Essays on Empirical Welfare Economics

Marko Ledić

A thesis submitted for the degree of
Doctor of Philosophy in Economics

Lombardy Advanced School of Economic Research
University of Milan
2016

I hereby certify that this thesis and the work presented in it is entirely my own original research except where otherwise indicated. Any use of the works of any other authors, in any form is properly acknowledged at their point of use.

To Mateja

Contents

List of Figures

List of Tables

Doctoral Committee

Supervisor:

Prof. Dr. Carlo Fiorio, University of Milan

Committee:

Prof. Dr. Tommaso Frattini, University of Milan

Prof. Dr. Luca Nunziata, University of Padua

Prof. Dr. Gilberto Turati, University of Turin

Acknowledgements

This dissertation benefited from the encouragement that I have received from numerous people. Since I owe a great deal to them, I would like to acknowledge my sincere gratitude for the support I have received. I must begin with acknowledging the benefits I have received from my supervisor, Carlo Fiorio. The directions and advices you gave me were of extreme importance for continuous improvement of my work. I have been privileged to receive an invitation from Erik Schokkaert to spend a year at the Centre for Economic Studies at University of Leuven. I would like to acknowledge my extensive duty to Erik who provided me with his invaluable comments and suggestions which have greatly improved my dissertation. During my research visit in Leuven, I have also benefited a great deal from discussions with Koen Decancq, André Decoster and Marc Fleurbaey. I would also like to acknowledge the benefits I have received from Massiliano Bratti, Tommaso Frattini and Marco Leonardi, who made invaluable comments and suggestions on my work. I have benefited considerably from conversation with my colleagues and friends at University of Milan and University of Leuven. Particularly, I have learned a great deal from talking with Ivica, Daniele, Sergii, Ruhollah and Andualem. I am very grateful for the support I have received from my family who was there for me in any occasion. Finally, I would like to express my tremendous gratitude to Mateja for her love, appreciation and for walking this journey with me.

Summary of Chapters

Chapter 1

Over the last decade we have witnessed an improvement in the literature on how to measure and compare the well-being of individuals. While the standard approach in the analysis of individual well-being is based almost exclusively on a material dimension of income, there is a robust evidence that individuals care about non-income dimensions of life which accordingly should be included in such a measure. Nevertheless, even when the non-income dimensions of life are included in the analysis of individual well-being, a majority of studies are predominantly neglecting the notion of individual preferences in order to escape the problem of interpersonal comparisons of well-being.

In this chapter we have employed an alternative welfare measure which takes into account income and non-income dimensions of life while at the same time the following measure is sensitive to the individual preferences. This is known as the equivalent income measure. We have compared the equivalent income and income measures over 25 countries of the European Union. The following analysis is done for 2007 and 2011, since these were the only available years that we could use. Our contribution to the literature is reflected in the fact, that to the best of our knowledge, there are no such studies in the literature that compares the well-being with the following two measures for such a large set of countries.

Although we found that the welfare rankings across countries change to some extent between the average income and average equivalent income, in spite of that when we ranked countries according to the growth rates of income and equivalent income we observed a substantial change in the country rankings. The following evidence implies that the choice of the welfare metrics is empirically important. The previous results have been broadened by computing the welfare rankings across countries once we raise the concern about the egalitarian

principle of justice. We observed that the welfare rankings across countries changed remarkably when we take into account distributional inequalities. The evidence we have found suggest that correlations of disadvantages between life dimensions matter since some countries have sufficiently larger inequalities of equivalent income than inequalities of incomes.

The results we have found show that individuals across countries care about material dimension (income) but they also care much about the non-income dimensions. Relatively the most important non-income dimension for almost all countries is health while the least important non-income dimension concerns the (un)employment status. We have identified the worst off individuals according to each welfare measure and we have compared the socio-demographic characteristics of the worst off individuals. We have seen that different well-being measures will identify the worst off individuals with different socio-demographic characteristics. We have also observed that the worst off individuals considerably differ over countries with respect to their average income and non-income dimensions and average socio-demographic characteristics.

Finally, we have illustrated the degree of re-ranking between income and equivalent income measures taking into account all individuals of a given country. While we found a similar pattern of re-ranking between income and equivalent income across countries, the degree of re-ranking differs across countries. The pattern that we have observed across all countries indicated that individuals who are income rich can end up as equivalent income poor while the opposite has not been found.

Chapter 2

An important role of social and public policies, among others, is to provide employment opportunities and to maintain the initiative of people to work. Yet, the role of these policies should not exclusively be concerned with the improvement of job quantity, such as ensuring the optimal employment rate but likewise these policies should be designed to improve the well-being of workers by enhancing job quality. Although, the precise definition of job quality is lacking in the literature, one can reasonably argue that job quality is a multi-dimensional concept which includes the wage dimension but also non-wage job dimensions such as job autonomy, job security, whether a job is interesting, challenging, whether it offers a good career opportunities, etc.

Accepting the idea that a job quality is a multi-dimensional concept leads to the important question of aggregating various job dimensions into an overall index of job quality which can be used as a measure of well-being on the job. Moreover, if we agree on the notion that the preferences of workers over job dimensions should be respected, then we have to find a proper way to weight these various job characteristics such that the construction of weights is consistent with the preference orderings over different jobs. A measure that satisfies the previous two requirements is known in the literature as the equivalent wage measure.

In this study we have applied the concept of equivalent wage to a specific sub-population of recent graduates (bachelor, master and doctoral students) who are currently participating in the labour market. In addition to the equivalent wage measure, we have used four other well-being measures which are wage, average preferences objective measure, equal weights objective measure and subjective job satisfaction measure. We have compared the job quality using a large scale survey which includes nineteen countries.

We have found that individuals with various personal characteristics have different preferences over wage and non-wage job dimensions. This result underlines the importance of considering the heterogeneity of individual preferences seriously. We have shown that different measures of job quality will result in substantially different ranking of countries. In other words, the evidence we have found points out to the fact that the choice of well-being measure is utterly important for measuring job quality. Since, we have observed a considerable re-ranking of countries between different measures, we were encouraged to provide the evidence on the strength and direction of relationship between the ranking for all pairs of measures. We have found that the rank correlation is positive and statistically significant for almost all pairwise correlations. The lowest correlation has been found between pairs of wage and equal weights objective measure while the highest correlation has been found between subjective job satisfaction and average preferences objective measure.

As one important issue in creating a reasonable public policies is to identify those individuals who are not faring well or those who are faring very well, we have decided to identify the individuals at the bottom and top end of the distribution according to different measures of job quality. The results have shown that the overlap of the worst off when we use two measures is lowest for wage and equivalent wage measures while the largest overlap occurs when we use two objective measures. These results should not be surprising since the informational requirements

between two objective measures are more alike than the informational requirements between wage and equivalent wage. On the other hand, the largest overlap of the best off individuals for a pair of measures occurs between average preferences and equal weights measures while the overlap is lowest between wage and subjective job satisfaction.

We have evaluated the gender differential in job quality across countries by using wage and equivalent wage measures. The evidence we have found indicate that in majority of countries, the average quality of jobs is higher for men than for women if we use the wage measure. While even if we use the equivalent wage measure, the quality of jobs are higher among men in most countries, still we have observed that women are either holding jobs of the same quality or they are even faring better than men in some countries. In addition, we have computed the willingness-to-pay for each non-wage job characteristic and we have compared the gender differences in the willingness-to-pay across and within countries. We have found that across almost all countries, the willingness-to-pay is higher among men, which indicates that they are suffering more not reaching the best possible values of non-wage job characteristics. Finally, we have presented the decomposition the total willingness-to-pay on the contributions attributed to each non-wage job characteristic. We have found that across countries for both men and women, having a good career prospect is relatively the most important non-wage job characteristic while job security is relatively the least important non-wage job characteristic.

Chapter 3

In recent decades there has been a growing number of studies that investigated the effects of personal and job characteristics on the subjective well-being on the job. Besides, the empirical findings reveal that workers who are paid on the piece rates exert more effort and earn more than those workers paid an hourly salary. Nevertheless, it is ambiguous what will be the effect of performance paying schemes, since the well-being on the job can increase in wage but it can decrease with higher level of excreted effort. Since the possible effect of performance paying jobs on the well-being of workers stay hidden, we have tackled the following issue in this chapter and we have provided the empirical evidence on these effects.

This chapter contributes to the literature on the subjective well-being by providing the casual effects that the performance pay job schemes have on job satisfaction. We approximate

the well-being on the job by the subjective job satisfaction reported by individuals. We have used the Korean Labour and Income Panel Survey which allowed us to distinguish between the workers who are paid by performance and those who are paid by fixed rate. In addition, we could exploit the information about the particular type of performance paying scheme that applies to the workers who are paid by performance. Since the personality traits are possibly correlated with the observed and unobserved explanatory variables, we have decided to estimate the job satisfaction regression using the fixed effects estimator.

We have shown that workers in the performance pay job schemes have a higher subjective well-being on the job than workers who are using the non-performance pay job schemes. The following result holds true even after we have controlled for the level of earnings, attitudes toward risk and other personal and job related characteristics. This evidence is also confirmed for both men and women. When it comes down to the effect of wage on job satisfaction, we observe that the effect is not apparent as someone might expect. We have found that among all explanatory variables, health has the strongest effect on the well-being on the job.

Finally, we have exploited the information on the type of performance pay schemes in order to analyse how different performance pay schemes affect job satisfaction. The results have shown that workers who are employed on the individual, group and company performance pay job schemes are more satisfied on their job than workers who are paid by the fixed amount. The later result remains even after we have controlled for the difference in earnings, personal and job characteristics.

Chapter 1

Social Well-Being, Life Aspects and Individual Preferences

1.1 Introduction

The attractiveness of the concept of happiness in economics has gone historically through different phases. In the early 20th century, the predominant position of economists who were to a large extent under the influence of Arthur Pigou, was that happiness plays no important role in economics since the individual and social welfare can only be measured through the scope of money. However, the economists renewed their interest for the concept of happiness and life satisfaction in the 1970s. This has restored the important debate about whether it is possible to make interpersonal comparisons of utilities. While, economists have been reluctant to indulge in making interpersonal comparisons of utilities, they have mostly used income as a measure which approximates the individual well-being. Nevertheless, an alternative approaches for measuring well-being have been developed as well and the main purpose of these approaches is to provide a more reasonable comparisons of the individual well-being.

In recent decades, the literature on welfare economics has been preoccupied with the studies which have used the data on happiness or life satisfaction (see Oswald (1997), Frey and Stutzer (2002a), Frey and Stutzer (2002b), van Praag and Ferrer-i-Carbonell (2007) and Layard (2005)). In this developing field of literature, we can find two fundamental but opposing approaches which split on the question whether or not the data on happiness or life satisfaction

can be used for making interpersonal comparisons of utility[1]. While the first group of scholars who belong to the *welfarist* doctrine proclaim that the interpersonal comparisons of utility are plausible and therefore, we can indulge in the process of measuring social welfare, on the other hand the second group of scholars which belongs to the *non-welfarist* doctrine takes a position that interpersonal comparisons of utility are not achievable.

Nevertheless, it is necessary to emphasise that both of these two approaches are subject to criticism. Sen (1985) draws attention to various uncompromising weaknesses that are contained in the *welfarist* approach. The first weak point concerns the notion of *physical condition neglect* which means that the subjective utility does not appropriately takes into account the physical condition of individuals but it only cares about the mental states of individuals according to which the well-being of individuals is being compared. A second weakness pointed out by Sen has to do with the notion of *valuational neglect* which implies that the *welfarist* approach which is only concerned with the psychological states of individuals undermines the reflective valuations that individuals can have on their lives.

On the other hand, the *non-welfarist* approach suffers from the problem of paternalism, or in other words this approach does not respect the various viewpoints that individuals have for the important life dimensions (functionings). Although, the later problem is indeed the fundamental one, fortunately it can be resolved since the recent findings in the literature on welfare economics show that we can use the data on life satisfaction for measuring individual well-being while at the same time we can respect the individual preferences over important life dimensions. That is to say, there is a reconciliation between the *welfarist* and *non-welfarist* approaches and the resulting concept that emerges is known as the equivalent income (see Fleurbaey and Blanchet (2013) and Decancq et al. (2015)).

In this chapter, we use the individual data on life satisfaction which allows us to recover the information on individual preferences for income and non-income dimensions of life. We have found that besides income, individuals do care about non-income dimensions as well. These non-income dimensions include health, quality of accommodation, quality of neighbourhood and

[1]Through history the concept of utility has taken various considerations. The well known classical utilitarian, Jeremy Bentham perceived utility as a predominant stream of pleasure and pain that individuals experience over time. Kahneman et al. (1997) distinguish between the two concepts of utility which they denote as the *experienced utility* and *decison utility*. The *experienced utility* refers to Bentham's concept of utility as a hedonic experience of an outcome and this was a predominant concept among economists in the 19th century. At the beginning of 20th century the concept of *experienced utility* was abandoned and a new concept of *decision utility* which denotes the impact of an outcome in decision process became the predominant concept (like today).

employment status. Once we have estimated preferences, we were able to compute the equivalent income measure. If we agree on the notion that welfare is a multi-dimensional concept then the following measure allows us to make well-being comparison which goes beyond a standard income approach where income is used as the only criterion for measuring individual well-being. We contribute to the welfare economics literature by providing the empirical evidence on the well-being for 25 European Union countries in 2007 and 2011. Our empirical analysis is based on the European Quality of Life Survey (EQLS). We compare the well-being across countries with the equivalent income and income measures.

The results we have found indicate that the choice of well-being being measure is important since different measures can lead to different well-being ranking of countries. We show that the correlation of disadvantages between life dimensions matter since we have found that across all countries the inequality of equivalent income is significantly larger than the inequality of income. Since we want to raise a concern for the inequality in the distribution of well-being, we have computed a social welfare functions for income and equivalent income, where a larger weight has been given to those individuals who are on a lower position in the distribution. Although we have found a moderate re-ranking of countries between the levels of social welfare of income and equivalent income measures, yet we have found a substantial re-ranking between the growth rates of social welfare of income and eqiuvalent income.

We address an important point which concerns the identification of the worst off individuals according to each of these two well-being measures. All individuals which have been found below the threshold of the 20th percentile for a given well-being measure, were classified among the worst off. We also compare the socio-demographic characteristics of the worst off individuals for income and equivalent income measures. We have found that different well-being measure identifies different worst off individuals with respect to the income and non-income dimensions and socio-demographic characteristics. We also complement the later findings by illustrating the percentage of individuals who are belonging to the worst off according to both income and equivalent income measures.

We illustrate the total willingness-to-pay that individuals would pay for reaching the best possible value for all non-income dimensions. We show that the average share of willingness-to-pay in income differs across various socio-demographic groups and across countries. After we have obtained the total willingness-to-pay, we have applied the Shapley value decomposition in

order to decompose total willingness-to-pay to relative contributions of each non-income dimension. We have found that health is relatively the most important non-income dimension across all countries and the relative importance of health dimension is more conspicuous for older than for younger population. It is quite surprising that the unemployment status is relatively the least important dimension across all countries. Nevertheless, the relative contributions to unemployment status have gained importance for some countries that have been suffered quite substantially during the recent economic crisis in 2007 and 2008.

Finally, we illustrate the size of re-ranking between income and equivalent income measures that happens for all individuals within a country. The size of this re-ranking over countries is quantified with the Spearman rank correlation coefficient. Although we have found that the rank for both welfare measures overlaps for a large number of individuals within countries, yet there is a considerable fraction of individuals who experience a noticeable re-ranking between income and equivalent income.

The structure of this chapter is organized as follows. Section 1.2 presents an overview of the literature on the multi-dimensional well-being measures. In the same section we illustrate the conceptional framework that we follow in this study and we also present the underling principles which are providing a normative justification for using a particular well-being measure. In section 1.3 we present the methodology for estimating equivalent income from the satisfaction data and we illustrate the empirical specification for our satisfaction regression. Section 1.4 describes the econometric model for the satisfaction equation. In section 1.5 we illustrate the concept of Shapley value and Shapley value decomposition. Section 1.6 describes the data. In section 1.7 we describe our empirical strategy for constructing income and non-income dimensions of life. Section 1.8 presents the results. In section 1.9 we conclude.

1.2 Inequality, Satisfaction and Preferences

In this section we present the conceptual framework and we provide an overview of the three approaches for measuring the multi-dimensional well-being. The approaches that have been singled out in the literature are the *capabilities* approach, *subjective well-being* approach and *equivalent income* approach. In addition, we present a set of principles which are providing a normative justification for each approach. Hence, different principles would imply different approachs for measuring well-being. The illustration of these principles is mainly based on Decancq et al. (2014).

Let us start with illustrating the conceptual framework. We assume that each individual i has the m-dimensional vector of aspects of life, $\psi_i = (\psi_{1i}, \psi_{2i}, \ldots, \psi_{mi})$ where $i \in (1, 2, \ldots, N)$, $m \in (1, 2, \ldots, M)$ and ψ_i is defined on $\mathbb{R}^m_+$. A vector of aspects of life characterizes the life situation of each individual and it can consist of various dimensions like income (or consumption), leisure, health, social status, employment status, acquired level of education, etc. We assume that each individual i has a well-defined preferences[2] over aspects of life which can be represented as $\psi_i R_i \psi_i'$ if individual weakly prefers ψ_i over ψ_i', $\psi_i P_i \psi_i'$ if individual strictly prefers ψ_i over ψ_i', and $\psi_i I_i \psi_i'$ if individual is indifferent between ψ_i and ψ_i'. The observed level of satisfaction of an individual i, evaluated at her vector of life dimensions ψ_i will be represented with the satisfaction function which we denote with S_i.

