappa}_k))$. The slope parameters are obtained by regressing these conditional expectations on x, separately for the two sectors. Finally, the starting values for the selection equation are obtained from a few Newton-Raphson steps of a Logit model. The resulting parameters are divided by 1.6 to approximate the probit coefficients.

The full simultaneous log-likelihood function is then maximized using the BFGS algorithm with numerical first and second derivatives as implemented in GAUSS. We experienced no convergence difficulties. Moreover, different starting values led to the same ML estimates.

3 Data

3.1 Reported Subjective Well-Being

In order to study the welfare gains from matching directly (as proposed in our model), individual well-being has to be measured. We take advantage of the insights in psychology and their transfer to economics on the valuable information in people's reports of their satisfaction with life or happiness. We take these reports as an indicator of individual well-being.[10]

Following the economic tradition on relying on the judgment of the persons directly involved, people are considered to be the best judges of the overall quality of their life. With the help of representative surveys, it is possible to get indications of individuals' evaluation of their life satisfaction. Behind the score indicated by respondents lies a cognitive assessment on the extent

[9] Van Praag and Ferrer-i-Carbonell (2004) refer to this model as Probit-OLS.

[10] A comprehensive review is provided in the edited volume titled *Well-Being: The Foundations of Hedonic Psychology* (Kahneman et al. 1999).

to which they judge the overall quality of their lives in a favorable way. This includes the match between their preferred characteristics of a job and the ones they actually experience. Measures of life satisfaction and happiness passed a series of validation exercises and seem to significantly correlate with true positive inner feelings (see Frey and Stutzer 2002a;b for introductions to the economics of happiness and references to the validation literature in psychology).

Various contributions demonstrate that the study of data on individual life satisfaction and happiness can provide new and complementary insights in economics. Recent findings are with regard to the macro-economic determinants of individual well-being (e.g. Di Tella, MacCulloch and Oswald 2003), the relationship between income and happiness (e.g. Boes and Winkelmann 2004, Frijters et al. 2004, Stutzer 2004, Luttmer 2005), the valuation of public goods (e.g. Frey, Luechinger and Stutzer 2004, van Praag and Baarsma 2005) or the evaluation of public policy (e.g. Gruber and Mullainathan 2005).

Data on reported subjective well-being are ordinal in nature. By this we mean that the particular numerical labels attached to the response scale, here $y \in \{0, 1, \ldots, 10\}$, provide an ordering only. Any monotonic transformation $z = g(y)$, $g'(y) > 0$, conveys the same information. A direct consequence is that, strictly speaking, expected values and regression models are not meaningful for such data. Since there are only 11 discrete outcomes, it is better to model the response probabilities directly, accounting for the ordering. The ordered probit and logit models provide such a framework. Our model with endogenous switching outlined in subsection 2.2 is a generalization of the standard ordered probit model. Although often not realized, the ordered probit model imposes an implicit cardinalization as well, in the way the regressors affect the probabilities (Boes and Winkelmann, 2004, van Praag and Ferrer-i-Carbonell, 2004). Usually, interpersonal comparability is assumed. This requirement is however softened in our framework allowing sector specific levels of reported subjective well-being.

3.2 Data Set and Sample Description

In our analysis, we use data from the first (2002) wave and the first edition of the second (2004) wave of the European Social Survey (ESS). The ESS is a repeated cross-section survey covering more than 20 European nations.

Our definition of government sector includes people working either in the public administration, defense, compulsory social security or in education. The dummy variable is constructed on the basis of information about the respondents' industry (according to the EU industry classification, NACE Rev. 1). Other employed or self-employed people are in the reference category; respondents that were neither employed nor self-employed the week preceding the interview or whose main income source is neither wage nor income from self-employment are excluded. In order to increase the homogeneity of the sample, the analysis is restricted to non-transformation countries leaving us with a total of 29,584 observations from people active on the labor market.[11] The sample averages of the explanatory variables are displayed in the last column of Table 1: the proportion of public sector workers is 16 percent, the average age is 41 years, 45 percent are women, 58 percent are married, and the average education level corresponds to 12.9 years of schooling.

The dependent variable is the overall satisfaction with life, elicited with the following question: 'All things considered, how satisfied are you with your life as a whole nowadays?' Individuals are asked to state their life satisfaction on a scale from 0 (extremely dissatisfied) to 10 (extremely satisfied). For our sample of European workers, average satisfaction with life is 7.42 score points with a standard deviation of 1.93 . There is a large fraction of people reporting high satisfaction scores: 10.8% report 10, 18.4% report 9 and 29.7% report 8. Only a small fraction of workers reports low satisfaction scores: 0.8 % report 0, 0.5% report 1, 1.1% report 2 and 2.4% report 3.