Nevertheless, as pointed out by Fleurbaey et al. (2009), Decancq et al. (2014) and Decancq et al. (2015) it may not be correct to assume that we will observe the true level of satisfaction, since it can happen that some individuals do not report their level of satisfaction truthfully. For instance, one can find situations where individuals are distracted by various factors while answering the satisfaction question or their answers can be influenced by a certain mental states they are going through at the time of the interview. That is to say, the data on satisfaction can be manipulated by the feelings of individuals, the order in which the questions on various

[2]We assume the preference relation to be complete, transitive, continuous and weakly monotonic. Completeness of preferences implies that for all consumption goods $x_1, x_2 \in X$ we have either $x_1 \succeq x_2$ or $x_2 \succeq x_1$ or both. Transitivity of preferences implies that for any consumption good $x_1, x_2, x_3 \in X$, if $x_1 \succeq x_2$ and $x_2 \succeq x_3$, then $x_1 \succeq x_3$. Preferences are said to be continuous if for any sequence of pairs of consumption goods $\{(x_1^n, x_2^n)\}_{n=1}^{\infty}$ with $x_1^n \succeq x_2^n \ \forall n$, $x_1 = \lim_{n\to\infty} x_1^n$ and $x_2 = \lim_{n\to\infty} x_2^n$, we have $x_1 \succeq x_2$. Preferences are said to be weakly monotonic if for any bundle of goods the agent always prefers the consumption bundle that have more of every good in it relative to other feasible bundles or the agent is at least as good with the bundle that have more of at least one good and not less in any other good. Formally if X is the consumption set, where $X = \mathbb{R}^L_+ = \{x, y \in \mathbb{R}^L,\ x_\ell \geq 0, y_\ell \geq 0 \text{ for } \ell = 1, \ldots, L\}$ then for any $x, y \in X$ such that $y \gg x$ implies $y \succ x$ or such that $y > x$ and $y \not< x$ implies $y \succeq x$.

dimensions of life have been asked in a survey (see Schwarz and Strack (1988)) and with the process in which individuals compare their own life satisfaction with the life satisfaction of other people (see Clark (2003)). Since we assume that the true level of satisfaction is not truthfully observable, we will introduce the error term, η_i, that represents the amount by which the observed level of satisfaction of individual, S_i, differs from the true (unobserved to statisticians) level of satisfaction of individual. We denote the true level of satisfaction with ω_i. The observed level of satisfaction for each individual can be represented as follows

$$S_i = S(\omega_i, \eta_i) \tag{1.1}$$

where S denotes the general functional form of life satisfaction. We assume that ω_i represented with a function ω, that is $\omega_i = \omega(\psi_i, A_i, R_i)$, where (A_i) denotes the level of aspirations and (R_i) denotes the preference orderings (R_i). The complete life characterization for each individual is represented with the triple (ψ_i, R_i, S_i) which we use for evaluating the well-being of individuals. Although, we have not yet specified a vector of personal characteristics, nevertheless they will be included in the triple, through R_i or S_i.

After we have introduced the notation, we can now define a well-being measure, $\text{WB}(\psi_i, R_i, S_i)$, which represents the well-being of each individual evaluated at her vector of life aspects (ψ_i), given her preference orderings (R_i) and given her satisfaction function (S_i). However, we are still facing a few difficulties. The important question that is certainly difficult to answer is concerned with the choice of life dimensions which one needs to consider when constructing a measure of well-being. If we agree on the notion that individual preferences should be respected then it seems reasonable to claim that our vector of life dimensions needs to include all life dimensions which are important for individuals. It is immediately obvious from the following proposition that it will be difficult to figure out from the pragmatic point of view what is the right method for elicitation of individual preferences but also how specific one should be with respect to the choice of life dimensions which individuals consider important.

In the literature, we could find the opposing views about what makes these important life dimensions. One group of researchers that belongs to the *capability* approach discard the idea that the important life dimensions should be selected on the basis of revealed preferences since the preferences of individuals might not be truthfully disclosed. A different viewpoint is taken by Nussbaum (2006, 2011) who suggests a list of functionings (capabilities) that are objectively

needed for a prosperous life. On the other hand, Sen (2004) argues that the list of relevant functionings should remain undefined unless there is a public consensus about what is the right choice for these dimensions[3]. Nevertheless, we will abstract from these issues since the purpose of this chapter is not to provide a comprehensive discussion about the normative justifications behind the choice of important life dimensions.

Once an agreement is reached on the list of important life dimensions which will be included in a measure of well-being, we are immediately confronted with another dilemma on how to aggregate these various dimensions of life over individuals in a synthetic indicator of well-being. If we are interested in making interpersonal evaluations of multi-dimensional well-being then we need to find a proper social aggregation procedure which will represent the aggregation of social orderings over these vectors of life dimensions. However, before one could proceed with the aggregation, one still needs to construct an individual well-being measure which allows for such weighting procedure that ultimately respects individual preferences over these dimensions of life. Before we illustrate the first principle, we have to assume consistency between the valuation function and ordinal preferences. It can be shown that any binary relation that is complete, transitive and continuous over vector of functionings can be represented by a continuous function ν_i or more formally this can be stated as

$$For\ all\ \psi_i, \psi_i' \in \mathbb{R}_+^m,\ \nu_i(\psi_i) \geq \nu_i(\psi_i') \Longleftrightarrow \psi_i \succeq \psi_i'\ (or\ equivalently\ \psi_i R_i \psi_i') \tag{1.2}$$

where $\nu_i : \mathbb{R}_+^m \to \mathbb{R}$. One should note that each individual can have his own evaluation function, ν_i, which represents his preference relations over the vector of functionings. Every increasing monotonic transformation of ν_i will guarantee that a preference relation, R_i of individual i over these vectors of functionings, will be satisfied. Nevertheless, it is certainly not a trivial task to define this valuation function and we find a great deal of contention about this issue in the literature. Sen (1985) suggested an "intersection approach" which is based on the *Dominance Principle*. The *Dominance Principle* can be formally represented as follows

Principle 1 (***Dominance Principle***)**.** *Suppose that two individuals, i and j have different rankings over the dimensions of life, $R_i \neq R_j$. Then we have (i) $(\psi_i, R_i, S_i) \succeq (\psi_j, R_j, S_j)$ if $\psi_i R \psi_j\ \forall R$, and (ii) $(\psi_i, R_i, S_i) \succ (\psi_j, R_j, S_j)$ if $\psi_i P \psi_j\ \forall R$.*

[3]The list of relevant dimensions has been suggested by Stiglitz et al. (2009a), the OECD (2011) and the European Statistical System (2011) where the following list consisted of consumption of commodities, health, housing quality, employment status, leisure, social interactions and environment.

According to this principle, the comparison of well-being of two individuals, i and j, will not depend either on their preferences over the vector of functionings, nor on their satisfaction functions but will only depend on the preference orderings which belong to a feasible binary representation of preferences. An obvious weakness of this principle is that it implies only the ordinal preference orderings and the well-being comparisons based on this principle could regularly lead us to ambiguous conclusions. Unfortunately, this is not the fundamental problem with the *Dominance Principle*. If we accept the idea that individual sovereignty should be respected by acknowledging individual preference rankings over important life dimensions, then it can be easily shown that this idea will be in contrast with the logic that is implied by the *Dominance Principle* (see Brun and Tungodden (2004) and Fleurbaey (2007)). The *Personal Preference Principle* according to which the individual preferences are respected can be formally stated as follows

Principle 2 (***Personal Preference Principle***)**.** *Suppose that for each individual i we compare two individual life situations where each life situation differ in the vector of functionings. Then we have (i) $(\psi_i, R_i, S_i) \succeq (\psi_i', R_i, S_i)$ if and only if $\psi_i R_i \psi_i'$, and (ii) $(\psi_i, R_i, S_i) \succ (\psi_i', R_i, S_i)$ if and only if $\psi_i P_i \psi_i'$.*

The *Personal Preference Principle* implies that if the individual i (strictly) prefers a vector of functionings ψ_i over a vector of functionings ψ_i', then this individual is (strictly) better off when $\psi_i R_i \psi_i'$ ($\psi_i P_i \psi_i'$) holds true. Unfortunately, we will not be able to develop a synthetic well-being measure that is based on the *Dominance Principle* and *Personal Preference Principle* because these two principles are conflicting each other. More precisely the assumption of transitivity of preferences would be violated in such a case (see Fleurbaey et al. (2009)).

1.2.1 The Capability Approach

A prominent concept of multi-dimensional well-being that has been established by Amartya Sen in the 1980s is known as the *capability* approach (see Sen (1985, 1997)). Sen rejects the *subjective welfarism* since it leads to *physical condition neglect* and *valuation neglect* but he also rejects all other approaches to well-being which are based on income or assets (material resources) exclusively. Sen proposes a well-being concept that is based on the functionings or achievements that individuals are able to accomplish (i.e. being well-nourished, being well-dressed). It is important to recognize that the functionings are not the same as the inputs

(resources) which we transform in the process of reaching our life achievements because whether we have succeeded to accomplish what we wanted or not will by large depended on our individual characteristics and opportunities in life that we had. A concept of well-being, suggested by Sen is represented with the well-being measure which is based on functionings. We denote this measure with WB_i^f. Formally, the following measure can be represented as follows

$$\mathrm{WB}_i^f(\psi_i, R_i, S_i) = \nu_i(\psi_i) \tag{1.3}$$

where ν_i represents the valuation function. It is important to emphasise that two individuals can have exactly the same vector of functionings but with a quite different implications which have brought each of these individuals to have such a vector of functionings. Realizing this situation, Sen suggests that besides the vector of functionings, one needs to take into account the capabilities, that is a set of feasible functionings which are attainable to individuals.

Nevertheless, it turns out that the *capability* approach suffers from several serious problems. The first problem is that we cannot find a general solution on how to compare the opportunity sets between individuals when we allow for heterogeneity of individual preferences. The second problem is that the evaluation of opportunity sets violates the *Compensation Principle* (see Fleurbaey and Blanchet (2013)) which represents a fundamental point in the theory of equality of opportunity. Based on these critiques, it seems that measuring well-being with the capabilities approach suffers from some serious weaknesses which are presently not possible to resolve.

1.2.2 The Subjective Well-Being Approach

The literature on happiness and life satisfaction have been growing rapidly in the last couple of decades. Economists have utilized a lot of effort to make their contribution in this field. The popularity of economic studies on happiness and life satisfaction can be attributed by and large to the data which has recently become available. A prominent approach for measuring well-being that economists have taken concerns either the usage of the question on the life satisfaction or the question on happiness and both of these questions are appearing nowadays in many representative surveys. A large group of economists believes that both of these questions can be used to represent the standard concept of utility which we call the *subjective well-being*. However, another group of economists together with psychologists have realized that the concept of life satisfaction and the concept of happiness is not the same. For the time being

we will not discuss the conceptual differences between happiness and life satisfaction but in the upcoming sections we will provide the argumentation why these two concepts are not supposed to designate the same thing. Notwithstanding, we have witnessed a growing number of robust empirical studies that have dealt with the notion of *subjective well-being*. The empirical evidence points out that the subjective well-being is affected by income but interestingly it is affected by a larger extend by non-income dimensions like health conditions, labour market status, social interactions, political freedom, etc. Another robust finding in the literature on the *subjective well-being* states that people compare their own well-being with some reference group that they find appropriate to be compared with. The mechanism of adaptation where people change their aspirations depending on their current life situation has been found in the literature as well (see Loewenstein and Ubel (2008)).

The approach that uses the data on life satisfaction and happiness in order to measure the well-being is known under the name of *subjective welfarism*. The proponents of this approach assume that the scores obtained from the data on life satisfaction and happiness can be used as a measure of well-being that is entirely comparable between individuals. The *subjective well-being* measure, WB_i^s, can be represented as

$$\text{WB}_i^s(\psi_i, R_i, S_i) = S_i(\psi_i) \tag{1.4}$$

The underling idea behind the *subjective well-being* measure is that this measure combines the information on different life dimensions which are then aggregated into a single measure of individual well-being. Although this approach seems as a very elegant solution to the problem of finding a proper well-being measure which can be used for making interpersonal comparisons, yet we will see that this concept of *subjective welfarism* is not immune to some fundamental problems.

Although the predominant standpoint among the economists is that both the notion of happiness and life satisfaction resemble the same concept of utility, nevertheless the psychologists greatly oppose this view. In the psychological literature, there exists a distinction between these two concepts where the concept of happiness refers to affects or feelings while the concept of life satisfaction refers to the mental action or process of acquiring knowledge and understanding through thought, experience which we call cognition (see Kahneman and Krueger (2006)). A similar distinction exists in welfare economics which differentiates between *hedonic welfarism*

and "preference welfarism". While the *hedonic welfarism* is primarily concerned on acquiring individual happiness (Kahneman et al. (2004), Layard (2005), the preference welfarism relies on the individual preferences which then serve as a proper measure for deciding on important life aspects. Accepting the view propagated by the *hedonic welfarism*, one neglects the notion that individual preferences are important in measuring individual well-being which does not seem to stand as a reasonable argument to make. Although, it does not seem plausible to dismiss the feelings of happiness as something which individuals do not find important in life. Another weakness of the *hedonic welfarism* approach comes from the fact that it leaves individuals irresponsible for their feelings of happiness or sadness although the following approach uses this information for measuring individual well-being.

A different approach for measuring *subjective well-being* which contrasts the one based on the individual feelings of happiness, uses the cognitive ideas of individuals about their life. The individual assessment of various life dimensions can be obtained from the individual satisfaction function. Nevertheless, one should bear in mind that the *preference welfarism* would make sense only if individuals have a complete preference ordering defined over important dimensions of life. Unfortunately, we must stress out that understanding of preference ordering has not been perceived unanimously in the literature.

Kahneman et al. (1997) distinguish between the two concepts of utilities, which they refer to as the *experienced utility* and *decision utility*. The concept of experienced utility refers to a well known Bentham's concept of utility which can be understood as a hedonic experience of an outcome. This was a predominating concept among economists in the 19th century. At the beginning of the 20th century the concept of experienced utility was abandoned and a new concept of decision utility emerged as a leading one. The following two concepts are quite distinctive and moreover one should not confuse the preference ordering R_i with the notion of revealed preferences. The individual satisfaction function S_i would be a proper characterization of individual preferences if the preference ranking, R_i over life dimensions is achieved. This is called the *consistency assumption* and it can be represented as follows

$$For\ all\ \psi_i, \psi_i' \in \mathbb{R}_+^m,\ S_i(\psi_i) \geq S_i(\psi_i') \Longleftrightarrow \psi_i R_i \psi_i' \tag{1.5}$$

An important point that needs to be made concerning the interpretation of satisfaction function S_i. The characterization of individual preferences with the satisfaction function would

be valid as long as one assumes an ordinal concept of preferences. On the contrary, a cardinal representation of the individual satisfaction function, S_i presupposes a particular scaling factors which are attributed to a process of individual adaptation (or habit formation) and forming a frame of reference (peer comparison effects). That is to say, a cardinal representation of S_i would not be consistent with the individual revealed preferences and if we want to find the identity between S_i and R_i then the scaling factors needs to be purged out from the satisfaction function, S_i which would then result having an ordinal representation of preferences. Thus, the subjective well-being which is implied by the *consistency assumption* would respect the intrapersonal evaluation of life aspects, or in other it would respect the *Personal Preference Principle*. Unfortunately, this would not suffice if we want to make the interpersonal evaluation of life aspects between two individuals who have the same preference rankings but their scaling factors differ or when the preference ranking changes between two points of time for the same individual. However, the later requirement could be achieved by the *Same Preference Principle* which can be represented as:

Principle 3 (***Same Preference Principle***)**.** *Suppose that two individuals, i and j have the identical preferences, $R_i = R_j \equiv R$. Then we have (i) $(\psi_i, R_i, S_i) \succeq (\psi_j, R_j, S_j)$ if and only if $\psi_i R_i \psi_j$ (or equivalently $\psi_i R_j \psi_j$), and (ii) $(\psi_i, R_i, S_i) \succ (\psi_j, R_j, S_j)$ if and only if $\psi_i P_i \psi_j$ (or equivalently $\psi_i P_j \psi_j$).*

Nevertheless, it is important to emphasise that the subjective well-being measure is incompatible with the *Same Preference Principle*. Thus, we cannot directly relate the information on life satisfaction to subjective well-being measure if we want to respeact individual preferences.

1.2.3 The Equivalent Income Approach

We are now turning to illustrate the concept of *equivalent income*. Unlike the previous concepts of well-being, the concept of equivalent income complies with the *Same Preference Principle*. In order to formalize the concept of equivalent income we have to introduce a vector of life dimensions $\psi_i(y_i, x_i)$ which consists of income, y_i and non-income dimensions, $x_i = (x_{1i}, x_{2i}, \ldots, x_{mi})$ for each individual i. In addition, we have to know the preference orderings[4] of individuals.

[4]Contemporary economic literature has suggested three approaches for the identification of individual preferences. These approaches include the revealed preferences, stated preferences and preference identification utilizing the data on the life satisfaction (happiness). The revealed preferences approach is based on observing choices made by individuals which then allows to identify the preferences. The requirement needed for the identification is that individual rationally decided over their choices. Nevertheless, whether this condition is indeed satisfied is very much debatable. The stated preferences approach is based on the hypothetical evaluations where individuals

We also have to specify the reference value for the vector of non-income dimensions which we denote with $\widetilde{x}$. We can now define the equivalent income, y_i^*, as the amount (monetary value) which makes any individual indifferent between (y_i, x_i) and $(y_i^*, \widetilde{x})$, or equivalently using the preference relation we have $(y_i, x_i) I_i (y_i^*, \widetilde{x})$. The equivalent income represents the amount of income which makes any individual indifferent between her current life position (i.e. achieved life aspect) and some hypothetical situation where all of her non-income dimensions are set at the reference values. We represent the equivalent income measure, WB_i^e as follows

$$\mathrm{WB}_i^e(\psi_i, R_i, S_i) = y_i^* \tag{1.6}$$

An important feature of the equivalent income is that it is given in monetary terms and since the equivalent income has cardinal properties it can be used for interpersonal comparison of well-being. Moreover, the equivalent income unlike the life satisfaction approach satisfies the *Same Preference Principle* or in other words it respects the preference rankings (assuming monotonicity in income) of individuals over the important dimensions of life. The equivalent income is insensitive to any scaling factors (aspirations and expectations) so that the interpersonal comparisons are made on the basis of ordinal representation of utilities. Alternatively, we can represent the equivalent income as follows

$$y_i^* = y_i - \mathrm{WTP}_i(x_i \to \widetilde{x}; \psi_i) \tag{1.7}$$

where $\mathrm{WTP}_i(x_i \to \widetilde{x}; \psi_i)$ represents the amount of willingness to pay of individual i if the current level of all her non-income dimensions were to be set at the reference value. We can easily see from the equation above that the equivalent income corresponds to income if all non-income dimensions are already at the reference values. The underlying logic of this approach is that once we have set the reference values for all non-income dimensions then the only important information that we need for making the interpersonal comparisons of well-being concerns the income level of individuals. The fundamental question is still how to define these reference values for non-income dimensions. A plausible solution is to set the reference values for each non-income dimension at the level to which all individuals would aspire. Although it would

are asked to reveal their willingness to pay for commodities that are not supplied by the market. Whether this method is a plausible one or not is still genuinely debatable in the literature. The third approach for measuring preferences uses the data on life satisfaction (happiness). The individual satisfaction function, S_i which obeys the consistency assumption represents the ordinal rankings of individuals over important life dimensions.

be easier to come up with such reference values for some non-income dimensions (i.e. health) while for other non-dimensions (i.e. working time or leisure) the reference values are very much debatable, still it seems quite reasonable to try to find a solution where these reference values represent a level which all individuals wish to achieve.