[11] The sample includes observations from the following countries: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

36.4% report scores between 4 and 7.

[Figure 2 about here]

Figure 2 shows that there are some sector specific differences: a higher proportion of government sector employees responds with values 8, 9 or 10.

4 Results

The empirical findings are presented in three subsections. First, the regression results and the test on endogenous selection are shown and explained. Second, the welfare gains from matching due to selection based on unobservables are calculated. Third, the importance of selection based on returns to observables is assessed.

4.1 Endogenous Selection

The estimation results are shown in Tables 1-3. A total of four different specifications was estimated. The first two specifications go a step back and *neglect* the possibility of self-selection into the government and private sector. We display results for the simple pooled ordered probit estimator with a sector dummy only. There are two such models, one without further control variables, and one with a set of six additional control variables (household size; female; a second order polynomial in age; married; years of schooling). Note that it is important in this context not to control for salaries, or indeed for any job-specific attributes. Otherwise, it is not possible to interpret satisfaction differentials as indicators of sector-specific rents, based on how individuals value the bundle of attributes in each sector.

The results of the simple model without controls show a positive and statistically significant effect of government sector on satisfaction with life. Employees in that sector unambiguously have a higher predicted probability of reporting very high levels of satisfaction than others. The second column shows that this estimated effect is biased due to omitted variables. Once we control for

further factors relevant for well-being, and thus compare workers in the public and private sector who are otherwise the same (with respect to those characteristics), there is no longer a statistically significant differential in life satisfaction.

The third and fourth specification now allow for endogenous selection. The explanatory variables are the same as in Table 1 in each of the following models. The difference is, of course, that the effect of these variables becomes sector-specific in the switching ordered probit models. The restriction of equal effects is tested and rejected in both cases. The model with endogenous switching is estimated in two different versions, presented in Tables 2 and 3 (in both tables, the estimated cut-off values are suppressed). The base model in Table 2 uses a single instrument, citizen status. In many countries, government jobs are, at least partly, available for citizens only. In Table 3, an additional instrument is used, an indicator whether the father worked in a modern professional occupation.[12]

All in all, the results display a remarkable stability, in particular the two key parameters of the model, the correlation between the selection equation and the two outcome equations. In each case, the correlation between selection into the government sector and satisfaction in the government sector is close to zero and statistically insignificant, whereas the correlation between selection into the government sector and satisfaction in the private sector is large, negative, and statistically significant. Thus, there is statistical evidence for endogenous selection, and joint estimation is an improvement over separate estimation based on an independence assumption. We will turn to a detailed interpretation of these correlations in the next subsections. Before that, some further aspects of the model are noteworthy.

Clearly, there is evidence for parameter heterogeneity across the two outcome equations. For

[12]Personal contacts are an important source of information about the availability of jobs, but also about job conditions and affect job selection accordingly. In the USA, one third of newly hired employees in the public administration learnt about their job from friends and family members (Lewis and Clark 2002). Father's occupation is thus a potential instrument. Unfortunately, the dataset contains no information whether the father was employed in the government or in the private sector. However, a large fraction of people in a modern professional occupation works in the government sector. So, we take the latter information for the father as an instrument.

example, in the model with a single instrument, household size has a significant positive effect on life satisfaction in the private sector, but not so in the public sector. More intruguingly, one can compare the effect of explanatory variables in the selection and outcome equations. Education, for example, has no effect on well-being, but it is highly significant in the selection equation. Apparently, this factor does affect selection not on the side of labor supply (what employees want) but rather from the labor demand side (what employers want). The same can be said about the variable female.

Just the opposite case arises for the variable "marital status". Here, there are significant effects in both outcome equations but it is insignificant in the selection equation. One has to be cautious when comparing coefficients across outcome equations, since their relationship to the outcome distribution is moderated through thresholds that vary in the two equations. However, when we compute the predicted effect of marriage on the probability of being very satisfied (a score of 8 or higher on the 0-10 scale), for an otherwise average person, one finds indeed a stronger effect in the government sector (+10 percentage points compared to +6.7 percentage points). One would therefore expect that married people select themselves into the government sector because the benefits from that characteristic is largest there. While the positive estimate of being married in the selection equation points in the right direction, the hypothesis of no selection based on marital status cannot be rejected.[13]

4.2 Selection based on unobservables

Figure 3 shows the influence of self-selection on the probability of reporting a high level of life satisfaction (a score of 8 or higher on the 0-10 scale). Formally,

$$P(y_s \geq 8|\varepsilon) \quad = \quad P(y_s^* \geq \kappa_{s,8}|\varepsilon)$$

[13] A possible explanation for the absence of an effect in the selection equation is that the differences in returns to marriage reflect sector-independent preference heterogeneity. In this interpretation, government sector workers would retain their above average well-being premium from being married even if they were to move to the private sector. Hence, marital status has no effect on sector choice.