1.3 Methodology

1.3.1 Estimating Equivalent Income

In this section we show how to estimate the equivalent income using the data on life satisfaction. The starting point for estimating the equivalent income is to have the information on the live satisfaction at the individual level (S_i). Currently a significant number of representative surveys contain the question on the self-reported satisfaction with life. Basically, the following question can be found in surveys: *How satisfied or dissatisfied are you currently with your life in general?* The responders are usually offered a discrete or categorical (or combination of both) scale of possible answers. The empirical relationship between the life satisfaction as the dependent variable and the right hand side variables can be written as follows

$$S_i = \alpha + (\beta + \Lambda Z_i) \ln y_i + (\phi + \Omega Z_i)' F_i + Z_i \theta + \epsilon_i \tag{1.8}$$

where F_i is a vector of non-income dimensions of life, $\ln y_i$ denotes the logarithm of income, Z_i is a vector of personal characteristics, β, ϕ, θ, Λ, Ω and α are coefficients to be estimated and ϵ_i represents the error term. We have introduced the logarithmic transformation of income in order to allow for a non-linear relationship between the life satisfaction and income. This seems as a plausible assumption to make since it has been shown that the effect of income on the life satisfaction is not necessarily constant across the income distribution (see Clark and Oswald (1996) and Layard et al. (2008)).

We would like to emphasise that different individuals would probably consider different life dimensions to be important in their lives. A list of non-income dimensions which are commonly used in the literature include the employment status, health, housing, environment, social protection and the like. Although, the purpose of this section is only to illustrate the methodological framework for the estimation of the equivalent income, in the subsequent sections we will put forward the arguments concerning the choice of relevant life dimensions. It is important to note that even though the variables contained in Z_i produce a direct effect on the level of satisfaction, the main role of these variables is to capture the aspiration levels and norms that might differ across the individuals. The variables contained in Z_i produce a direct effects on S_i through the coefficient θ. These effects should be interpreted only as a shift in the level of life satisfaction.

Another important point concerns the issue of heterogeneity of individual preferences. One approach that allows us to model heterogeneity of preferences is to include the interactions of individual characteristics (Z_i) with income ($\ln y_i$) and non-income dimensions (F_i). The following argument is supported by the claim that individuals with different personal characteristics have a heterogeneous opinion on the list of important life dimensions. The indirect effect that the individual characteristics have on the life satisfaction, through their interaction with life dimensions, change the marginal rate of substitutions between life dimensions. In other words, these effects change the slope of the satisfaction function. The marginal rate of substitution between the income and non-income dimension d can be written as follows

$$MRS_i^{y,F_{id}} \equiv \frac{\partial S_i/\partial F_{id}}{\partial S_i/\partial y_i} = \frac{(\phi + \Omega Z_i)' y_i}{\beta + \Lambda Z_i} \tag{1.9}$$

where $MRS_i^{y,F_{id}}$ denotes the marginal rate of substitution for individual i between the income and non-income dimension d. One should notice that although the interaction terms between Z_i and y_i and between Z_i and F_i are necessary if one wants to introduce the heterogeneity of individual preferences, still we would observe identical preferences for those individuals with the same values of regressors in Z_i. As it was already mentioned, we keep the marginal rates of substitution between income and non-income dimensions constant. Although one can argue that the following assumption is undoubtedly questionable, we could not do better than that with the data we have at our disposal.

We illustrate the necessary steps for computing the equivalent income. In the first step, we set up the reference values for all non-income dimensions which we denote $\overline{F}_i$. In the second step we calculate the equivalent income, y_i^*, such that the individual i is indifferent between the vector $(y_i^*, \overline{F}_i)$ and his actual life situation (y_i, F_i). In other words, one has to solve for the system of these two equations for y_i^*

$$S_i = \alpha + (\beta + \Lambda Z_i) \ln y_i + (\phi + \Omega Z_i)' F_i + Z_i\theta + \epsilon_i \tag{1.10}$$

$$S_i = \alpha + (\beta + \Lambda Z_i) \ln y_i^* + (\phi + \Omega Z_i)' \overline{F} + Z_i\theta + \epsilon_i \tag{1.11}$$

After we solve this system of equations we arrive at the equivalent income equation

$$y_i^* = y_i \exp\left[\left(\frac{\phi + \Omega Z_i}{\beta + \Lambda Z_i}\right)' \left(F_i - \overline{F}\right)\right] \tag{1.12}$$

One can immediately see that the equivalent income y_i^* would collapse to income y_i if the values of all non-income dimensions were exactly on the reference values. Moreover, if the values of non-income dimensions, F_i is below the chosen reference value, $\overline{F}_i$, then for every increase in non-income dimensions (relative to income) the equivalent income will increase. We observe that the direct effect of individual characteristics Z_i on the life satisfaction, S_i, that is captured by the coefficient θ drops out from the equivalent income equation. One can also notice that the equivalent income equation has no error term ϵ_i because it has been cancelled out once we have solved the system of equations given in 1.10 and 1.11. This implies that the idiosyncratic differences over individuals linked to aspirations and adaptations play no role in computing the equivalent income. Whether someone finds this acceptable or not is an ethical question which determines the justification for our choice of the well-being measure. One can also notice that the equivalent income does not depend on the subjective life satisfaction since the following term has been cancelled out once we have solved the system of equations.

1.3.2 Life Satisfaction Regression

In this section we illustrate our empirical strategy for estimating the life satisfaction regression. We have specified five different life satisfaction regression models. We start with the model that includes only a parsimonious specification and then in each subsequent model we hve broadened our specification by including the additional set of regressors. Each specification uses a set of regressors which comprises of logarithm of income ($\ln y_i$), the quality of accommodation (a_i), health (h_i), the quality of neighbourhood (n_i) and unemployment (u_i). The logarithm of income represents the income dimension while the last four variables represent the non-income dimensions. Other control variables that we have included in a vector of personal characteristics (Z_i) consist of age, gender, marital status, the level of education an individual has obtained, a dummy variable if an individual has at least one child, a dummy variable if living in the urban areas, country dummies and a dummy variable for 2011.

In order to account for individual heterogeneity we have also included a set of variables which represents the individual personality (P_i). These variables measure the extent to which an individual is optimistic, cheerful, calm, active and has a interest in life. As we do not have a panel data we cannot use the fixed effects in the satisfaction regression to control for the unobserved (time-invariant) heterogeneity. However, we can control for the unobserved heterogeneity that comes from the difference in individual personality by including these personality traits variables.

It is important to stress out form the outset that our aim is to estimate a latent variable model which assumes that the subjective life satisfaction is an ordered categorical response variable. Although we would ideally like to obtain the causal estimates of the regressors on the life satisfaction, unfortunately we could still be sceptical about whether our estimates are influenced by the unobservables we have not managed to control for in the estimation. Actually, most of the literature on life satisfaction and happiness has the same problem of providing the causal inference of the variables included in the life satisfaction regression.

Yet, we should bear in mind that we are not after finding the behavioural effects on the life satisfaction but our purpose is to find the relationships between the life satisfaction and a vector of variables which represent income and non-income dimensions of life. For that purpose we will use the ordered logit model where the probability of observing a particular category of the dependent variable corresponds to the probability that the estimated linear function which

includes the error term lies within the limits of the thresholds estimated for the dependent variable. The specification of the life satisfaction regression that we have used can be written as

$$S_i = \alpha + \beta \ln y_i + F_i\gamma + Z_i\theta + P_i\vartheta + \epsilon_i \tag{1.13}$$

where $F_i = (a_i, h_i, n_i, u_i)$ is a vector of non-income dimensions of life, $\alpha, \beta, \gamma, \theta$ and ϑ are parameters to be estimated while ϵ_i denotes the error term.

At this stage there are two important points to be emphasised. We are primarily interested in estimating the marginal rate of substitution between the income and non-income dimensions. For that matter we need the coefficients β and γ. The remaining coefficients, α, θ and ϑ are not of any particular interest concerning the estimation of individual preferences. In other words, the coefficients on the income and non-income life dimensions are necessary for obtaining the information on the indifference curves, while the coefficients on the personal characteristics and personality traits are considered just as the scaling factors of indifference curves. Assuming the linear coefficients in the life satisfaction regression, we put forward the arguments which tells us that the indifference curves are parallel lines since the marginal rates of substitution between income and non-income dimensions are constant.

Once we have introduced the interaction terms into our life satisfaction regression, we have immediately changed the coefficients on income and non-income dimensions. We have interacted income and non-income dimensions with a vector of socio-demographic characteristics of individuals (Π_i). This vector comprises of a dummy variable that equals 1 if an individual is male ($male_i$), if an individual belongs to the non-middle age group which is defined for age below 45 and age above 65 year ($nonmiddle_i$), if an individual is married ($married_i$), if an individual lives in urban area ($urban_i$), if an individual has acquired a lower level of education ($lowereduc_i$) and if an individual has any children ($child_i$). Finally, the specification of the satisfaction regression which includes an interaction terms can be written as

$$S_i = \alpha + (\beta + \Lambda\Pi_i) \ln y_i + (\gamma + \Omega\Pi_i)' F_i + Z_i\theta + P_i\vartheta + \epsilon_i \tag{1.14}$$

where $\alpha, \beta, \gamma, \theta$ and ϑ represents direct effects while Λ and Ω are matrices of the interaction terms to be estimated. Respecting the natural ordering of the self reported level of satisfaction,

S_i, we have estimated the equation 1.14 with the ordered logit model where all parameters of the model are estimated by the maximum likelihood estimation (MLE).

1.4 The Econometric Model

1.4.1 An Ordered Logit Regression

This section illustrates the ordered logit model which we have employed for estimating the life satisfaction regression (see Cameron and Trivedi (2005) and Train (2009)). Two popular estimation strategies known for the qualitative dependent variable model are the multinomial logistic or probit regressions and ordered outcomes models (i.e. ordered logit model or ordered probit model). A weak point of the multinomial logit model or probit model is that these models are throwing away orderedness of categories of dependent variable which is clearly not applicable in our setting. Hence, we have reasonably opted for the ordered outcome model as our estimation strategy. The regression model for a latent variable Y^* (unobserved to statisticians) can be represented as follows

$$Y_i^* = X_i'\beta + \epsilon_i \tag{1.15}$$

where X_i is a vector of independent explanatory variables and ϵ_i is the error term. Since we do not observe the latent variable Y_i^*, we relate it to the observed ordered categorical variable, Y_i, which then depends on a series of increasing thresholds as we move from the lowest value of Y_i^* to the highest value of Y_i^*. We define the ordered model for an kth possible alternatives as follows

$$Y_i = \begin{cases} 0 & \text{if } Y^* \leq \alpha_0 \\ 1 & \text{if } \alpha_0 < Y^* \leq \alpha_1 \\ \vdots & \\ k & \text{if } Y^* > \alpha_k \end{cases} \tag{1.16}$$

where $j = 1, ..., k$ and where the threshold parameters α_j are assumed to be strictly increasing in the category j, $\forall j,\ \alpha_j < \alpha_{j+1}$ and by definition we have $\alpha_0 = -\infty$ and $\alpha_{j-1} = +\infty$. Assuming that the dependent variable Y_i takes the value j if the jth alternative is preferred over other alternatives, we can then define the response probability of observing the outcome j for each

individual i in the following way

$$\begin{aligned}\Pr[Y_i = j] &= \Pr[\alpha_{j-1} < Y_i^* \leq \alpha_j] \\ &= \Pr[\alpha_{j-1} < X_i'\beta + \epsilon_i \leq \alpha_j] \\ &= \Pr[\alpha_{j-1} - X_i' < \epsilon_i \leq \alpha_j - X_i'\beta] \\ &= F(\alpha_j - X_i'\beta) - F(\alpha_{j-1} - X_i'\beta) \end{aligned} \tag{1.17}$$

where $F(\cdot)$ is the cumulative density function (cdf) of an error term ϵ_i. In the ordered logit model the functional form for the conditional probability that individual i select the alternative jth is specified as follows

$$p_{ij} = \Lambda(\alpha_j - X_i'\beta) - \Lambda(\alpha_{j-1} - X_i'\beta) \tag{1.18}$$

where $\Lambda(\cdot)$ is the logistic cdf with the following property $\Lambda(z) = e^z/(1+e^z)$ while a random variable $z \sim$ Logistic $(0, \pi^2/3)$. The density function of the dependent variable y_i, can be simply written as the product of the probabilities when the outcome variable takes a particular value from the set of available categories. The probability density function (pdf) of the dependent variable, Y_i, for an individual i is defined as follows

$$f(Y_i) = p_{i1}^{Y_{i1}} \times \cdots \times p_{ij}^{Y_{ij}} = \prod_{i=1}^{n}\prod_{j=1}^{k} p_{ij}^{Y_{ij}} \tag{1.19}$$

Using the probability model from the equation 1.18 and assuming the independence over i, the log-likelihood function can be written as

$$\begin{aligned}\mathcal{L}_N(\alpha, \beta) &= \sum_{i=1}^{N}\sum_{j=1}^{K} I_j(Y_{ij}) \ln\left\{\Lambda(\alpha_j - X_i'\beta) - \lambda(\alpha_{j-1} - X_i'\beta)\right\} \\ &= \sum_{i=1}^{N}\sum_{j=1}^{K} I_j(Y_{ij}) \ln\left\{\frac{\exp(\alpha_j - X_i'\beta)}{1+\exp(\alpha_j - X_i'\beta)} - \frac{\exp(\alpha_{j-1} - X_i'\beta)}{1+\exp(\alpha_{j-1} - X_i'\beta)}\right\} \\ &= \sum_{i=1}^{N}\sum_{j=1}^{K} I_j(Y_{ij}) \ln p_{ij} \end{aligned} \tag{1.20}$$

where $I_j(Y_{ij})$ is an indicator function defined as follows

$$I_j(Y_{ij}) = \begin{cases} 1 & \text{if } Y_{ij} = j \\ 0 & \text{otherwise} \end{cases} \tag{1.21}$$

Differentiating the log-likelihood function with respect to β and $(k-1)$ threshold parameters, $\alpha_1, \cdots, \alpha_{k-1}$, and setting the first order conditions to zero, we can find the maximum likelihood estimator (MLE) for $\widehat{\beta}$ and $\widehat{\alpha}_1, \cdots, \widehat{\alpha}_{k-1}$ that solve the maximization problem. Assuming that we have M regressors (excluding the intercept) in the equation 1.15 and assuming that the ordered logit model has k alternatives, the total number of parameters to be estimated is given by $M + k - 1$.

1.5 The Shapley Value and Shapley Value Decomposition

This section provides an overview of the Shapley value and Shapley value decomposition which decomposes the distributional statistic of interest by the factors components (see Shapley (1988) and Shorrocks (2013)). A popular application of the Shapley value decomposition can be found in the literature on inequality and poverty (see Sastre and Trannoy (2002) and Kolenikov and Shorrocks (2005)).

One can either decompose the aggregate inequality indices into the population subgroups that are defined by some demographic characteristics of interest or one can decompose a particular welfare measure (i.e. disposable income) on its components. In the later case, the Shapley value method is often used for decomposing the poverty index into the growth effect that represents the difference in mean incomes and into the redistribution effect that represents the difference in relative income shares. We will illustrate the Shapley value decomposition in a particular setting that has been of interest in our work. This concerns decomposition of the willingness-to-pay on the contributions of non-income dimensions.

1.5.1 The Shapley Value

The Shapley value is a concept that originates from the cooperative game theory which offers a solution on how to divide the surplus between the players of the game. Let us assume that the game consists of n agents where each agent is denoted by i and the total number of agents is denoted by N where $N \in \{1, ..., i, ..., n\}$. In addition, there is a subset of agents denoted by $S \subset N$ who are contemplating about the procedure which can divide the gains from the cooperation in a fair way. The payoff that can be achieved by any coalition that is formed by the players, $S \in 2^S$, can be represented with the function $v(S)$ where $v : \{S \mid S \subset N\} \rightarrow \mathbb{R}$ and $v(\emptyset) = 0$. We can define the marginal contribution that a player i makes to the coalition S as follows

$$\Pi_S(S, v) = v(S) - v(S \setminus \{i\}) \tag{1.22}$$

where $v(S \setminus \{i\})$ denotes the payoff formed by the coalition S that excludes the contribution made by player i. Because the players form their coalitions at random there is an equal chance that any order of players that form that coalition will be accomplished. Due to the fact that the contribution of each player i is dependent on the order in which that player forms the coalition, the Shapley value method will attach the weights to each possible coalition according

to its probability and then it will ascribe to every player the average value of the marginal contributions that the following player brought up to all possible coalitions. The reason why we need to compute the average value of all marginal contributions across all possible combinations for making the coalition comes from the fact that we do not have a natural order of elimination for the coalitions that could be formed.

We will denote the number of possible permutations of n players by $n!$ while the number of individuals that form a coalition S we denote by s. We are interested to know the expected marginal contribution made by player i over the whole randomization of coalitions that can be formed in the game. For every permutation in a given coalition $S \in N$ with $i \in S$, we have $(n-s-1)!$ permutations for the players that complement the coalition S. The Shapley value of player i, $\Gamma_i(N, \upsilon)$, shows the expected marginal value that the player i contributes after joining the coalition S in any possible way s. Formally this can be represented as follows

$$\Gamma_i(N, \upsilon) = \sum_{\substack{S \subset N \\ i \in S}} \frac{s!(n-s-1)!}{n!} \Big(\upsilon(S \setminus \{i\}) \Big) \tag{1.23}$$

It is important to note that the Shapley value decomposition satisfies two important properties. First, the Shapley value decomposition satisfies the symmetry condition which means that the order in which we introduce factors is not important for evaluating the contribution of each factor. Second, the Shapley value decomposition satisfies the additivity property which means that the sum of all factors taken together adds up to the total amount (payoff). Applications of the Shapley value decomposition are convenient in decomposing inequality and poverty indices where the marginal contribution of each factor to an index is computed by eliminating the role of that factor in a series of sequences and computing the index for each possible combination. The total contribution of each factor is computed as the mean value of marginal effects for that factor and for all series of sequences.

1.5.2 Shapley Value Decomposition of the Willingness-to-pay

Let us illustrate the procedure for the Shapley value decomposition of the total WTP by factor components which in our setting are represented by non-income dimensions. Assume that each individual i has a willingness-to-pay for each non-income dimension of life. A set that includes all non-income life dimensions is represented by $D = \{1, ..., d^*, ..., d\}$. We will denote a subset of non-income components by C. We can express a distribution of WTP for each subset of

non-income components as follows

$$WTP(D) = \sum_{i=1}^{N} \sum_{d=1}^{D} WTP_{id} \tag{1.24}$$

where by the definition the following relationships hold $WTP : \{D \mid D \subset C\} \rightarrow \mathbb{R}$ and $WTP(\emptyset) = 0$. Based on the Shapley value model that we have described in the previous section, we will denote the marginal contribution of each non-income component (dimension) d^* to WTP with Γ_{d^*}. Formally, the marginal contribution of each non-income component can be written as follows

$$\Gamma_{d^*}(D, WTP) = \sum_{\substack{D \subset C \\ d^* \in D}} \frac{d!(c-d-1)!}{c!} \Big(WTP\Big(D \setminus \{d^*\}\Big)\Big) \tag{1.25}$$

The procedure for decomposing the total WTP by non-income components (dimensions) can be summarized in two steps. In the first step we compute the marginal effects of all non-income components by removing each non-income component at the time but retaining all other non-income components. In the second step we repeat the computation of the marginal effects for all possible combinations of non-income components and we estimate the average value of these marginal effects for each non-income component. The sum of all non-income contributions to WTP that we obtain should add up to the total value of WTP. In other words, the Shapley value decomposition enabled us to decompose the total WTP into the contribution for accommodation (WTP^a), health (WTP^h), neighbourhood (WTP^n) and unemployment (WTP^u).