$$
\begin{aligned}
&= 1 - P(x'\beta_s + u_s < \kappa_{s,8}|\varepsilon) \\
&= 1 - \Phi\left(\frac{\kappa_{s,8} - x'\beta_s - \rho_s\varepsilon}{\sqrt{1-\rho_s^2}}\right)
\end{aligned}
$$

Figure 2 plots this probability for $s = 0, 1$, for an average person ($x = \bar{x}$), and for $\varepsilon \in (-2, 2)$, based on parameter estimates from Table 2. Since the marginal distribution of ε is standard normal, this range covers approximately 95 percent of all possible cases. A large ε means that the person is likely to work in the government sector. The selection rule formally requires that $\varepsilon_i > z_i'\gamma$, so that the cut-off for selection into the government sector is individual specific. However, we know that 16 percent of all persons in the sample work in the government sector. Therefore, an otherwise average person is allocated to the government sector as long as $\varepsilon > \Phi^{-1}(0.84) \approx 1$.

From Figure 3, we see that predicted government workers (those with a high ε in the selection equation) tend to be less satisfied than predicted private sector workers, regardless of the sector they work in. However, they would be much worse off if allocated to the private sector. Thus they gain the most from working in the government sector, which is a manifestation of self-selection based on comparative advantage.

[Figure 3 about here]

The two satisfaction curves in Figure 3 intersect when u is approximately minus one. Thus it would be optimal if all workers on the left of the intersection, where workers maximize their satisfaction by working in the private sector, would actually work in the private sector. Similarly, all workers with $\varepsilon \geq -1$ should work in the government sector. This does not happen however since, as we saw above, much fewer people work in the government sector. The actual threshold is around $\varepsilon \geq +1$. Within the formal structure of our model, the fact that more workers find it optimal to work in the government sector than actually do can be explained by a restricted labor demand in that sector. The fact that there are queues for government jobs is well known and has been analysed before (e.g., Krueger, 1988). The novel insight here is that into the nature of the rationing mechanism, namely that government workers are those who gain most from working in

that sector.

Finally, we also observe that private sector workers have on average only a slightly lower probability of reporting a high satisfaction than government workers. This can be seen from Figure 3, by averaging over the government satisfaction locus for $\varepsilon \geq 1$, and over the private sector satisfaction locus for $\varepsilon < 1$. Formally, the probability of high satisfaction for an average person in the government sector is

$$P(y_s \geq 8|\varepsilon \geq c) = 1 - \frac{\Phi_2(\kappa_{1,8} - x'\beta_1, -c, -\rho_1)}{\Phi(-c)} \tag{10}$$

whereas it is

$$P(y_s \geq 8|\varepsilon < c) = 1 - \frac{\Phi_2(\kappa_{0,8} - x'\beta_0, c, \rho_0)}{1 - \Phi(-c)} \tag{11}$$

in the private sector, for $c = 1$. If we evaluate these expressions at the sample means of the explanatory variables and the parameter estimates, we obtain $P(y_s \geq \widehat{8}|s = 1) = 0.612$ and $P(y_s \geq \widehat{8}|s = 0) = 0.577$. Thus, government workers have on average a slightly higher probability of being highly satisfied. We have seen a similar result already in the pooled ordered probit estimates with government sector dummy variable (Table 1). Hidden behind this average effect is a large amount of individual heterogeneity and a self-selection process based on comparative advantage. The "treatment effect on the treated" is indeed much larger, as the above analysis has demonstrated.

4.3 Gains from Matching

The gains from matching are illustrated in Figure 4, where we display the predicted aggregate happiness distribution under two scenarios. The first one, in dark grey bars, shows the actual distribution in the sample. Hence, it reflects the choices of people and incorporates the gains from sorting and matching. The second scenario is a counterfactual one. We ask the question, what would happen if people were randomly assigned to the two sectors, without taking the preference heterogeneity into account, while keeping the sector sizes unchanged, i.e., 16 percent of the worker population are assigned to the government sector, and 84 percent are assigned to the private sector.

For a worker with average characteristics, we obtain the predicted happiness distribution as

$$P(\widehat{y=j}|\bar{x}) = 0.16 * P(\widehat{y_1=j}|\bar{x}) + 0.84 * P(\widehat{y_0=j}|\bar{x})$$

We see that the sorting based on comparative advantage shifts the happiness distribution to the right relative to the random matching case. For example, the probability of being very satisfied ($P(\widehat{y \geq 8})$) is increased by 5 percentage points due to endogenous matching.

[Figure 4 about here]

The graphical and numerical results thus indicate significant welfare gains from sorting and matching in the labor market that were not and could not be measured with traditional approaches. Accordingly, there are no previous results, we are aware of, about the gains from matching that could serve as a benchmark to assess the size of the calculated effect. There are, however, many studies estimating the loss in subjective well-being due to individual unemployment (see Frey and Stutzer 2002, chapter 5 for a review), probably the most extreme case of a mismatch. For the same set of countries in the ESS, we find that the fraction of employed or self-employed people reporting a satisfaction score of 8 or more is 57.4 percent while it is only 33.5 percent for unemployed people. Thus the gains from sectoral matching shift about a fifth as many people into the category of very satisfied people as employment as such.[14]

Moreover, the overall result hides large gains from matching for people working in the government sector and small average losses for people working in the private sector. The latter effect is due to the politically determined size of the government sector restricting access to government employment. It means that with random allocation, on average, 16 percent of the private sector workers were to be employed in the government sector that would have made them better off, on average. However, not all people employed in the private sector would have benefited from random allocation. As seen in Figure 3, those most likely to work in the private sector are indeed better

[14] We are aware that the raw difference in the fraction of very satisfied people between employed and unemployed people does not account for selection and differences in baseline satisfaction, but rather serves as a first approximation.

off in the private than in the government sector and thus benefit from sorting as well.

4.4 Selection based on returns to observables

We have touched earlier upon selection on observables, when we discussed the sector specific differences in the coefficients. For example, we observed that the well-being premium for being married is larger in the government sector than in the private sector. Thus, one might expect, based on an argument of relative gain, that married people have a higher probability of being in the government sector, ceteris paribus. Yet, the marital status variable was insignificant (albeit positive) in the selection equation.

While the evidence is thus inconclusive for this particular variable, we can instead assess the overall evidence for positive or negative selection based on observable characteristics across the board, taking all of them into account simultaneously. Let $\bar{x}_1$ denote the sample mean of these characteristics among government employees, and $\bar{x}_0$ the sample mean among private sector employees. The predicted satisfaction distribution of an average government worker in the government sector, unconditional on selection but conditional on $\bar{x}_1$, is then

$$\widehat{P(y_1 = j|\bar{x}_1)} = \Phi(\hat{\kappa}_{1,j+1} - \bar{x}_1'\hat{\beta}_1) - \Phi(\hat{\kappa}_{1,j+1} - \bar{x}_1'\hat{\beta}_1)$$

whereas the predicted satisfaction distribution of an average private sector worker in the government sector is

$$\widehat{P(y_1 = j|\bar{x}_0)} = \Phi(\hat{\kappa}_{1,j+1} - \bar{x}_0'\hat{\beta}_1) - \Phi(\hat{\kappa}_{1,j+1} - \bar{x}_0'\hat{\beta}_1)$$

Based on our parameter estimates and sample means it turns out that the difference between these distributions is small, althoug there is some evidence for positive selection based on observables. For example, the predicted probability of being very satisfied in the government sector ($P(y_1 \geq 8)$) is by 0.4 percentage points higher among goverment workers than among private sector workers. Similarly, the predicted probability of being very satisfied in the private sector ($P(y_0 \geq 8)$) is by 0.2 percentage points higher among private sector workers than among goverment workers.[15]

[15]These estimates are based on the assumption that differences in returns are sector related. If they reflect

5 Concluding Remarks

Individuals choose their jobs to attain an optimal match between job characteristics and their preferences. As far as an individual is not the marginal worker in a job, he or she benefits from a rent, i.e. a utility premium from matching. In general terms of traditional welfare economics, workers' sorting maximizes consumer and producer rents. Empirically, it is very difficult to get a grip on this fundamental source of well-being in society. Traditional approaches are based on the theory of equalizing differences and are restricted to analyze observed behavior at the margin. Thereby, the degree of preference heterogeneity and resulting welfare gains from matching remain very difficult to take into consideration.

Here, we propose a completely different approach. People's reports of their subjective well-being are taken as a proxy measure for their utility. It thus becomes possible to address the welfare gains from matching with minimal structural assumptions and no information about specific job characteristics in the two sectors. We introduce a two-equation ordered probit model with endogenous switching. This is the most basic model to capture the idea that there are individual specific gains in well-being from working in a particular sector and that people self-select into sectors according to these relative advantages.

The model is applied to study sorting between government and private sector jobs for a sample of 29,584 workers from 18 European countries. We find that there is sectoral sorting based on relative advantage. The resulting gains in subjective well-being relative to a random allocation of workers to the two sectors are considerable: The fraction of very satisfied workers increases from 53.8 to 58.8 percent.