1.6 Data

In this section we illustrate the European Quality of Life Survey (EQLS) which we employed in our analysis. The EQLS is a cross sectional data set which examines the objective and subjective life conditions of European citizens, their social-demographic and personal characteristics. The EQLS contains information on a various topics such as income, employment status, attained level of education, housing conditions, family characteristics, self-assessed health status, neighbourhood quality and etc. The information on these topics are necessary for computing the important dimensions of life. The EQLS contains several variables on the subjective life conditions like happiness, life satisfaction in general and life satisfaction with a certain subdomains of life. Knowing all this information offered us a unique opportunity to relate the life satisfaction with the income and non-income dimensions of life.

Concerning the geographical coverage of the data, the EQLS has increased the number of covered countries from 28 countries in 2003 to 34 countries in 2011. Although, the EQLS is collected every fourth year starting from 2003, we have been forced to constrain our analysis only on the data for 2007 and 2011 because the data for 2003 was less reliable and the data was lacking some variables which were decisive for the purpose of our estimation. We also had to exclude from the estimation three countries (Ireland, Switzerland, Norway) because in the data for 2007 these countries were lacking a few important variables. In total, we have worked with 17,601 individuals in 2007 and with 22,342 individuals in 2011.

The distribution of overall life satisfaction across countries and years is described in figure 1.1. The question on the overall life satisfaction that we have used for our analysis is formulated as follows: *All things considered, how satisfied would you say you are with your life these days?* The responders were offered a discrete scale of possible answers which ranged from 1 ("very dissatisfied") to 10 ("very satisfied"). Each sub-figure represents the estimated proportions of the overall life satisfaction within each country for 2007 and 2011. The capped spike lines at each vertical bar represent 95 percent confidence intervals.

The first thing that can be noticed form the figure 1.1 is that a high degree of heterogeneity of the self-reported life satisfaction is present over countries but not over time within a country. Moreover, the distribution of overall satisfaction with life is either skewed to the left with long left tails or countries have almost symmetric distribution of self-reported life satisfaction. Nevertheless, most countries fall in the former case. The heterogeneity of life satisfaction across

countries can be easily demonstrated by comparing distributions of life satisfaction between countries. For instance, in Denmark, the estimated cumulative proportion of life satisfaction for the highest three categories (i.e. categories 8, 9 and 10) in 2007 was 0.85 while in Bulgaria the estimated cumulative proportion of life satisfaction for the highest three categories in 2007 was only 0.1. On the other hand, we can see that in Bulgaria the estimated cumulative proportion of life satisfaction for the lowest three categories (i.e. categories 1, 2 and 3) in 2007 was 0.23. Other countries like the Czech republic, Estonia, Greece, Hungary, Lithuania, Latvia, Portugal and Slovakia have the largest proportion of the population in the middle part of distribution, which means that most of people in those countries have the life satisfaction that ranges from 5 to 7. One can also notice that the distributions of life satisfaction within countries are almost identical between 2007 and 2011 which implies that the distribution of life satisfaction did not changed much over time.

We are now turning to another set of results which illustrates how the life satisfaction is distributed across gender. The distribution of overall life satisfaction within each country for men and women is shown in figure 1.2. One can observe that the distribution of life satisfaction for both men and women is quite heterogeneous over countries. Nevertheless, the distribution of life satisfaction within countries does not seem to differ much between men and women.

Descriptive statistics of the main variables (tabulated in rows) that we have used in our study are represented in table 1.1 and table 1.2 for 2007 and 2011, respectively. Because we have a relatively large number of countries that we use in our study we will only present the means of main variables in the tables of descriptive statistics. In both years, 2007 and 2011, the average value of life satisfaction has found at the lowest level in Bulgaria and at the highest level in Denmark. Comparing the average value of life satisfaction between 2007 and 2011 within countries we noticed that these values remained fairly unchanged. The hedonic treadmill theory suggested by Brickman and Campbell (1971)) tells us that individuals maintain a relatively stable level of happiness even though they experience all kinds of changes in life. Since it is possible that the real conditions within countries have remained unchanged between 2007 and 2011, we cannot relate the following theory to our findings.

In the second row of table 1.1 and table 1.2 we can see the average value of the real equivalized monthly income. In 2007 and 2011, Bulgaria had the lowest average income while Luxembourg has the highest average income. Comparing the unemployment rates between 2007

and 2011 we can notice that for most of the countries the unemployment rates have increased in the later year which is not surprising as we recognized the severe effects of the recent economic recession which occurred in many countries. One can notice that the mean of self-assessed health is the lowest in Latvia and Lithuania in 2007 and 2011, while the mean of self-assessed health is found to be the highest in Cyprus in 2007 and 2011, respectively. The average quality of accommodation was the lowest in Latvia for both years, it was the highest in Sweden and Germany in 2007 and in 2011 it was the highest in Austria and Germany. Finland has on average the fewest problems with the quality of neighbourhood, while the lowest average quality of neighbourhood was found in Italy and Bulgaria in 2007 and in Greece and Cyprus in 2001.

In the remaining rows we show the average values of socio-demographic and personal characteristics across countries. There are few interesting points regarding the personality characteristics that are worth to mention. In 2007, a country with the lowest average level of optimism was Portugal while in Greece the average value of optimism was at the average level computed among all countries. What seems particularly interesting is that the average value of optimism for Greeks felt significantly after the recent economic recession so that Greece was the most pessimistic country in 2011. Nevertheless, we can observe that in Spain the average value of optimism has stayed constant between 2007 and 2011, although we know that they have experienced economic decline during the recent economic crisis.

1.7 The Choice of Income and Non-Income Dimensions

A crucial issue that arises in the estimation of multi-dimensional well-being concerns the choice of life dimensions. An important life dimension that determines individual's well-being in the sphere of material living standard can be captured by income, consumption and wealth. We have selected income as a measure that will represent the material living standard. We have used the total disposable monthly income at the household level with incomes expressed in euros. Because our income variable is measured at the household level, we have have applied the OECD-modified equivalence square which assigns a value of 1 to the household head, a value of 0.5 to each additional adult member of the household and a value of 0.3 to each child present in the household (see Hagenaars et al. (1994)). In order to construct the real income variable we have applied a Consumer Price Index (CPI).

The non-income life dimension in the domain of work is represented by the employment status of individuals. The employment status variable equals 1 for those individuals who are unemployed and 0 otherwise. Although, we are aware that representing the domain of work with a binary variable may have many weaknesses, nevertheless we could not propose a better solution given the data at our disposal. The individual's self-assessed health is another non-income life dimension which we have used[5]. The individuals were asked to assess their health level by using the following question *In general would you say your health is?* They were offered a categorical scale of possible answers which consists of 1 for "very bad health", 2 for "bad health", 3 for "fair health", 4 for "good health" and 5 for "very good health". For each category of the self-assessed health variable we have constructed a binary variable that equals 1 if a particular category applies to individual and 0 otherwise. As a result, our measure of individual health consists of the five binary variables with "very good health" as the base category.

The third non-income life dimension that we have used is the quality of accommodation. For constructing the quality of accommodation variable we have used the question in which the

[5]Besides the self-assessed health variable, we have been considering the possibility to include a variable that measures health in a more objective way. Our candidate for the objective health variable comes from the following question: *Are you limited in your daily activities by this physical or mental health problem, illness or disability?* The respondents have been offered a categorical scale where 1 means "severely disabilities present", 2 means "disabilities present to some extent" and 3 means "no disabilities present". We have transformed this categorical variable into a binary variable that equals 1 if the individual faces either severe disabilities or disabilities to some extent and 0 if the individual faces no disabilities. However, we opted not to include the objective health variable in our analysis due to the fact that we have obtained a positive coefficient on this variable in the estimation of the life satisfaction regression. That is to say, it is difficult to believe that the level of life satisfaction was higher for those individuals with disabilities than for those individuals without them.

individuals were asked to assess the quality of their accommodation according to five different categories. On each question they answered with a binary variable that equals 1 if they had problems with the accommodation in that particular category and 0 otherwise. The following questions have been asked *Problems with your accommodation? a) shortage of space, b) rot in windows, doors or floors, c) damps or leaks in walls or roof and d) lack of indoor flushing toilet, e) lack of bath or shower.* We have computed the average score on these five questions which represents our measure of quality of accommodation. The resulting variable takes values from 0 to 1 where 0 means the best possible quality of accommodation while 1 means the worst possible quality of accommodation.

The last non-income dimension we have used is the quality of neighbourhood. In order to construct this variable, we have used a set of questions in which individuals were asked to emphasise whether or not their neighbourhoods have any difficulties with air, crime, litter, noise and water. While these questions slightly differ in their formulation between 2007 and 2011, in essence questions in both years have the same content and they are querying the same thing. While the original question in 2007 was *Reason to complain about the problem in your neighbourhood?*, in 2011 the question was *Thinking of your immediate neighbourhood do you have problems?*

The answers on both of these questions provide us with the information on whether or not individuals experienced any problems in their neighbourhoods. In 2007 the respondents have been offered a categorical scale of possible answers which included the categories 1 for "very many reasons", 2 for "many reasons", 3 for "few reasons" and 4 for "no reason at all". In 2011 the respondents were offered a categorical scale of possible answers which included the categories 1 for "major problems", 2 for "moderate problems" and 3 for "no problems". In order to have the categorical scale which is comparable across years, we have recoded the categorical scale in 2007 so that it fit the scale in 2011. As a result we have recoded the categories "very many" and "many" from 2007 into the category "major problems" which is valid for 2011, the category "few reasons" from 2007 into the respective category "moderate problems" for 2011 and the category"no reason at all" from 2007 has been recoded to the category "no problems" for 2011. In our last step, we have inverted the categorical scale so that lower numbers represent the less severe problems (higher quality of neighbourhood) while a higher numbers represent the more severe problems (lower quality of neighbourhood). The categorical scale for the variable that

measures the quality of neighbourhood takes value 1 when individuals face no problems with the neighbourhood, 2 when individuals face moderate problems with the neighbourhood and 3 when individuals face major problems with the neighbourhood. Finally, our measure for the quality of neighbourhood is constructed by computing the average value from the five questions which designated the quality of neighbourhood with respect air, crime, litter, noise and water. We have normalized the quality of neighbourhood variable to a scale between 0 and 1 where the former value denotes the lowest quality of neighbourhood while the later value denotes the highest quality of neighbourhood.

A vector of life dimensions that we have chosen to play an important role in lives of individuals, definitely should not be taken for granted or should not be taken as the complete list of life dimensions that individuals find important in their lives. Nevertheless, we assume that the list of life dimensions that we have selected are capturing those dimensions of life for which individuals attach a great deal of importance so that our list of functioning vectors is a reasonable choice.

1.8 Results

1.8.1 Life Satisfaction Regression

In this section we present the estimation results obtained from the life satisfaction regression models. These results illustrate the effect of income and non-income dimensions, socio-demographic and personal characteristics on the level of life satisfaction in a pooled sample of 25 countries. We have specified five different regression models where each specification of the model differs depending on the type of regressors that we are controlling for in that specification. Each specification of the life satisfaction regression is estimated with the ordered logit model[6]. Since the error term in the life satisfaction model could violate the assumption that observations are independent and identically distributed, we have proceed in the estimation by assuming that errors are clustered at the country level. That is to say, we have assumed that the observations are correlated within countries but not between countries. One should bear in mind that since we are presenting the estimated coefficients from an ordered logistic regression, we are only able to make inference about the direction and significance of the effects while we cannot conclude anything about the magnitude of effects by just looking at the estimated coefficients. The results are given in table 1.3.

In model I we control for income and non-income dimensions of life, set of socio-demographic variables and a time dummy for year 2011. We can notice that all variables (except variables urban and lower education) are highly significant. All other things being equal, the life satisfaction is increasing in income and decreasing if you are unemployed, decreasing if you are living in the accommodation of bad quality or if you live in problematic neighbourhood. The effect of health dimension on the life satisfaction should be evaluated relative to the base category of health dimension which is represented with the "very good" health. We can notice that relative to the the base category, the effects of health for all other health categories decrease the life satisfaction. The effect of age on the life satisfaction is found to be convex, or in other words there exists the U-shaped curve for age. The minimum level of satisfaction is reached at the age of 44,5. Males tend to have a lower level of life satisfaction than females, all other things being equal. The life satisfaction is higher for those individuals who are married (or they

[6]In addition, we have estimated the life satisfaction models using the OLS regression (i.e. a cardinal specification of the life satisfaction model) and using a semi-non-parametric estimation of an extended ordered probit model (SNEOP). The results we have obtained from both of these estimation approaches were quite similar with the results we have obtained from an ordered logit model.

cohabitate with their partners) in comparison with individuals who are single. The likelihood of having a higher level of life satisfaction is decreasing for those individuals who are divorced or widowed. Having a child or living in urban area increases life satisfaction although the later effect is not significant.

In addition to previous variables, in model II we introduce a set of country dummies where Austria represents a base category. The rationale for introducing the country dummies is to capture the heterogeneities between countries. After we have introduced the country dummies which serve as the shift parameters of the indifference curves, we can notice that the magnitude of the coefficient for log income decreased substantially. The remaining coefficients on non-income dimensions (except for neighbourhood which has decreased in absolute value) have not changed much in comparison with model I. The coefficients on the socio-demographic variables did not change significantly between model I and model II, except for lower education whose coefficient dropped in absolute terms and it has become statistically significant. Individuals who acquired only a lower level of education (i.e. either no education acquired or having acquired the primary education) are less satisfied with their life in comparison with those individuals who acquired either secondary or higher education.

So far, we have assumed that a functional form of the life satisfaction equation is the same across all individuals which means that the estimated indifference curves are assumed to be parallel lines with the constant trade-offs between each pair of life dimensions. Since it is hard to believe that the these trade-offs between life dimensions are constant, so we have decided to introduce a more flexible functional form in which we allow for the heterogeneity of individual preferences. We have assumed that the preferences of individuals belonging to a given socio-economic group differ across these groups. Thus, we have introduced the interaction terms between the life dimensions and socio-economic characteristics.

The concept of life dimensions denotes a list of important dimensions of individual well-being which measures the life achievements of individuals. Needless to say, there is no general approach which we can follow for defining the list of income and non-income dimensions which individuals find important in life and therefore the dimensions we have chosen seemed to us as a reasonable list of life dimensions the individuals care about. Another important point concerns a distinction between life dimensions and basic needs which individuals have to posses in order to achieve those life dimensions. For instance, one can think of basic needs as the minimum

amount of food, water, shelter, and availability of health care.

A reasonable concern can be raised on whether education is a life dimension or it is a scaling factor. Although we allow for the possibility that some individuals perceive education as a life dimension, we have opted to treat education as additional variable which only has an effect on the individual level of aspiration. In other words, we perceive the level of acquired education as a mean that individuals seek to accomplish in life rather than the outcome[7]. Unfortunately, it turns out that there is no apparent agreement on the level of basic needs that are sufficient for individuals in order to acquire life dimensions. Even though we can argue that the question on whether or not individuals have acquired their dimensions of life will depend on the realization of basic needs, the later will inevitably depend on the socio-economic characteristics and norms in the society. Nevertheless, accounting for the right specification of basic needs when the socio-economic characteristics differ across individuals, is definitely not a trivial task in the well-being analysis.

Additionally, when one chooses over important life dimensions, it is important to pay attention whether this choice should include the personal dimensions of life (i.e. being single, being married, being divorced, having children and the like). Despite the fact that we are certainly not denying that individuals might perceive these personal life characteristics as the important dimensions of life, nevertheless our interest will be to compare the well-being across countries and in the following comparison we will concentrate on the dimensions of life which can be affected by public and social policies. That is to say, in our study we are focusing on the public domains of life which are important for individuals but on the other hand we want to allow for the that social and public policies use their instruments for making welfare improvements.

In the third column of table 1.3 we present the results that have been obtained when we included the interaction terms. Immediately one can notice that the coefficient on log income have decreased by more than half in comparison with the model II. This is clearly a consequence of introducing the heterogeneity of preferences which we have illustrated with different socio-demographic characteristics that a group of individuals belong to. Other things being equal, the effect of income on life satisfaction is higher for those individuals which live in the urban areas and for those individuals who have children. Although we have found a larger income effect for males, for individuals in the middle age, for married (or cohabiting) couples and in-

[7] As a result, our specification treats the level of schooling which individuals have acquired as a mean for achieving personal realization in the domain of education (i.e. to achieve literacy).

dividuals with a lower level of education, however these effects are not statistically significant. The coefficients on non-income dimensions of life kept the same sign and statistical significance as in the previous two specifications. Individuals with children have a higher life satisfaction when their are unemployed and when they are in a "good" health. As it was already mentioned, a higher income is more important for those individuals with children. Moreover, the results show that having a higher quality of neighbourhood is more preferred for those individuals who are married (or cohabiting) and for those individuals with a lower level of education. Having a "good health" is more important in the urban areas. The evidence shows that individuals who are not in their middle age, do not prefer to be in a "bad health".

We are now turning to the model IV which expands the previous model by including the personality traits, that is a set of variables which underline personality of individuals (i.e. their behaviour, thoughts and emotions). In the economic literature researchers have paid much attention on finding a proper treatment of unobserved heterogeneity across individuals in order to reach the validity of statistical inference (see Ferrer-i-Carbonell and Frijters (2004)). An important part of unobserved heterogeneity is ascribed to individual personality which may affect explanatory variables but also the outcome variable. The personality traits can be seen as factors which increase the individual material position but on the other hand they also increase the life satisfaction of individuals. A common approach when thinking about the estimation strategy is to assume that the unobserved heterogeneity is fixed over time within individuals. The estimation procedure in which the individual heterogeneity is treated as time invariant requires from us to work with a panel data but since we are working with a cross-sectional data, in order to deal with the unobserved individual heterogeneity we include a set of variables that are capturing the individual personality.