There are at least one implication of substance and one of methodology in research on individual well-being from this study. First, the study highlights matching on the labor market as a potentially

preference heterogeneity instead, the gains from matching on observables will be smaller, or may even disappear altogether. However, in either case, most of the gains from matching remain as they result from selection based on unobservables.

very important determinant of well-being in society. We expect that these gains in well-being depend on labor market institutions. In fact, an important motivation for state unemployment benefits is the concern that gains from matching are lost if people cannot afford to search for appropriate employment.

Second, the empirical findings make clear that the well-being gains from acting in a particular environment like working in the government rather than in the private sector are individual specific. In situations, where people have choice, this leads to self-selection. Accordingly, the well-being consequences of different environmental conditions can neither be assessed from simply comparing individuals' well-being across environments nor from studying the changes in well-being for those who voluntarily change environments. The latter advice to caution applies also to panel studies taking into account individual specific fixed effects. In such a framework, for example, the effect of having a public sector job on individuals' well-being is evaluated based on people who change sectors (see e.g. Heywood et al. 2002). On the one hand, this might lead to a systematic over-estimation of the benefits from public employment because only those people who benefit the most will be observed as movers. On the other hand, if only a small fraction is moving, the well-being gains might be under-estimated because the gains of public employment of those already in the public sector are not taken into account. [16] Our approach with endogenous switching handles these difficulties.

The implications of our model do not only apply to the specific case of sectoral selection on the labor market but to all the situations where people can choose their environment. This asks for a careful interpretation of previous findings in economic research on people's happiness. For example,

[16]Moreover, panel analyses of this sort rely on the identifying assumption that the only unobserved individual specific change is the change in the environment. However, whenever this change in the environment is chosen, this assumption may not hold. The change itself indicates that the decision calculus of the individual has altered. According to economic theory, the change in the environment is driven by either a change in constraints and /or preferences. It is, then, likely that these changes in the constraints and/or preferences have direct effects on life satisfaction beyond inducing individuals to change the environment.

the findings in cohort and panel studies on the correlation between marital status and subjective well-being (e.g. Easterlin 2005, Stutzer and Frey 2006) or education, the number of children, etc. and subjective well-being might seriously change. In contrast, self-selection might play a minor role in assessing the psychic costs of unemployment (e.g. Clark and Oswald 1994, Winkelmann and Winkelmann 1998) or the welfare consequences of democratic institutions (e.g. Frey and Stutzer 2000). We see our contribution as a first step to a better understanding of the gains in happiness where people self-select into situations that match their preferences best.

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Table 1. Life Satisfaction and Sector of Employment:
Ordered Probit Estimates

Dependent variable: Life satisfaction			
	Model 1	Model 2	Mean
Public sector	0.080**	0.022	0.16
	(0.016)	(0.016)	
Household size		0.093**	1.66
		(0.016)	
Female		0.072**	0.45
		(0.012)	
Age$*10^{-1}$		-0.343**	4.09
		(0.036)	
Age squared$*10^{-3}$		0.401**	1.80
		(0.042)	
Married		0.177**	0.58
		(0.014)	
Years of schooling$*10^{-1}$		0.242**	1.29
		(0.016)	
κ_1	-2.417	-2.526	
κ_2	-2.227	-2.335	
κ_3	-1.971	-2.076	
κ_4	-1.656	-1.757	
κ_5	-1.406	-1.504	
κ_6	-0.982	-1.076	
κ_7	-0.703	-0.792	
κ_8	-0.210	-0.293	
κ_9	0.562	0.486	
κ_{10}	1.251	1.179	
Log-Likelihood	-57028.5	-56768.0	
Number of observations	29584	29584	

Notes: Standard errors in parentheses; ** indicates significance at the 1 percent level.
Source: European Social Survey 2002 and 2004, pooled data.

Table 2. Ordered Probit Model with Endogenous Switching:
Single Instrument

	Life satisfaction equations		Selection equation
	Public sector	Private sector	
Household size	0.045	0.075**	0.040
	(0.043)	(0.018)	(0.025)
Female	0.070	-0.020	0.308**
	(0.065)	(0.013)	(0.017)
Age$*10^{-1}$	-0.515**	-0.355**	0.295**
	(0.110)	(0.037)	(0.058)
Age squared$*10^{-3}$	0.548**	0.386**	-0.219**
	(0.123)	(0.045)	(0.069)
Married	0.262**	0.146**	0.031
	(0.039)	(0.015)	(0.022)
Years of schooling$*10^{-1}$	0.032	0.005	0.913**
	(0.174)	(0.023)	(0.024)
Citizen			0.499**
			(0.048)
ρ	-0.170	-0.684**	
	(0.229)	(0.031)	
Log-Likelihood	-68986.7		
Number of observations	29584		

Notes: Standard errors in parentheses; ** indicates significance at the 1 percent level.
Source: European Social Survey 2002 and 2004, pooled data.