It is important to emphasize that using either a fixed effects (FE) estimation or random effect (RE) estimation in order to get rid of the individual unobserved heterogeneity can be misleading because both approaches are grounded on a set of specific assumptions which may be too restrictive. That is to say, even if we were to be in a possession of panel data, using the FE estimation will not be an appealing strategy due to (at least) two reasons. The first reason is that we are interested in obtaining the estimates on many socio-demographic characteristics (i.e. age, gender, etc.) but these estimates are not attainable when using the FE estimation because socio-demographic characteristics mostly do not vary within individuals. The second

reason is concerned with better understanding of what is happening in the estimation process. It is reasonable to opt for the FE if one assumes that the unobserved individual heterogeneity is correlated with the explanatory variables in the model. However, if we have information on the personality of individuals, then instead of using the FE estimation, it makes more sense to include the information on the personal characteristics in our model.

We should also emphasise that there is no common agreement on the definition of unobserved heterogeneity. The most prominent channels through which the unobserved heterogeneity has an effect comes from the individual ability (see Di Tella et al. (2010)), health (see Winkelmann and Winkelmann (1998)), anchoring or the attitude of individuals (i.e. pessimistic or optimistic) which is then reflected in providing inaccurate answer to the question about the well-being of individuals (see Clark et al. (2005)). Nevertheless, we mostly assume that the individual heterogeneity operates through the channel of individual personality (see Ferrer-i-Carbonell and Frijters (2004) and Frijters et al. (2004)).

A commonly used model that describes individual personality is the Big Five which includes openness to experience, conscientiousness, extroversion, agreeableness and neuroticism (see John and Srivastava (1999) and Borghans et al. (2008)). It has been shown the Big Five can robustly categorise individuals and their behaviour into these five groups. In contrast to the literature in psychology which conceive the personality traits as the most important factors of well-being, economists are more akin to economic understanding of well-being where dimensions of personality are mostly neglected. Although we control for the personality traits in our study, our main focus is on the effects of socio-demographic variables on the individual well-being since the latter effects are customarily susceptible to social and public interventions.

The EQLS contains five variables on individual personality which we have used in our study. The individuals were asked the following question *Which is closest to how you have been feeling over the last two weeks?* They could answer to what extend they have been optimistic about the future (*Optimistic*), feeling cheerful and in the good spirit (*Cheerful*), feeling calm and relaxed (*Calm*), feeling active and vigorous (*Active*) and whether their life has been filled with things that interest them (*Life Interest*). Individuals could express their degree of optimism on a scale from 1 if they "strongly agree" to 5 if they "strongly disagree" while for all other variables the suggested answers have ranged from 1 if they "agree all of the time" to 6 if they "agree at no time". Both scales were recoded in the inverse order so that we easy the

interpretation. Note that we assumed that the personality traits are cardinal variables.

We have found that each personality trait increases the likelihood of having a higher life satisfaction. It is important to notice that once we have controlled for the personality traits, the coefficient on each life dimension (except on income) has decreased in the absolute value. This evidence is perfectly in line with the argument that there is a substantial correlation between the individual personality and the explanatory variables. That is to say, the individual heterogeneity that is attributed to individual personality substantially reduces the size of coefficients (in absolute terms) on life dimensions. This evidence points out that some individuals have a higher level of life satisfaction which is attributed to the personality traits. In addition, once we have controlled for the personality traits, we can notice that the coefficients on the socio-demographic variables have decreased in absolute value as well. This also indicates that there is a correlation between socio-demographic variables and personality traits although the direction and statistical significance remained unchanged after we have controlled for the individual personality.

In model IV we have included the additional control variable which is the level of trust. This variable was constructed from the responses on the following questions *Would you say that most people can be trusted?* and *How much you personally trust each of the following institutions: a) legal system, b) police?* For the first question, the individuals were offered a categorical scale of possible answers where the scale ranged from 1 if you think that "you cannot be too careful" to 10 if you think that "most people can be trusted". For the last two questions a categorical scale of possible answers ranged from 1 if you "do not trust at all" to 10 if you "trust completely". Finally, the trust variable have been constructed as the average value of given responses on these three questions. Other things been equal, we have found that trust have a positive and statistically significant effect on the life satisfaction. Nevertheless, it may well be true the causality between trust and life satisfaction is reversed.

Until so far we have not assumed that the life satisfaction is dependent on the life dimensions of the reference groups with whom individuals could possibly compare themselves. The empirical evidence suggests that the level of happiness or satisfaction of individuals depends not only on their level of life dimensions but it also depends on the level of life dimensions that are possessed by others. If individuals have concerns about their relative income position in the society, then the utility function will be dependent on the income level of the reference group

with whom individuals are comparing themselves. This is known as a social comparison effect (i.e. a sociological norm). The relationship between the relative income and well-being has been found in various studies (see Easterlin (1974, 1995, 2001), Stadt et al. (1985), Clark and Oswald (1996), Ferrer-i-Carbonell (2005) and Vendrik and Woltjer (2007)). Applying the same line of reasoning it has been shown that the relative position matters with respect to unemployment (see Clark (2003)).

The second important mechanism concerns the effect of adaptation (i.e. a psychological norm) which designates the process of psychological comparison in which an individual compares her current situation with respect to some dimension of life and then relate it to her previous experience. The theory suggests that the marginal effect of having the income aspiration lowers the level of utility and it also suggests that the individual aspiration is increasing in income (i.e. other things being equal, this implies that individual aspiration is increasing in the level of income which an individual had acquired in the past). However, it turns out that the effect of adaptation is marginally decreasing over time. The empirical evidence that points out on the process of adaptation according to which individual aspiration is increasing in income has been found in studies by Stutzer (2002) and McBride (2001), among others.

In order to capture the process of social comparisons, we have included in model V a list of regressors which represents a reference group for income and non-income dimensions. However, we were unable to test whether there exists an effect of adaptations on the life satisfaction of individuals. Although, there is no common agreement how to define a reference group for the life dimensions, yet one approach that has been singled out is to construct the reference group for a certain life dimension according to the average value of that life dimension. In our study we have followed this approach so we have constructed the reference-group-variables for all life dimensions (except health) by computing the conditional mean of each life dimension with respect to gender, region, country and year.

The results which are illustrated in column five suggest that there exists a negative comparison effect for the accommodation and positive comparison effect for income, unemployment and neighbourhood, although only the effect on neighbourhood is statistically significant. Having found a positive comparison effect for income indicates that an increase in income of the reference group would increase the life satisfaction of an individual. Positive coefficients on the reference group for unemployment and quality of neighbourhood show that the life satisfac-

tion of an individual increases as unemployment and quality of neighbourhood of the reference group decrease. On the contrary, if the quality of accommodation of the reference group would decrease then the life satisfaction of an individual would decrease as well. Although we are certainly not neglecting the role of aspirations, we must confess that our final specification did not find any robust effects of aspirations. Thus, we opted to use our specification in model IV for the estimation of equivalent incomes.

1.8.2 Empirical Comparison of Well-being Measures

This section illustrates the results we have obtained from two well-being measures, income (y_i) and equivalent income (y_i^*). At this stage we are not indulging in the examination of inequality in the distributions of these two measures. Nevertheless, later on we will raise the important question which concerns the distributional analysis of the well-being. Although, we could have included the subjective life satisfaction (S_i), as our third measure of individual well-being, nevertheless we have decided to concentrate only on the comparisons between income and equivalent income.

The approach we have taken for comparing well-being across countries consists of calculating the averages of income and equivalent income at the country level and then we rank each country according to the averages of each measure. Since we know that adding additional non-income dimensions will lower the value of equivalent income, it is not very appealing to compare the absolute values of equivalent income with absolute values of incomes. Thus, we will concentrate on the ordinal rankings of measures. We present the growth rates of each well-being measure between 2007 and 2011 and we rank countries accordingly. The results are presented in table 1.4. For ease of presentation we have plotted the country rankings of income and equivalent income and its changes over years in figure 1.3 (panel a and panel c).

Ranking countries according to the average income in 2007 indicates that Luxembourg has the highest income, the Netherlands has the second largest income while Bulgaria and Romania are two countries with the lowest incomes. We can notice that for all countries the average value of equivalent income is lower then the average value of income. This evidence indicates that neither country has reached the best value for all non-income dimension that we have used for computing the equivalent income. The highest average equivalent income in 2007 was in Luxembourg while the lowest equivalent income was in Bulgaria. Comparing the relationship between the income rank in 2007 and equivalent income rank in 2007, we can notice that the ranking overlaps for several countries (see panel a of figure 1.4). The largest improvement in equivalent income rank in 2007 occurred in Cyprus, while the largest loss occurred in the United Kingdom and Belgium.

The results for 2011 show that Luxembourg has the highest income rank [*1*], Sweden has the second highest income rank [*2*], Romania has the second to last income rank [*24*] while Bulgaria has the lowest rank [*25*]. Comparing the rankings of equivalent income in 2011, we

find the highest average equivalent income in Luxembourg which is followed by Sweden and Denmark while the lowest equivalent incomes are in Latvia and Romania and Bulgaria. The rank of income and equivalent income in 2011 either remained the same or has changed slightly for some countries (see panel c of figure 1.4).

We can observe that all countries have had a negative growth rates of income. Luxembourg and Greece had the largest negative growth rates of average income while the smallest negative growth rates were in Poland and Bulgaria. The growth rates of equivalent income were negative for all countries except for for Bulgaria, Poland and Slovakia which had positive growth rates of equivalent income. Luxembourg and Estonia had the largest negative growth rates of equivalent income. While we have seen that the rankings between the average incomes and equivalent incomes do not change substantially for most of the countries, yet the rankings between the growth rates of income and equivalent income show a substantial re-ranking that occurs between countries (see panel e of figure 1.4). We can see that the ranking of the growth rate of income and equivalent income overlaps only for Luxembourg, Spain and Czech Republic, while all other countries experience a re-ranking between the growth rates of income and equivalent income measures. The results we have found indicate that if we measure the relative position of a country with the growth rate of equivalent income, then we observe a significant rank improvement of Italy, Slovenia, Portugal, Latvia and Greece, while on the other hand a significant rank deterioration occurred in Austria, Germany, Cyprus, Sweden, the Netherlands and Finland.

1.8.2.1 Inequalities and Social Welfare Functions

So far we have only put emphasis on the average level of income and equivalent income but we have not raised any concerns for inequality in the distribution of these two measures. In order to express our ethical position that we should give a higher weight to those individuals who are located at the bottom of distribution, we will introduce a concept of justice. One can introduce a concern about justice by specifying the social weights which reflect a normative perspective on the degree of inclination for justice. While the Utilitarian social welfare function assumes that each individual deserves an equal weight, on the other hand the Rawlsian social welfare function will attach only a positive weight to the worst off individual in the society. A common approach for introducing social weights is to compute the mean value of a well-being measure which is then corrected by a distributional factor reflecting the degree of awareness to

inequality. We will employ the following approach by correcting both well-being measures with a single parameter generalized Gini coefficient proposed by Donaldson and Weymark (1980). The generalized Gini coefficient can be represented in the following way

$$\text{Gini}(X, \rho) = -\rho \text{ Cov}\left(\frac{X}{\mu(X)}, \Big(1 - \Phi(X)\Big)^{\rho-1}\right) \tag{1.26}$$

where X is a random variable, $\mu(X)$ is the mean of X, $\Phi(X)$ is the cumulative distribution function of X and ρ is a parameter that describes the degree of aversion to inequality. Once we compute the measure of inequality we can proceed with computing the social welfare function

$$\text{SW}(\mu, \rho) = \mu(X)\Big(1 - \text{Gini}(X, \rho)\Big) \tag{1.27}$$

where the term $(1 - \text{Gini}(X, \rho))$ denotes the correction factor for inequality. We will first illustrate the results of the Gini coefficients for income and equivalent income. The generalized Gini coefficient is computed for ρ equals 2 in which case we obtain the standard Gini coefficient and for ρ equals 5 which implies a stronger degree of aversion to inequality or in other words it gives a stronger weight to individuals who are located at the lower tail of the distribution. We use the Gini coefficients for income and equivalent income to compute the social welfare function of income and equivalent income which is then corrected for the inequality in distributions. After we have obtained the social welfare measures which are sensitive to the notion of justice, we have compared the ranks across countries.

In table 1.5 we present the Gini coefficients for income and equivalent income together with the ranking which is implied by these two inequality measures (see figure 1.5 and figure 1.6). Income inequality in 2007 was the lowest in Slovenia, Sweden and Slovakia while the highest income inequality is found in Latvia, Portugal, Romania and the United Kingdom. The evidence on the equivalent income inequalities in 2007 shows that countries which had the highest income inequality also have the highest inequality of equivalent income while some countries with the lowest level of income inequalities have become relatively more unequal with respect to the equivalent income. Nevertheless, the United Kingdom is an exception because it became relatively less unequal by equivalent income measure. An important point to notice is that the equivalent income inequalities are significantly higher than the income inequalities across all countries.

Analysing income and equivalent income inequalities in 2011 we can immediately notice a few changes which happened in contrast with 2007. In 2011 the lowest income inequality is found in Slovenia, Czech Republic and Sweden, while the highest income inequality is found in Greece, Latvia and Portugal. We can notice that in 2011 some countries like the Netherlands, Belgium, Czech Republic, the United Kingdom and Lithuania have experienced an improvement in the ranking of income inequality (i.e. they have become less unequal) relative to income inequality ranking in 2007. On the contrary, countries which had less income inequality in 2007, like for instance Greece, Spain, Italy and Hungary, have become more unequal by income in 2011. The lowest equivalent income inequality in 2011 has been found in the Netherlands, Sweden and Austria while the highest inequality has been found in Greece, Latvia and Romania.

An interesting evidence arises when we compare income and equivalent income inequalities (see figure 1.6). We have found that Slovenia and Slovakia who were having relatively the lowest income inequalities in 2011, have experienced a noticeable larger equivalent income inequalities in 2011. The opposite evidence has been found for countries like Greece, Spain and Portugal whose income inequalities were relatively among the highest yet the equivalent income inequalities in these countries were much lower. Countries that had the lowest equivalent income inequalities in 2007, like for instance Sweden and the Netherlands remained at the lowest level of equivalent income inequalities in 2011, while countries which had the highest level of equivalent income inequalities in 2007 like for instance, Latvia and Romania, have retained the highest level of equivalent income inequalities in 2011 (see panel b of figure 1.5). We have also found an interesting reversal in the rankings of equivalent income inequality between 2007 and 2011. While Poland and Portugal have lowered their rankings from 2007 to 2011 (i.e. they have moved towards those countries who have more equal distributions of the equivalent incomes), Hungary and Bulgaria experienced an increase in the ranking of equivalent income inequality (i.e. they have moved towards those countries which have more unequal distribution of equivalent income).

We are now turning to illustrate the social welfare measures of income and equivalent income. We will concentrate only on the ordinal rankings of social welfare measures. Notice that both social welfare measures we have previously described are based on the distributional parameter representing the degree of aversion to inequality ρ which is set to 1. This implies the utilitarian perspective on well-being according to which the social welfare measure is rep-

resented with the mean value of the well-being measure. The interpretation we will provide is based on the social welfare measures which are corrected with the standard Gini coefficient (i.e. inequality aversion parameter ρ equals 2).

Countries with the highest level of social welfare of income in 2007 are Luxembourg, Sweden, the Netherlands and Denmark, while the lowest level is found in Poland, Latvia, Romania and Bulgaria. An interesting evidence emerges for the United Kingdom whose income rank has substantially decreased once we have used a distribution sensitive measure in relation to the income rank obtained from the utilitarian social welfare function (see panel e of figure 1.3). This points out to the fact that income inequality is having a substantial effect in the United Kingdom. The largest social welfare of income in 2011 is found in Luxembourg, Sweden, the Netherlands and Denmark while the smallest social welfare of income is found in Estonia, Latvia, Romania and Bulgaria (see table 1.6).

Countries with the highest level of social welfare of equivalent income in both years are Luxembourg, Sweden and the Netherlands while countries with the lowest level of social welfare of equivalent income are Latvia, Romania and Bulgaria. Some countries have experienced a noticeable re-ranking in the social welfare of equivalent income between 2007 and 2011 (see panel d of figure 1.3). The rank of social welfare of equivalent income has moderately decreased (i.e. countries have relatively improved their positions) from 2007 to 2011 in France, Belgium, Italy and Poland while the rank of social welfare of equivalent income has moderately increased (i.e. countries have relatively decreased their positions) in Estonia, Latvia, Greece, the United Kingdom and Cyprus.

Finally, we compare the ranks of the growth rates of social welfare of income and equivalent income (see panel f of figure 1.4). We observe that the ranks of growth rate of social welfare of income and equivalent income stay unchanged only for Poland, Belgium and the United Kingdom, while the respective ranks have changed for all other countries. We can see that the relative position of Italy, Portugal, France, Slovenia and Lithuania has considerably improved as we moved from the growth rate of social welfare of income to equivalent income while the opposite holds true for Finland, the Netherlands, Sweden, Cyprus, Germany, Romania and Austria. As we have seen, the rankings of countries have changed moderately as we moved from the levels of social welfare functions of both measures, yet we can notice that a considerable re-ranking occurred when we considered the growth rates of social welfare functions.

1.8.3 Willingness-To-Pay for Non-Income Dimensions

In this section we will present two sets of results. The first set of results concerns the (total) willingness-to-pay (WTP) which can be expressed as a difference between income and equivalent income. This amount represents the monetary value that each individual is willing to give up in order to reach her reference values in all non-income dimensions. The second set of results illustrates the decomposition of the WTP at the willingness-to-pay contributions for each non-income dimension. Since the WTP is a function of income we have normalize it with income in order to neglect the differences in incomes between countries. We have also normalized the willingness-to-pay contributions with the (total) WTP. Although our main focus is to illustrate the relative shares of WTP in income ($\frac{WTP \times 100}{y}$) and relative shares of WTP contributions ($\frac{WTP^d \times 100}{WTP}$), we have shown the results for the absolute value of WTP and its contributions (see table A1, table A2 and table A3).

In figure 1.7 we show the mean of the relative shares of willingness-to-pay in income (hereafter the relative WTP) over gender and age groups. In panel a we illustrate the relative WTP for a pooled sample of men and women. We have found that Sweden, the Netherlands and Denmark have the lowest relative WTP in 2007 while Hungary, Lithuania and Latvia have the highest relative WTP. In 2011 the lowest relative WTP had Denmark, Austria and Sweden while the largest relative WTP had Lithuania, Estonia and Latvia. As we can see the largest changes in the relative WTP between 2007 and 2011 occurred in Italy, Poland and Luxembourg.

In panel b we show the relative WTP for men. We observe that Sweden, the Netherlands, Denmark, Austria and Cyprus have the smallest share of relative WTP in both years, while the highest share is found in Poland, Hungary and Latvia. In panel c we see that the lowest share of relative WTP in 2007 for women is found in Sweden, Austria and Denmark while the largest in Bulgaria, Lithuania and Latvia. The first three countries have the lowest share of relative WTP in 2011 as well, while the highest share have been found in Estonia, Romania and Latvia. If we compare panels b and c we can notice that within countries, on average both men and women are willing to pay similar amount (relatively to income) in order to reach the reference values of the non-income dimensions.

The lowest share of relative WTP in 2007 for the age group 18-44 is found in Austria, the Netherlands and Sweden while the largest share is found in Hungary, Italy and Latvia (see panel d). In 2011, the smallest share of relative WTP for the age group 18-44 has been found

in Austria, Cyprus and Denmark, while the largest share is found in Lithuania, Estonia and Latvia. Among the age group 45-65, Hungarians and Latvians are having the largest share of relative WTP (panel e). It is important to notice that across countries, the share of relative WTP for the age group 45-64 is smaller than the share for the age group 18-44. On the other hand, for majority of countries the share of relative WTP for the age group 64 and older is larger than the shares for the age groups 45-64 and 18-44. We can point out to two reasons why this evidence occurs. The first reason is that the older population (relative to younger population) evaluate to a larger extent the position of being in the best possible state of non-income dimensions. The second reason is that the income effect for the age group 45-64 and age group 65-over should be lower than the effect for the age group 18-44.

We are now turning to the results of the willingness-to-pay contributions for non-income dimensions (hereafter relative WTP contributions). Figure 1.8 shows the shares of relative WTP contributions for the pooled sample of men and women and separately for men and women. We have found that health is relatively the most important dimension across all countries except for Greece in 2007 (see panels a and d). Relative WTP contributions to health are most important in Scandinavian countries, Austria, Germany, the Netherlands and Slovenia. This evidence comes as the result of suffering from the lower health level of individuals these countries. The second most important non-dimension for almost all countries in 2007 turns out to be the quality of neighbourhood. The highest relative WTP contributions to neighbourhood in 2007 is found in Greece while the lowest in Finland. The quality of accommodation is found to be on the third place of importance in 2007. The highest relative WTP contributions to accommodation is found in the Baltic countries, Romania and Bulgaria. It is quite striking that the importance of unemployment turns out to be at the last place across all countries.

The relative importance of non-income dimensions in 2007 shows a similar pattern between men and women across countries (see panels b and c). Nevertheless, one can see that the relative importance of health over countries has marginally higher effect for women than for men. Men attach a higher weight on the quality of neighbourhood than women do. The importance of the quality of accommodation and employment are almost equal for both men and women across countries.

The results for 2011 show many similarities with the results for 2007, although there are some interesting changes between these two years. We can see that across all countries the

health dimension plays relatively the most important role (see panel d of figure 1.8). The second most important non-income dimension for most countries is the quality of neighbourhood, on the third place is the quality of accommodation and on the last place is the employment status. Although, the employment status has relatively the smallest effect across most countries, nevertheless we can observe that for some countries like Bulgaria, Greece, Spain and Slovenia the relative WTP contributions to unemployment have grown substantially from 2007 to 2011. However, this effect should not be surprising because the following countries have experienced a significant labour market shock during the recent economic crisis which began in 2007 and 2008.

Figure 1.9 shows the relative WTP contributions of non-income dimensions for the age groups 18-44, 45-64 and 65-over. Despite the fact that health is the most important dimension among the age group 18-44 for majority of countries, we can see that for Greece, Cyprus, Bulgaria, Hungary, Poland, Italy and Spain other non-income dimensions are either more important or somewhat equally important as health. One can notice that the effect of health becomes more important across countries as we move from the youngest to the oldest age group so that the effect of health is predominantly the most important across countries for the age groups 45-64 and 65-over. This should make perfect sense since we observe that older people have stronger preferences for health but also due the fact that older people are in worse health than the younger people. We can observe that unemployment plays no role for the age group 65-over since elderly people have already been retired.

1.8.4 Description of the Well-being of the Worst off

In this section we focus on the worst off individuals with respect to both measures. Focusing on the worst off individuals is important from the normative perspective of policy makers who create a dozen of public and social policies which have the aim of improving the well-being of individuals. Our analysis is going to unveil who are the worst off individuals by providing a complete characterization of their incomes, non-income dimensions, life satisfaction and socio-demographic characteristics. We have used the bottom 20th percentile of income and equivalent income as a threshold for identifying the worst off individuals. All individuals below this threshold are characterized as being the worst off. The threshold is computed at the country level and for each year. We only present the result for 2011.

We first illustrate the results for the worst off with respect to income. These results are given in table 1.7. Note that we have multiplied all non-income dimensions except health with 100. The average equivalized household income among the worst off individuals with respect to income is lowest in Romania and Bulgaria while it is highest in Luxembourg and the Netherlands. The average quality of accommodation differs noticeably across countries. For instance, the highest quality of accommodation among the worst off is in Sweden (6.65) while the lowest quality of accommodation is in Latvia (35.80) and Romania (33.66). We have not found any noticeable differences in the self-assessed health across countries. The average quality of neighbourhood is lowest in Greece, Bulgaria and Cyprus while highest in Denmark and Finland. The highest unemployment rates among the worst off individuals are in Latvia (34.84%) and Bulgaria (30.15%).

The oldest population among the worst off is to be found in Slovenia and Luxembourg. Czech Republic has the smallest percentage of men among the worst off individuals (34.39%). We found that the likelihood of being married among the worst off individuals is highest in the Mediterranean countries (Cyprus, Greece, Portugal and Spain) while it is lowest in the Scandinavian countries (Denmark, Finland and Sweden). The highest percentage of divorced individuals among the worst off is found in Sweden (25.26%) while the smallest percentage is found in Italy (5.22%). The difference in the number of widowers and widows across countries are quite noticeable. Among the worst off we have found that on average there is only 3.76% of widowers and widows in Luxembourg while in Slovenia the percentage of widowers and widows is 30.02%.

We will now compare the results for the worst off individuals with respect to income (numbers given in rows of table 1.7) with the unconditional averages of the population (numbers given in columns of table 1.2). We observe that in the United Kingdom the worst off posses 40% of the average income while in Romania the worst off posses 30% of the average income. Although, we can see that health is lower among the worst off individuals across all countries, nevertheless these differences are not well pronounced. Comparing the socio-demographic characteristics between the worst off and the average individual in the population, show some interesting evidence. We can see that in Belgium, Germany, Estonia, Greece, Lithuania, France, Hungary, Luxembourg, Latvia, the Netherlands and the United Kingdom the average age among the worst off is lower than the average age among the population. In every country except Belgium, Estonia, Hungary and the United Kingdom the percentage of men among the worst off is lower then the average percentage of men in the population. In the Scandinavian countries, the probability of finding an individual who is married among the worst off with respect to income is around 30 percentage points lower than on average finding the same individual in the population.

In table 1.8 we illustrate the portraits of the worst off measured with the equivalent income. We can see that the lowest average equivalized household income among the worst off is found in Romania while the highest average income among the worst off individuals is found in Luxembourg. It is striking to see that the average income among the worst off individuals is 7 times higher in Luxembourg than in Romania. We observe that across all countries, the average income of the worst off individuals with respect to the income (table 1.7) is lower than the average income for the worst off individuals with respect to the equivalent income (table 1.8). This evidence points out that some individuals who were not below the income threshold are nonetheless classified as the worst off with respect to equivalent income. The average life satisfaction among the worst off individuals with respect to equivalent income is lowest in Bulgaria (4.53) while it is highest in Denmark (7.87).

Among the worst off individuals with respect to equivalent income, Denmark has the highest quality of accommodation (9.01) while Latvia has the lowest quality of accommodation (41.45). The least healthy individuals among the worst off are in Lithuania, Latvia and Estonia while the most healthy individuals are in the Mediterranean countries. The lowest unemployment rate among the worst off individuals is found in Romania (10.50%) and Finland (11.55%)

while the highest unemployment rate is in Latvia (45.54%) and Spain (43.78%).

We observe the apparent differences in socio-demographic characteristics across countries. Among the worst off individuals we have found that the youngest individuals are in Luxembourg with the average age of 38 while the oldest individuals are found to be in Czech Republic, Portugal and Bulgaria with the average age of 48. A moderate gender differences among the worst off individuals are present across countries as well. For instance, Denmark, Finland, Slovakia, France, Romania, Poland, Lithuania and Latvia have an equal share of men and women among the worst off while in Germany, Slovenia, Hungary and the United Kingdom there is 63% of men among the worst off individuals. The highest rate of divorced or separated among the worst off is found in Slovakia (28.80%) while the smallest rate is found in Greece (5.60%).

Finally, we compare the average worst off individuals with respect to the equivalent income (numbers given in rows of table 1.8) with the average individuals in the population (numbers given in rows of table 1.2). We can notice that the percentage of the average income for the worst off individuals differs noticeably across countries. For example, in Romania the worst off individual possess less then 50% of the average income while in Sweden this percentage is 65%. We observe that the average life satisfaction among the worst off individuals with respect to equivalent income is lower than the average life satisfaction in the population.

We can also notice a substantial differences across countries between the average value of non-income dimensions among the worst off individuals and the average value of non-income dimensions in the population. The relative likelihood of having a lower quality of accommodation is higher for the worst off individuals than the average individual across countries. The average value of health is higher among the average population than among the average value of health among the worst off with respect to equivalent income. The relative likelihood of having lower quality of neighbourhood is higher among the worst off individuals across all countries with some notable exception. The most compelling cross country differences are found for the unemployment status. Differences in the socio-economic characteristics are also noticeable across countries. The most prominent age gap between the average worst off individuals with respect to equivalent income and the average individual in the population is found in Luxembourg with around 7 years older individuals in the later group.

1.8.5 Overlap of the Worst off Individuals

In the previous section we have shown that different well-being measure would identify different individuals among the group of the worst off. These individuals differ in average incomes, average equivalent incomes, average values of non-income dimensions and socio-demographic characteristics. We have also shown that according to each well-being measure, the worst off individuals would differ over countries. In this section we illustrate the percentage of individuals who belong to the worst off according to both income and equivalent income measures. We show the percentage of individuals among the worst off when they belong to the bottom 10th percent and bottom 20 percent according to each measure. We will present the results for 2011.

In the first column of table 1.9 we show the results for the entire sample, in the second column we show the results for men while in the third column we show the results for women. We can observe that the percentage of individuals who belong to the bottom 10th percent of income and equivalent income measures varies from 1.4% in Luxembourg to 2.6% in Cyprus. While the highest percentage of males who belong to the bottom 10th percent of income and equivalent income measures is found in Lithuania and Greece, the highest percentage of females who belong to the bottom 10th percent of income and equivalent income measures is found in Cyprus and Czech Republic. We have found that around two-thirds of the countries have higher percentage of men among the bottom 10th percent of income and equivalent income, while around one third of countries have higher percentage of women among the worst off.

Increasing the threshold value for identification of the worst off at the bottom 20th percent, increases the percentage of individuals among the group of the worst off. The overlap of individuals who belong to the bottom 20th percent of income and equivalent income measures is highest in Bulgaria, Cyprus, Portugal and Greece while lowest in Slovenia, Luxembourg, Finland and Hungary. The highest percentage of women among the bottom 20th percent of income and equivalent income is found in Bulgaria and Cyprus, while the highest percentage of men among the bottom 20th percent of income and equivalent income is found in Greece and Portugal. We can see that with the identification threshold set at the bottom 20th percent of income and equivalent income, the percentage of women among the worst off is larger in around two-thirds of countries which means that the percentage of men among the worst off is larger in around one third of countries.

1.8.6 Re-ranking between Income and Equivalent Income

We have seen that the ranking of countries is dependent on which measure of well-being we use. In this section we illustrate the size of re-ranking between income and equivalent income measures that happens for all individuals within a country. The following analysis is important for constructing the progressive redistribution policy according to which we could redistribute from some individuals at the top end of distribution to others located at the bottom end of distribution. In order to do that we have to consider all individuals in a society.

In figure 1.10 we plot the rank of the individuals within each country according to the percentile of income and equivalent income an individual belongs to in 2011. These plots are called sunflowers and they are convenient for representing bivariate data whose observations are having a high density which are difficult to read with the standard scatter plots. A sunflower plot is divided into a low density bins which plot the individual observation as in the standard scatter plots, a medium density bins which contain light sunflowers and high density bins which contain dark sunflowers. While each petal in the light sunflower represents one observation, petals in dark sunflower represent a particular number of observations. If all points were to be situated on a diagonal line, there wound be no individuals whose rank of income and rank of equivalent income differ. Thus, the observations off diagonal are representing the re-rankings between the two measures.

In order to determine the size of re-ranking, we have computed the Spearman rank correlation coefficient r which is a bivariate non-parametric measure of rank correlation. The Spearman rank correlation coefficients are presented on each plot. We have also tested the statistical significance of the Spearman rank correlations and all coefficients have shown to be significant at the 1%.

One can immediately notice that the scatter plots show similar patterns across all countries which means that the re-ranking between income and equivalent income is to be similar across countries. Nevertheless, the size of re-ranking differs across countries. While the highest density of observations are placed around the diagonal, we observe that a lower density observations are spread out in the top left hand side of the plot. These findings highlight the fact that while for most of individuals we would not find a considerable difference in ranks of income and equivalent income, yet for those individuals located in the top left hand side of plot, the re-ranking between these two measures is pronounced. The later re-ranking indicates that individuals who

are income rich can end up as equivalent income poor. It should not be surprising to observe these findings since we know that the equivalent income is a multi-dimensional and preference sensitive measure. Thus, although individuals care about income, they also give weights to other non-income dimensions.

On the other hand, we have found no individuals who are equivalent income rich and income poor. We can see that the highest degree of re-ranking between the income and equivalent income measure happens in Hungary, Italy, Spain and the Netherlands (countries with the lowest value of the Spearman rank correlation coefficient) while the highest degree of overlap between income and equivalent income ranks are in Greece, Austria, Finland, Denmark and Bulgaria (countries with the highest value of the Spearman rank correlation coefficient).

An interesting detail that we observe across all countries concerns a high concentration of observations in the top right corner of the plot. These findings indicate that there is a high density of individuals who are faring very well with both income and equivalent income measure. Thus, these individuals belong to the top end of income distribution but they have also achieved very high values of the non-income dimensions of life. Our findings in this section have shown that although there is a significant amount of individuals whose ranking between income and equivalent income measure overlaps, still we have observed a considerable re-ranking for certain individuals across countries.

1.9 Conclusion

Over the last decade we have witnessed a growing interest in the empirical welfare analysis which compares the well-being over and within countries. An important contribution to this surge of literature comes from Stiglitz et al. (2010) who have emphasized the importance of overcoming the *income approach* for measuring the well-being. They have suggested that we should focus on the multi-dimensional measure of well-being since income is not the only dimension that matters in life. We should also bear in mind that the choice of well-being measure is grounded on the normative assumptions which are essential in the process of measurement. Hence, the creators of social and public policies which are using well-being measures for their policy evaluations are indulging in putting forward their ethical and political perspectives resulting from these measures.

According to our point of view a reasonable measure of the individual well-being should be sensitive to egalitarian perspective of equality among all people and it should respect individual preferences over important life dimensions. The literature on happiness and life satisfaction have demonstrated that interpersonal comparisons of utility are attainable when the preferences of individuals over life dimensions are respected. However, this literature has questioned the righteousness of using information on the level of happiness or life satisfaction as a measure of individual well-being since the subjective utility might be affected with the scaling factors which make individuals utilities incomparable. Abandoning *subjective welfarism* as a legitimate measure of individual well-being have created an obstacle in designing a well-being measure which respects individual preferences over life dimensions.

Fleurbaey (2011) and Fleurbaey and Blanchet (2013) have demonstrated that it is possible to compare the individual well-being defined over various life dimensions when the heterogeneity of individual preferences is respected. In the literature this is known as the *equivalent income* approach. Nevertheless, the heterogeneity of individual preferences is occasionally overlooked in the empirical analysis of individual well-being. This is despite the fact that a great deal of studies have shown that individual preferences matter. Although, we are aware the fact that interpersonal welfare analysis is not a trivial task, still this does not justify the position of researchers to neglect the individual preferences when making individual welfare comparisons. An obvious obstacle which immediately emerges when individual preferences are respected concerns the question of aggregating various life dimensions into a single index.

In this study we have compared the well-being across 25 European countries using income and equivalent income. Accepting the idea of equivalent income implies that we have abandoned the standard income approach in the evaluation of individual well-being and instead we have computed the preference sensitive and multi-dimensional well-being measure which consists of income and non-income dimensions. Our results confirm that the evaluation of well-being across countries depends on which measure we use. As we have shown, the ordinal rankings resulting from the equivalent income and income, have given us a quite different picture of the well-being of countries. The following evidence reassures our previous point that each welfare measure embodies a certain set of normative assumptions which can have different welfare implications. For that matter, it is immensely important for the creators of social and public policies to show interest in the distributional effects of well-being. Certainly, the later only holds if we agree on the egalitarian doctrine which advocates the idea of equality of people.

Although, it is predominately a normative matter to debate about whether one can use the individual preferences as a well-founded justification for redistribution, one can reasonably argue that in some occasions we should hold people responsible for their preferences. We have shown that besides income, individuals have strong preferences for non-income dimensions. We have found that the identification of the worst off individuals is sensitive to the notion of equality and the heterogeneity of individual preferences. The results of this sort can be of crucial importance to policy makers when they are accomplishing their policy evaluations. Nowadays, the majority of comparisons of the individual well-being are based only on a single dimension of income but we could reasonably argue that the following approach is exceptionally narrow because individuals care about their non-income dimensions as well.

Our results have confirmed that the worst off individuals differ with respect to each welfare measure we have used. We have found that for both measures of income and equivalent income, the identification of the worst off individuals will be quite different across different socio-demographic groups. If we accept the position that material resources are not the only important aspects of life but on the contrary that people care about other non-material dimensions, then the results we have obtained for the worst off individuals with respect to equivalent income can be of a greater importance for policy makers. The policymakers can use the information on the socio-demographic characteristics of the worst off individuals in order to design a policy which would aim to compensate the individuals who are classified as the worst off.

Finally, we have used the information on equivalent income for each individual in order to restore their willingness-to-pay for each non-income dimension and in the next step we have used the Shapley value decomposition in order to obtain the exact contributions of the willingness-to-pay attributed to each non-income dimension. This decomposition has revealed some interesting results. We have demonstrated that the average share of willingness-to-pay in income and the contributions of willingness-to-pay to each non-income dimension differ remarkably across countries. It is important to note that the ranks of willingness-to-pay across countries are giving us a quite diverse results depending on whether we use the absolute willingness-to-pay or we normalize the willingness-to-pay with the average income (i.e. relative willingness-to-pay). In the former case, we have seen that countries which suffer the most in non-income life dimensions are those countries with the highest incomes. This evidence makes perfect sense because the countries with the highest incomes can afford to pay the most in order to reach the reference value in these non-income dimensions. On the contrary, the results have shown that the highest relative willingness-to-pay has been found in countries with a lower level of income.