Table 3. Ordered Probit Model with Endogenous Switching:
Two Instruments

	Life satisfaction equations		Selection equation
	Public sector	Private sector	
Household size	0.046	0.075**	0.041
	(0.043)	(0.018)	(0.025)
Female	0.082	-0.020	0.309**
	(0.058)	(0.013)	(0.017)
Age$*10^{-1}$	-0.507**	-0.356**	0.301**
	(0.109)	(0.037)	(0.059)
Age squared$*10^{-3}$	0.543**	0.386**	-0.224**
	(0.123)	(0.045)	(0.069)
Married	0.265**	0.146**	0.031
	(0.038)	(0.015)	(0.022)
Years of schooling$*10^{-1}$	0.064	0.006	0.899**
	(0.153)	(0.023)	(0.024)
Citizen			0.503**
			(0.048)
Father in modern professional occupation			0.191**
			(0.034)
ρ	-0.126	-0.684**	
	(0.201)	(0.031)	
Log-Likelihood	-68971.8		
Number of observations	29584		

Notes: Standard errors in parentheses; ** indicates significance at the 1 percent level.
Source: European Social Survey 2002 and 2004, pooled data.

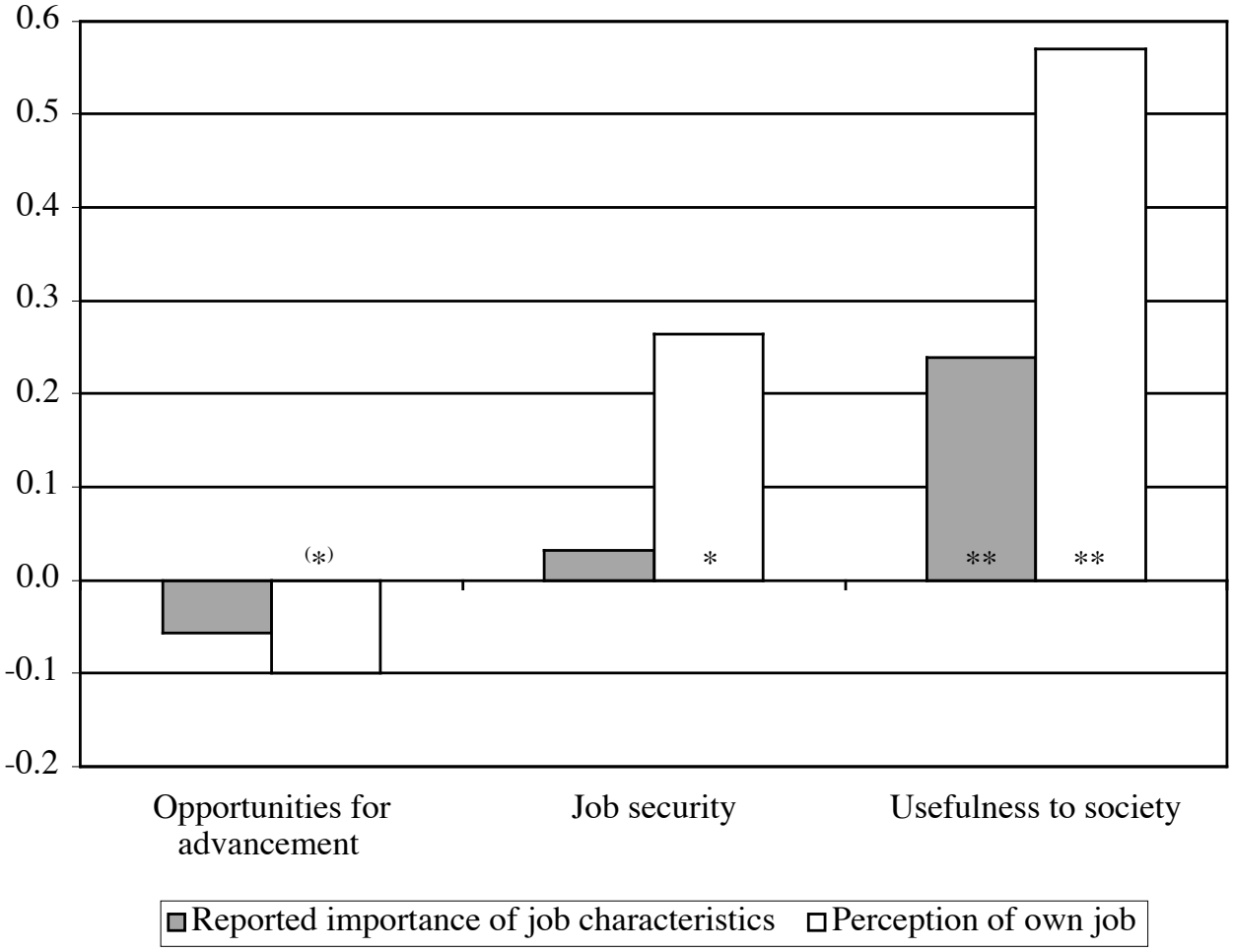

Figure 1: *Differences in preferences and perceptions of job characteristics between government and private sector workers in 23 countries 1997* .

Notes: The bars reflect the mean differences of the answers, elicited on a six point scale, between public and private sector employees; ∗∗ is significant at the 1 percent level, ∗ at the 5 percent level, and (∗) at the 10 percent level. The differences are calculated based on the pooled sample for all 25 countries in the ISSP, except the USA and the Netherlands where the required sector information is not available. Standard errors are adjusted for possible clustering at the country level. People working in publicly owned firms, cooperatives and non-profit organization are excluded. The numbers of observations vary between 12,365 and 14,480.
Source: Own calculations based on ISSP 1997.

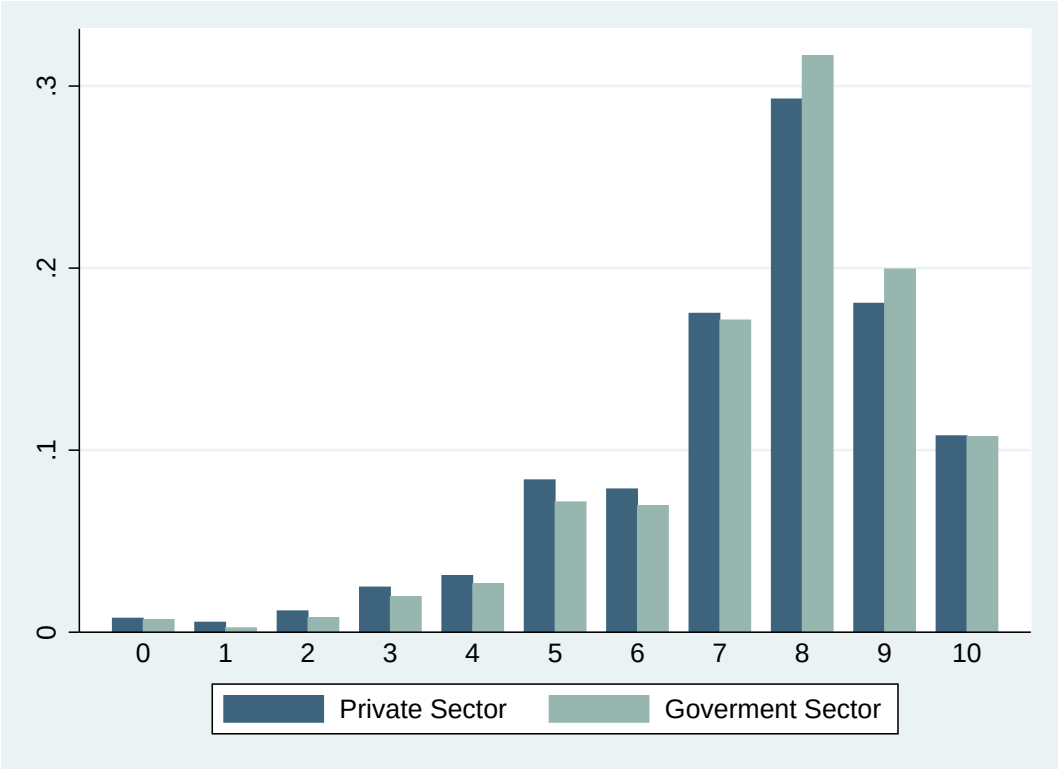

Figure 2: *Happiness distribution for government and private sector employees. Source: European Social Survey 2002 and 2004, pooled data.*