Although, the willingness-to-pay contributions to non-income dimensions are quite heterogeneous across countries, we have still found that the contribution of heath is relatively the most important for most of the countries. A completely striking finding was that the relative importance of employment status was at the last place for most of the countries. We have also seen that the relative importance of the willingness-to-pay contributions differ across different socio-demographic groups. While the relative importance of health is more conspicuous among women, we have also found that the older population evaluate health to a larger extent than the younger population. These findings are revealing an important sources of information which policy makers can use in the process of creation and evaluation of social and public policies. Although, we are aware the fact that a lot of work has still remained to be done we believe that our study has made a step further in achieving this goal.

Table 1.1: Summary Statistics, 2007

	Countries																								
	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HU	IT	LT	LU	LV	NL	PL	PT	RO	SE	SI	SK	UK
Satisfaction	7.09	7.51	4.84	7.07	6.53	7.10	8.49	6.74	6.48	7.20	8.26	7.31	5.42	6.62	6.41	7.94	6.09	7.86	7.02	6.08	6.41	8.43	7.23	6.57	7.26
Income (€/mnth)	2887	2755	818	2410	1729	2728	2872	1521	2178	2524	2799	2697	1286	2460	1473	5226	1263	3149	1379	1847	1002	3144	2122	1512	2951
Unemployment	3.89	8.85	8.00	3.38	2.41	6.99	2.10	3.29	6.66	5.41	2.44	5.44	6.73	2.88	5.45	2.79	4.62	2.45	8.70	8.65	2.16	2.95	5.13	3.29	6.38
Self-assessed health	3.81	3.75	3.51	4.09	3.71	3.78	3.86	3.44	4.05	3.93	3.79	3.91	3.44	3.70	3.36	3.88	3.27	3.91	3.60	3.40	3.57	3.90	3.55	3.70	3.84
Accommodation	5.78	8.80	18.75	11.34	7.07	5.00	9.34	21.37	13.62	7.10	7.87	9.58	15.26	9.83	22.11	8.66	28.44	7.32	14.77	11.31	23.98	5.07	8.35	9.45	10.50
Neighbourhood	19.06	34.90	49.79	23.41	26.82	17.57	13.88	31.81	42.68	29.43	13.51	33.12	41.66	52.31	38.31	34.64	38.25	17.16	43.31	36.25	30.02	14.65	21.02	29.92	25.35
Male	49.28	49.59	47.95	54.93	49.10	49.27	50.00	45.10	50.31	50.77	50.02	49.61	46.62	44.66	47.29	52.59	46.34	51.86	48.01	46.22	50.18	50.17	49.45	48.79	50.36
Age	46.77	48.20	50.04	45.29	46.36	48.56	47.13	45.95	47.14	46.62	47.97	47.49	47.17	50.26	44.85	47.02	47.01	47.49	45.16	47.92	45.52	48.54	47.02	44.75	45.81
Married	70.46	65.87	68.40	73.30	63.52	66.49	69.43	60.70	66.61	72.62	70.95	73.23	62.82	59.11	64.03	71.83	61.10	70.88	66.04	71.68	71.03	69.37	67.58	56.01	65.31
Divorced/Separated	7.27	12.11	5.71	5.27	9.67	8.73	7.68	11.81	3.90	5.00	9.58	8.36	8.09	4.61	9.17	6.20	14.09	8.88	3.94	7.17	5.12	11.26	3.49	6.45	11.53
Widowed	9.47	7.89	14.61	3.70	12.99	7.97	6.68	10.92	7.65	6.57	6.87	7.85	11.35	13.04	11.04	6.16	11.63	5.93	9.40	8.11	8.85	6.05	8.99	11.62	6.29
Lower education	2.48	12.72	4.35	23.56	0.00	4.04	1.97	2.41	33.63	34.01	7.06	16.78	21.15	19.94	8.17	13.95	2.23	4.21	1.61	50.61	8.78	7.81	3.30	0.24	1.68
Children	73.31	76.65	85.30	78.38	75.39	75.22	73.41	79.18	71.70	75.01	79.43	80.37	74.48	68.90	77.89	75.67	77.50	68.74	72.95	77.36	64.38	77.99	75.07	70.29	70.84
Urban	30.71	22.12	39.59	27.14	15.62	26.15	31.45	19.28	42.23	20.27	16.55	12.53	18.14	21.43	29.10	15.16	33.26	29.28	26.30	23.78	29.34	26.78	3.97	10.86	28.43
Feel optimistic	3.65	3.29	3.10	3.32	3.25	3.45	4.10	3.80	3.43	3.76	3.88	3.06	2.99	3.07	3.58	3.42	3.51	3.77	3.63	2.85	3.48	4.20	3.68	3.12	3.47
Feel cheerful	4.17	4.52	3.91	3.94	4.26	4.52	4.74	4.15	4.06	4.36	4.48	4.33	4.26	3.97	4.09	4.48	3.92	4.52	4.11	4.00	3.72	4.75	4.15	4.10	4.46
Feel calm	4.01	4.09	3.73	3.89	4.18	4.33	4.45	3.94	3.92	4.18	4.30	3.86	3.90	3.92	3.88	4.16	3.68	4.34	4.05	3.90	3.75	4.43	4.02	3.90	4.24
Feel active	3.99	4.18	3.84	4.10	3.88	4.29	4.22	3.96	4.22	4.32	4.25	4.25	4.19	4.03	4.04	4.29	3.85	4.21	4.06	3.86	3.85	4.25	3.99	3.97	3.70
Life interest	3.92	4.41	3.22	3.95	4.13	4.39	4.53	3.70	3.87	4.17	4.35	4.36	4.21	3.89	3.90	4.45	3.94	4.64	3.92	3.76	3.61	4.55	4.04	4.16	4.11
Observations	520	701	558	661	740	1333	770	731	696	442	769	1111	667	476	724	458	573	759	908	364	620	885	642	729	764

Notes: Mean values of variables computed at the country level. The life satisfaction variable takes an integer value from 1 to 10. The variables that are given in percentages pertain to unemployment, accommodation, neighbourhood, male, married, divorced/separated, widowed, lower education, children and urban. The self-assessed health variable takes an integer that ranges from 1 to 5, life interest variable takes an integer that ranges from 1 to 6 while all other personality traits variables take an integer from 1 to 5. The results are weighted using the sampling weights.

Table 1.2: Summary Statistics, 2011

	Countries																							
	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HU	IT	LT	LU	LV	NL	PL	PT	RO	SE	SI	SK	UK
Satisfaction	7.54	7.37	5.49	7.09	6.37	7.19	8.39	6.28	6.02	7.39	8.03	7.22	5.77	6.83	6.72	7.79	6.27	7.71	7.03	6.71	6.80	8.06	7.05	6.27	7.29
Income (€/mnth)	2492	2322	792	2095	1437	2485	2517	1108	1505	1897	2270	2317	1082	1965	1182	3533	992	2654	1347	1512	826	2661	1679	1419	2192
Unemployment	3.62	7.51	14.13	8.85	3.50	8.25	5.07	8.01	11.59	17.26	3.34	8.30	9.29	4.52	11.12	3.17	13.54	3.57	10.64	13.17	2.94	4.83	11.28	7.32	6.66
Self-assessed health	4.03	3.73	3.70	4.03	3.63	3.71	3.87	3.35	4.02	3.92	3.73	3.85	3.56	3.81	3.30	3.88	3.28	3.71	3.56	3.48	3.44	3.83	3.72	3.65	3.78
Accommodation	4.24	8.98	17.47	11.28	6.98	5.35	5.97	15.71	13.67	5.49	6.69	8.81	11.39	7.34	14.58	7.45	24.81	6.92	12.12	9.88	18.01	6.42	6.40	6.80	9.62
Neighbourhood	15.87	18.69	27.57	29.31	21.95	17.36	7.38	17.37	27.94	14.14	7.06	16.38	18.23	23.77	20.12	10.40	15.33	10.10	18.90	11.48	21.87	10.69	10.12	15.84	16.21
Male	49.24	50.01	45.76	51.37	47.60	50.89	50.45	44.90	49.45	51.46	49.94	48.23	47.95	47.21	44.88	53.02	43.64	49.35	47.45	48.90	50.77	51.42	48.95	46.02	50.33
Age	47.96	49.63	49.38	47.31	48.85	49.86	48.33	47.75	50.70	48.15	48.50	48.07	48.20	50.83	46.65	46.24	46.38	48.12	46.64	49.14	46.18	48.64	49.41	47.00	46.88
Married	52.59	48.99	59.18	65.88	59.83	49.64	49.68	44.89	60.91	60.74	54.25	56.03	48.04	51.16	49.52	60.83	50.77	56.46	54.57	61.53	57.99	50.81	53.68	52.67	53.93
Divorced/Separated	14.70	17.60	9.29	7.40	13.95	15.08	15.63	14.13	4.70	10.57	14.65	14.50	13.39	9.75	16.34	13.56	17.74	11.20	8.66	8.89	11.46	17.45	7.62	18.27	14.09
Widowed	9.44	12.42	15.06	8.70	13.82	12.52	11.06	14.46	11.67	8.75	7.50	10.53	16.21	15.15	14.08	9.72	12.53	9.00	13.55	9.75	12.72	5.69	15.08	23.07	9.19
Lower education	1.19	12.91	1.70	21.17	0.99	2.68	4.21	3.54	27.47	25.14	11.31	13.96	3.59	15.95	4.74	6.69	0.00	5.21	14.76	48.84	7.92	4.98	2.36	0.66	3.71
Children	59.86	66.89	78.00	72.60	74.69	66.29	68.59	69.80	72.69	68.07	66.14	70.20	68.57	60.43	71.94	68.95	72.52	63.64	70.76	71.71	71.70	63.10	68.30	74.80	69.11
Urban	30.95	27.55	25.91	31.18	15.45	25.73	31.74	19.73	48.61	20.45	20.74	27.89	11.32	20.44	24.51	10.99	23.48	39.24	24.38	20.53	18.63	32.16	11.38	9.49	26.90
Feel optimistic	3.69	3.21	3.36	3.17	3.17	3.63	4.19	3.58	2.43	3.49	3.86	3.03	3.16	2.92	3.63	3.45	3.46	3.68	3.51	2.57	3.44	4.20	3.29	2.69	3.40
Feel cheerful	4.54	4.55	4.37	3.87	4.28	4.48	4.80	4.12	3.81	4.39	4.47	4.29	4.20	4.23	4.04	4.48	3.90	4.46	4.05	4.33	3.89	4.59	4.10	4.06	4.43
Feel calm	4.37	4.22	4.24	3.80	4.22	4.32	4.63	3.93	3.68	4.32	4.26	3.78	3.95	4.15	3.89	4.06	3.76	4.23	3.99	4.27	3.92	4.33	4.04	3.94	4.16
Feel active	4.21	4.10	4.34	4.15	3.91	4.23	4.32	3.94	4.18	4.32	4.26	4.20	4.18	4.32	3.96	4.13	3.89	4.10	3.95	4.28	3.98	4.07	3.76	3.85	3.69
Life interest	4.21	4.35	3.85	3.91	4.13	4.32	4.56	3.62	3.72	4.32	4.23	4.27	4.15	4.11	3.93	4.37	3.92	4.47	3.81	4.23	3.93	4.35	3.77	3.99	3.94
Observations	733	725	649	582	692	2278	837	666	651	881	848	1861	677	1378	869	627	732	805	1606	528	1074	809	620	642	1572

Notes: Mean values of variables computed at the country level. The life satisfaction variable takes an integer value from 1 to 10. The variables that are given in percentages pertain to unemployment, accommodation, neighbourhood, male, married, divorced/separated, widowed, lower education, children and urban. The self-assessed health variable takes an integer that ranges from 1 to 5, life interest variable takes an integer that ranges from 1 to 6 while all other personality traits variables take an integer from 1 to 5. The results are weighted using the sampling weights.

Table 1.3: Satisfaction Equation

	Model I		Model II		Model III		Model IV		Model V	
	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.
Life Dimensions										
Log Income	0.566***	(0.085)	0.364***	(0.033)	0.155**	(0.054)	0.166***	(0.050)	0.160***	(0.048)
Unemployed	-0.672***	(0.090)	-0.720***	(0.086)	-0.778***	(0.107)	-0.529***	(0.098)	-0.534***	(0.098)
Health very bad	-2.346***	(0.138)	-2.503***	(0.092)	-3.014***	(0.410)	-1.557***	(0.378)	-1.563***	(0.377)
Health bad	-1.636***	(0.095)	-1.789***	(0.069)	-1.640***	(0.132)	-0.693***	(0.108)	-0.696***	(0.107)
Health fair	-0.884***	(0.080)	-0.990***	(0.046)	-0.929***	(0.108)	-0.324***	(0.083)	-0.328***	(0.083)
Health good	-0.450***	(0.064)	-0.500***	(0.033)	-0.564***	(0.087)	-0.269***	(0.072)	-0.272***	(0.072)
Accommodation	-1.047***	(0.091)	-1.144***	(0.106)	-1.231***	(0.231)	-0.873***	(0.182)	-0.868***	(0.180)
Neighbourhood	-1.206***	(0.154)	-0.786***	(0.057)	-0.543***	(0.138)	-0.234	(0.128)	-0.256*	(0.129)
Personal Characteristics										
Age	-0.058***	(0.006)	-0.057***	(0.006)	-0.053***	(0.007)	-0.041***	(0.007)	-0.041***	(0.007)
Age squared/1000	0.651***	(0.059)	0.648***	(0.054)	0.614***	(0.058)	0.485***	(0.057)	0.485***	(0.057)
Male	-0.113***	(0.021)	-0.104***	(0.019)	-0.348	(0.230)	-0.089	(0.211)	-0.119	(0.226)
Married	0.246***	(0.055)	0.291***	(0.057)	-0.206	(0.351)	0.079	(0.341)	0.082	(0.340)
Divorced	-0.260***	(0.065)	-0.296***	(0.057)	-0.286***	(0.056)	-0.184***	(0.054)	-0.183***	(0.054)
Widowed	-0.217**	(0.067)	-0.156*	(0.073)	-0.132	(0.070)	-0.036	(0.061)	-0.034	(0.060)
Urban	0.007	(0.048)	-0.036	(0.029)	-1.059**	(0.347)	-0.618*	(0.301)	-0.743*	(0.300)
Child	0.141***	(0.034)	0.131***	(0.036)	-1.076*	(0.431)	-0.386	(0.466)	-0.394	(0.464)
Lower education	-0.188	(0.104)	-0.135**	(0.044)	-0.202	(0.493)	-0.228	(0.527)	-0.191	(0.520)
Personality Traits										
Optimistic							0.368***	(0.025)	0.368***	(0.025)
Cheerful							0.292***	(0.019)	0.292***	(0.019)
Calm							0.084***	(0.015)	0.084***	(0.015)
Active							0.030*	(0.015)	0.030*	(0.014)
Life interest							0.245***	(0.023)	0.244***	(0.023)
Trust							0.183***	(0.012)	0.184***	(0.012)
Reference Groups										
Ref. Log Inc									0.045	(0.202)
Ref. Unemp									1.020	(0.603)
Ref. Accomm									-0.399	(0.731)
Ref. Neigh									0.640*	(0.302)
Interactions										
Income*Nonmiddle					0.012	(0.007)	0.001	(0.007)	0.001	(0.007)
Income*Male					0.029	(0.030)	-0.008	(0.026)	-0.006	(0.028)
Income*Urban					0.128**	(0.045)	0.067	(0.038)	0.076	(0.039)
Income*Married					0.076	(0.044)	0.045	(0.044)	0.045	(0.044)
Income*Lower educ					0.018	(0.067)	0.040	(0.073)	0.036	(0.072)
Income*Child					0.158**	(0.056)	0.072	(0.060)	0.073	(0.060)
Unemp*Nonmiddle					-0.079	(0.102)	-0.103	(0.107)	-0.105	(0.107)
Unemp*Male					-0.132	(0.100)	-0.156	(0.112)	-0.159	(0.111)
Unemp*Urban					0.188	(0.157)	0.179	(0.135)	0.178	(0.134)
Unemp*Married					0.011	(0.113)	0.021	(0.094)	0.021	(0.094)

Table 1.3: Satisfaction Equations (continued)

	Model I		Model II		Model III		Model IV		Model V	
	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.	coef.	s.e.
Interactions										
Unemp*Lower educ					-0.112	(0.178)	-0.032	(0.183)	-0.034	(0.183)
Unemp*Child					0.212*	(0.092)	0.058	(0.102)	0.057	(0.102)
Hea. vbad*Nonmiddle					-0.073	(0.230)	-0.018	(0.222)	-0.018	(0.221)
Hea. vbad*Male					0.133	(0.199)	0.148	(0.211)	0.145	(0.210)
Hea. vbad*Urban					0.115	(0.176)	0.131	(0.196)	0.136	(0.195)
Hea. vbad*Married					0.246	(0.151)	0.253	(0.180)	0.261	(0.178)
Hea. vbad*Lower educ					-0.087	(0.173)	-0.163	(0.235)	-0.165	(0.234)
Hea. vbad*Child					0.492	(0.300)	0.313	(0.323)	0.316	(0.322)
Hea. bad*Nonmiddle					-0.211*	(0.098)	-0.082	(0.079)	-0.083	(0.080)
Hea. bad*Male					-0.035	(0.079)	-0.007	(0.085)	-0.003	(0.086)
Hea. bad*Urban					0.096	(0.103)	0.111	(0.097)	0.115	(0.096)
Hea. bad*Married					0.035	(0.081)	-0.056	(0.088)	-0.054	(0.088)
Hea. bad*Lower educ					0.015	(0.120)	0.039	(0.137)	0.034	(0.135)
Hea. bad*Child					-0.045	(0.088)	-0.082	(0.107)	-0.082	(0.107)
Hea. fair*Nonmiddle					0.014	(0.076)	0.038	(0.073)	0.040	(0.073)
Hea. fair*Male					0.043	(0.051)	0.005	(0.057)	0.007	(0.058)
Hea. fair*Urban					-0.024	(0.062)	0.002	(0.054)	0.007	(0.055)
Hea. fair*Married					0.052	(0.059)	0.020	(0.064)	0.023	(0.064)
Hea. fair*Lower educ					0.059	(0.107)	-0.023	(0.087)	-0.025	(0.086)
Hea. fair*Child					-0.153	(0.091)	-0.181*	(0.086)	-0.182*	(0.087)
Hea. good*Nonmiddle					-0.064	(0.064)	-0.035	(0.060)	-0.034	(0.059)
Hea. good*Male					0.071	(0.054)	0.035	(0.056)	0.036	(0.057)
Hea. good*Urban					0.139**	(0.050)	0.128*	(0.054)	0.131*	(0.053)
Hea. good*Married					-0.057	(0.057)	-0.040	(0.068)	-0.039	(0.067)
Hea. good*Lower educ					-0.087	(0.095)	-0.155	(0.116)	-0.155	(0.116)
Hea. good*Child					0.114*	(0.050)	0.047	(0.060)	0.045	(0.059)
Accomm*Nonmiddle					-0.033	(0.135)	-0.015	(0.122)	-0.015	(0.123)
Accomm*Male					0.135	(0.141)	0.115	(0.124)	0.116	(0.122)
Accomm*Urban					0.093	(0.158)	0.112	(0.160)	0.123	(0.157)
Accomm*Married					-0.111	(0.143)	0.010	(0.134)	0.010	(0.133)
Accomm*Lower educ					-0.001	(0.182)	-0.158	(0.233)	-0.155	(0.230)
Accomm*Child					0.108	(0.154)	0.006	(0.150)	0.008	(0.151)
Neigh*Nonmiddle					0.042	(0.106)	0.014	(0.084)	0.012	(0.084)
Neigh*Male					-0.094	(0.076)	-0.024	(0.065)	-0.002	(0.065)
Neigh*Urban					-0.070	(0.154)	-0.158	(0.126)	-0.204	(0.134)
Neigh*Married					-0.199**	(0.075)	-0.322***	(0.095)	-0.332***	(0.096)
Neigh*Lower educ					-0.240*	(0.119)	-0.419**	(0.131)	-0.440***	(0.131)
Neigh*Child					-0.079	(0.122)	0.033	(0.125)	0.037	(0.124)
Year Dummy										
2011	0.033	(0.067)	0.054	(0.054)	0.057	(0.054)	0.122**	(0.041)	0.172**	(0.062)
Country Dummies	No		Yes		Yes		Yes		Yes	
Pseudo-R^2	0.0597		0.0676		0.0777		0.1282		0.1283	
Log-likelihood	-81567.8		-80098.3		-80009.0		-72100.5		-72091.4	
Number of Observations	43014		43014		43014		40943		40943	

Notes: The estimation procedure includes sample weighting. Clustered standard errors at the country level in parentheses. *, ** and *** indicate statistical significance at the 5% level, 1% level, and 0.1% level, respectively.