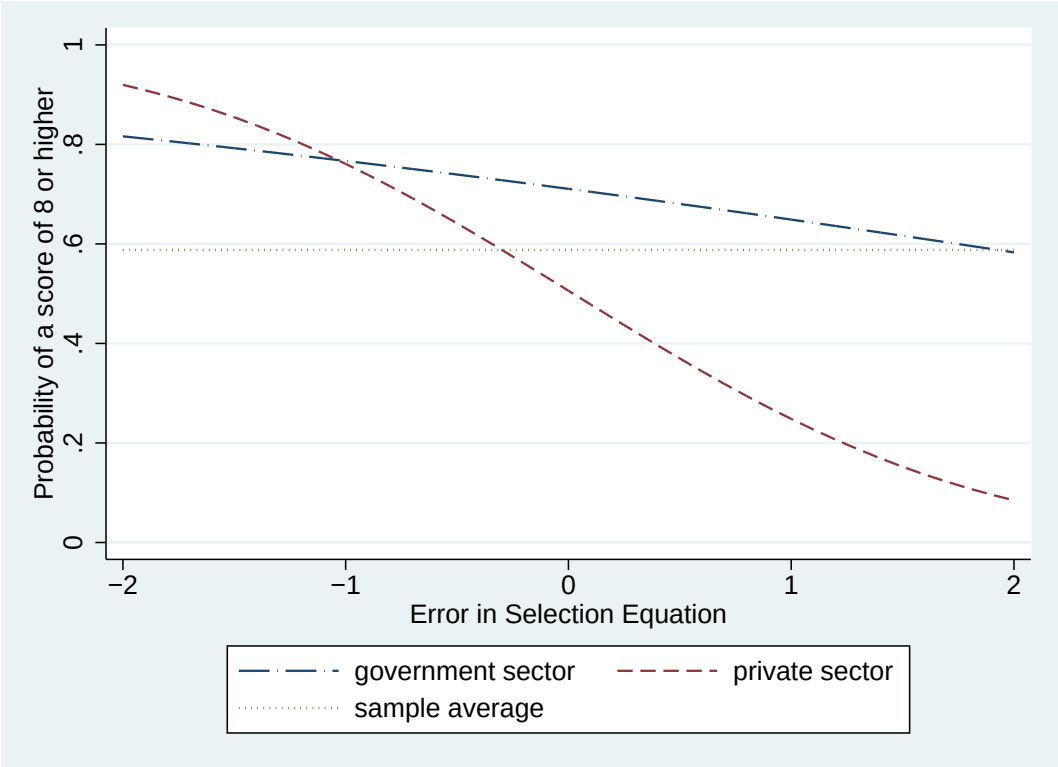

Figure 3: *Predicted probability of being very happy (a score of 8 or above) for government and private sector employees by ε (the error in the selection equation).*

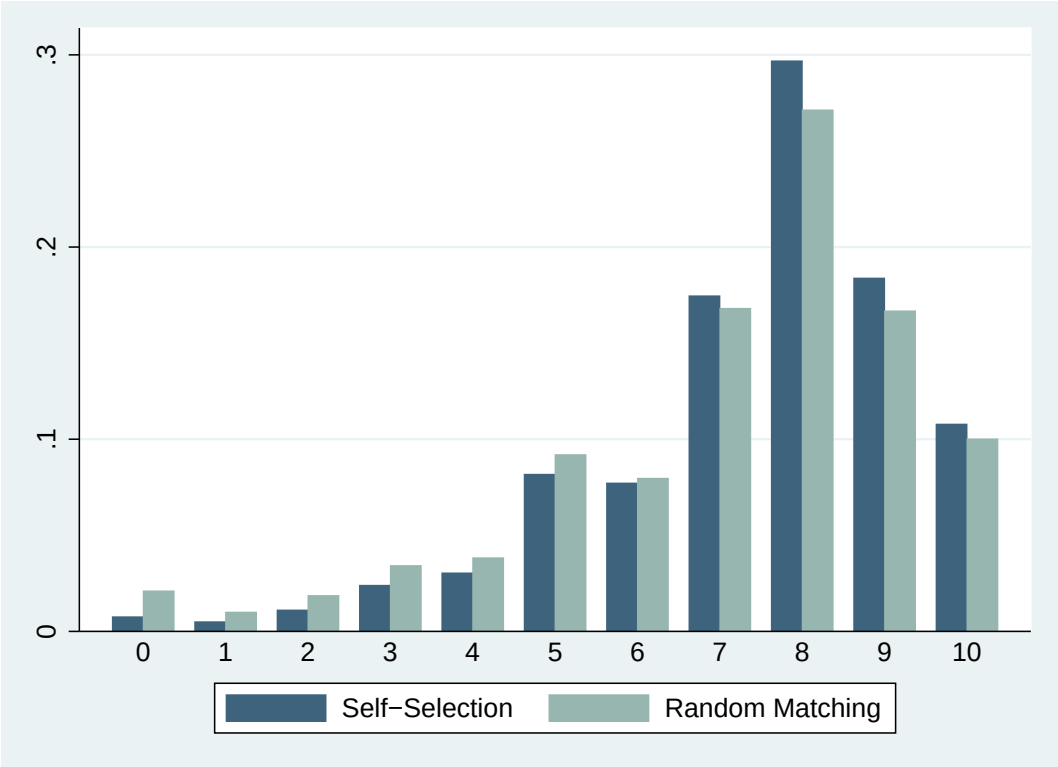

Figure 4: *Predicted aggregate happiness distribution (0-10 scale) under self-selection (dark grey) and random matching (light grey).*