Table 1.4: Mean and rank of: Income, Eq. Income, Growth Rate of Income and Growth Rate of Eq. Income

	2007				2011				Δ%			
	Income		Equivalent Income		Income		Equivalent Income		Income		Equivalent Income	
	Mean	*Rank*	Mean	*Rank*	Mean	*Rank*	Mean	*Rank*	Mean	*Rank*	Mean	*Rank*
AT	2885	*5*	1958	*4*	2492	*5*	1712	*4*	-3.59	*7*	-3.29	*11*
BE	2754	*8*	1624	*11*	2322	*7*	1433	*9*	-4.18	*10*	-3.07	*8*
BG	807	*25*	415	*25*	786	*25*	422	*25*	-0.66	*1*	0.42	*3*
CY	2409	*13*	1662	*9*	2091	*11*	1350	*11*	-3.48	*6*	-5.06	*16*
CZ	1726	*17*	1006	*16*	1440	*17*	836	*18*	-4.44	*13*	-4.52	*13*
DE	2722	*9*	1792	*8*	2478	*6*	1527	*6*	-2.32	*4*	-3.92	*12*
DK	2872	*6*	1950	*5*	2517	*4*	1727	*3*	-3.25	*5*	-3.00	*7*
EE	1520	*18*	761	*19*	1100	*21*	542	*22*	-7.77	*23*	-8.15	*24*
EL	2178	*14*	1316	*13*	1505	*16*	1000	*14*	-8.83	*24*	-6.64	*21*
ES	2522	*11*	1599	*12*	1895	*13*	1163	*12*	-6.90	*21*	-7.65	*23*
FI	2796	*7*	1854	*6*	2270	*9*	1442	*8*	-5.08	*16*	-6.09	*20*
FR	2699	*10*	1640	*10*	2317	*8*	1502	*7*	-3.75	*8*	-2.18	*5*
HU	1286	*22*	603	*22*	1082	*22*	549	*21*	-4.23	*11*	-2.32	*6*
IT	2453	*12*	1205	*14*	1955	*12*	1105	*13*	-5.51	*18*	-2.15	*4*
LT	1467	*20*	730	*20*	1178	*20*	597	*20*	-5.34	*17*	-4.91	*15*
LU	5217	*1*	3173	*1*	3531	*1*	2247	*1*	-9.30	*25*	-8.27	*25*
LV	1255	*23*	563	*23*	986	*23*	462	*23*	-5.86	*20*	-4.80	*14*
NL	3159	*2*	2147	*3*	2651	*3*	1684	*5*	-4.28	*12*	-5.89	*19*
PL	1378	*21*	675	*21*	1340	*19*	760	*19*	-0.70	*2*	3.03	*1*
PT	1845	*16*	985	*17*	1509	*15*	870	*16*	-4.91	*15*	-3.08	*9*
RO	994	*24*	529	*24*	825	*24*	429	*24*	-4.55	*14*	-5.13	*17*
SE	3143	*3*	2217	*2*	2667	*2*	1777	*2*	-4.02	*9*	-5.38	*18*
SI	2114	*15*	1133	*15*	1675	*14*	998	*15*	-5.64	*19*	-3.13	*10*
SK	1518	*19*	811	*18*	1422	*18*	836	*17*	-1.63	*3*	0.77	*2*
UK	2943	*4*	1841	*7*	2191	*10*	1379	*10*	-7.11	*22*	-6.96	*22*

Notes: Numbers denote mean values and ranks of income, equivalent income, the growth rate of average income and the growth rate of average equivalent income. The results are weighted using the sampling weights.

Table 1.5: Gini indices of inequality and ranks for Income and Equivalent Income

	2007								2011							
	Gini($y;\rho$)				Gini($y^*;\rho$)				Gini($y;\rho$)				Gini($y^*;\rho$)			
	$\rho=2$	*Rank*	$\rho=5$	*Rank*	$\rho=2$	*Rank*	$\rho=5$	*Rank*	$\rho=2$	*Rank*	$\rho=5$	*Rank*	$\rho=2$	*Rank*	$\rho=5$	*Rank*
AT	0.276	*10*	0.490	*12*	0.367	*4*	0.648	*2*	0.275	*9*	0.480	*8*	0.399	*3*	0.700	*3*
BE	0.278	*11*	0.491	*13*	0.412	*11*	0.721	*11*	0.263	*7*	0.474	*7*	0.419	*9*	0.735	*10*
BG	0.338	*20*	0.571	*21*	0.471	*18*	0.776	*19*	0.334	*21*	0.576	*21*	0.506	*22*	0.823	*22*
CY	0.288	*12*	0.489	*11*	0.403	*7*	0.685	*6*	0.295	*13*	0.495	*12*	0.413	*7*	0.689	*2*
CZ	0.246	*5*	0.430	*2*	0.392	*6*	0.701	*8*	0.241	*2*	0.428	*1*	0.400	*4*	0.705	*4*
DE	0.301	*14*	0.512	*14*	0.406	*8*	0.703	*9*	0.283	*12*	0.494	*11*	0.434	*11*	0.756	*13*
DK	0.254	*6*	0.456	*6*	0.361	*3*	0.650	*4*	0.272	*8*	0.499	*13*	0.406	*6*	0.731	*9*
EE	0.311	*15*	0.540	*16*	0.480	*21*	0.783	*20*	0.329	*19*	0.568	*20*	0.537	*24*	0.843	*24*
EL	0.331	*19*	0.570	*20*	0.430	*16*	0.728	*12*	0.361	*25*	0.599	*24*	0.485	*19*	0.776	*17*
ES	0.322	*18*	0.569	*19*	0.426	*14*	0.732	*13*	0.340	*23*	0.590	*23*	0.462	*14*	0.778	*18*
FI	0.263	*7*	0.460	*7*	0.378	*5*	0.675	*5*	0.257	*6*	0.446	*3*	0.404	*5*	0.714	*6*
FR	0.297	*13*	0.488	*10*	0.414	*12*	0.695	*7*	0.302	*14*	0.492	*10*	0.436	*13*	0.730	*8*
HU	0.245	*4*	0.436	*3*	0.426	*15*	0.739	*15*	0.276	*10*	0.503	*14*	0.490	*20*	0.822	*21*
IT	0.311	*16*	0.552	*17*	0.477	*19*	0.791	*21*	0.330	*20*	0.558	*18*	0.472	*16*	0.775	*16*
LT	0.339	*21*	0.577	*23*	0.497	*23*	0.806	*23*	0.319	*17*	0.549	*17*	0.492	*21*	0.805	*20*
LU	0.270	*8*	0.464	*8*	0.407	*10*	0.704	*10*	0.279	*11*	0.486	*9*	0.416	*8*	0.727	*7*
LV	0.369	*25*	0.619	*25*	0.524	*25*	0.826	*25*	0.357	*24*	0.600	*25*	0.551	*25*	0.859	*25*
NL	0.272	*9*	0.466	*9*	0.359	*2*	0.650	*3*	0.255	*5*	0.450	*4*	0.386	*1*	0.682	*1*
PL	0.321	*17*	0.537	*15*	0.479	*20*	0.799	*22*	0.302	*15*	0.521	*15*	0.472	*15*	0.788	*19*
PT	0.357	*23*	0.575	*22*	0.487	*22*	0.766	*18*	0.340	*22*	0.561	*19*	0.473	*17*	0.756	*11*
RO	0.357	*24*	0.605	*24*	0.517	*24*	0.824	*24*	0.328	*18*	0.589	*22*	0.513	*23*	0.828	*23*
SE	0.238	*2*	0.441	*5*	0.346	*1*	0.643	*1*	0.244	*3*	0.452	*5*	0.387	*2*	0.714	*5*
SI	0.235	*1*	0.438	*4*	0.407	*9*	0.734	*14*	0.238	*1*	0.435	*2*	0.434	*10*	0.771	*14*
SK	0.238	*3*	0.426	*1*	0.418	*13*	0.744	*16*	0.254	*4*	0.462	*6*	0.436	*12*	0.756	*12*
UK	0.340	*22*	0.560	*18*	0.466	*17*	0.760	*17*	0.318	*16*	0.531	*16*	0.475	*18*	0.772	*15*

Notes: Numbers denote Gini indices of income (Gini($y;\rho$)) and equivalent income (Gini($y^*;\rho$)) for two parameters that indicate the degree of aversion to inequality ($\rho=2$ and $\rho=5$). The rankings of these Gini indices across countries are provided next to each Gini index. The results are weighted using the sampling weights.

Table 1.6: Social welfare and ranking of social welfare for income and equivalent income

	2007								2011							
	SW($y;\rho$)				SW($y^*;\rho$)				SW($y;\rho$)				SW($y^*;\rho$)			
	$\rho=2$	*Rank*	$\rho=5$	*Rank*	$\rho=2$	*Rank*	$\rho=5$	*Rank*	$\rho=2$	*Rank*	$\rho=5$	*Rank*	$\rho=2$	*Rank*	$\rho=5$	*Rank*
AT	2089	*5*	1472	*6*	1239	*5*	689	*4*	1807	*5*	1295	*4*	1029	*4*	513	*3*
BE	1989	*7*	1401	*7*	955	*11*	453	*10*	1711	*7*	1221	*8*	832	*9*	379	*9*
BG	534	*25*	346	*25*	219	*25*	93	*25*	524	*25*	333	*25*	208	*24*	75	*23*
CY	1715	*11*	1230	*11*	992	*8*	523	*8*	1474	*11*	1056	*10*	792	*10*	420	*6*
CZ	1302	*16*	985	*15*	611	*16*	301	*15*	1093	*15*	823	*14*	502	*16*	246	*14*
DE	1904	*9*	1328	*9*	1064	*7*	533	*7*	1778	*6*	1255	*7*	864	*6*	372	*10*
DK	2143	*4*	1562	*4*	1246	*4*	682	*5*	1833	*4*	1262	*5*	1026	*5*	464	*5*
EE	1047	*19*	700	*20*	396	*19*	165	*19*	738	*22*	476	*22*	251	*22*	85	*22*
EL	1457	*15*	937	*16*	749	*13*	358	*13*	962	*18*	604	*19*	515	*15*	224	*16*
ES	1710	*12*	1087	*14*	918	*12*	429	*12*	1251	*14*	776	*15*	625	*12*	258	*12*
FI	2061	*6*	1509	*5*	1154	*6*	603	*6*	1687	*8*	1256	*6*	859	*7*	412	*7*
FR	1898	*10*	1381	*8*	961	*10*	501	*9*	1618	*9*	1177	*9*	847	*8*	405	*8*
HU	971	*20*	725	*19*	346	*22*	158	*20*	783	*21*	538	*20*	280	*21*	98	*21*
IT	1689	*13*	1100	*13*	631	*15*	252	*16*	1311	*12*	865	*13*	584	*13*	248	*13*
LT	970	*21*	621	*22*	367	*20*	142	*21*	802	*20*	531	*21*	303	*20*	116	*20*
LU	3809	*1*	2797	*1*	1881	*1*	940	*1*	2544	*1*	1816	*1*	1313	*1*	612	*1*
LV	792	*23*	478	*23*	268	*23*	98	*23*	634	*23*	395	*23*	208	*25*	65	*25*
NL	2300	*3*	1688	*3*	1377	*3*	752	*3*	1975	*3*	1458	*3*	1033	*3*	535	*2*
PL	936	*22*	638	*21*	351	*21*	136	*22*	935	*19*	642	*18*	402	*19*	162	*19*
PT	1187	*17*	784	*18*	506	*17*	230	*17*	997	*17*	663	*17*	458	*18*	212	*17*
RO	639	*24*	393	*24*	256	*24*	93	*24*	555	*24*	339	*24*	209	*23*	74	*24*
SE	2395	*2*	1756	*2*	1451	*2*	792	*2*	2016	*2*	1462	*2*	1089	*2*	509	*4*
SI	1616	*14*	1187	*12*	672	*14*	301	*14*	1277	*13*	946	*12*	565	*14*	229	*15*
SK	1156	*18*	871	*17*	472	*18*	208	*18*	1061	*16*	765	*16*	472	*17*	204	*18*
UK	1941	*8*	1294	*10*	982	*9*	442	*11*	1495	*10*	1027	*11*	724	*11*	314	*11*

Notes: Numbers denote social welfare of income (SW($y;\rho$)) and equivalent income (SW($y^*;\rho$)) for two parameters of S-Gini that indicate the degree of aversion to inequality ($\rho=2$ and $\rho=5$). The rankings of social welfare measures across countries are provided next to each social welfare measure. The results are weighted using the sampling weights.

Table 1.7: Portrait of the bottom 20th percentile of Income in 2011

	WB measures		Non-income dimensions				Socio-demographic variables						
	Income	Satis.	Accom.	Health	Neigh.	Unemp.	Age	Male	Child.	Marri.	Divse.	Widow.	Low ed.
AT	1120	7.33	7.10	3.80	13.28	10.96	50.06	41.15	62.21	37.30	20.00	13.21	4.37
BE	1067	6.87	12.28	3.49	23.34	21.72	49.34	52.23	67.08	44.80	24.22	10.00	17.39
BG	260	4.39	30.60	3.41	26.62	30.15	53.08	40.64	78.18	42.13	13.33	28.25	5.98
CY	914	6.76	14.79	3.90	26.96	17.27	48.94	46.42	77.74	67.59	7.06	7.95	34.35
CZ	735	5.48	10.86	3.20	24.41	9.48	53.69	34.39	81.13	38.78	22.03	28.36	2.31
DE	1071	6.33	10.27	3.48	18.65	24.71	44.62	48.98	61.14	32.10	22.76	8.83	6.45
DK	1060	8.29	7.94	3.73	9.92	7.06	49.30	48.45	54.56	28.12	12.27	20.88	11.92
EE	394	5.40	18.77	3.23	19.49	23.79	46.76	45.72	67.70	36.41	18.77	14.35	6.33
EL	469	5.07	24.43	3.85	29.38	23.85	49.71	48.35	78.01	60.02	7.73	15.31	34.51
ES	608	6.90	7.54	3.79	15.87	27.34	49.17	48.72	75.57	64.83	9.28	5.41	34.14
FI	1095	7.55	7.14	3.47	9.79	7.01	48.59	38.73	54.20	24.58	19.27	14.59	25.14
FR	1026	6.68	12.81	3.59	18.76	17.96	46.43	43.68	61.00	45.90	14.81	13.12	21.80
HU	456	5.08	21.18	3.50	20.54	25.81	43.32	48.17	72.71	46.46	17.34	11.79	2.93
IT	694	6.16	11.41	3.57	26.94	12.46	53.25	36.19	72.94	51.38	5.22	22.35	30.39
LT	437	6.06	29.46	2.96	19.03	22.59	48.52	43.85	75.69	40.75	22.73	18.54	7.69
LU	1559	7.19	13.30	3.69	11.90	8.71	41.79	44.57	79.04	66.51	15.09	3.76	9.94
LV	317	5.40	35.80	3.11	15.97	34.84	44.72	37.28	73.75	42.35	25.07	14.13	0.00
NL	1302	7.16	11.76	3.50	10.96	8.02	43.49	43.86	59.00	43.38	14.27	7.12	8.13
PL	549	6.42	20.93	3.19	15.39	23.50	47.10	41.79	71.82	43.45	10.16	19.03	27.29
PT	557	5.74	15.55	3.15	11.13	24.76	52.80	48.82	71.30	52.92	10.96	13.29	66.84
RO	260	5.72	33.66	3.14	20.38	4.70	46.87	39.71	83.02	59.04	13.01	15.63	16.94
SE	1247	7.36	6.65	3.58	13.20	14.51	48.99	48.89	51.31	21.31	25.26	12.42	13.32
SI	840	6.26	12.00	3.24	11.26	23.43	54.50	45.48	69.45	34.44	7.84	30.02	5.98
SK	659	5.12	12.85	3.37	17.58	23.30	49.11	38.66	78.27	37.37	27.20	24.68	2.00
UK	865	6.26	16.02	3.35	20.82	16.88	45.81	49.47	78.42	40.00	17.12	11.71	8.59

Notes: All socio-demographic variables except age are represented in percentages. We have multiplied all non-income dimensions except health with 100. The results are weighted using the sampling weights.

Table 1.8: Portrait of the bottom 20th percentile of Equivalent Income in 2011

	WB measures		Non-income dimensions				Socio-demographic variables						
	Income	Satis.	Accom.	Health	Neigh.	Unemp.	Age	Male	Child.	Marri.	Divse.	Widow.	Low ed.
AT	1524	7.19	10.11	3.60	14.31	15.27	46.19	47.38	33.24	21.20	21.67	13.58	2.44
BE	1493	6.47	18.11	3.21	26.45	26.43	43.20	59.66	31.69	20.03	19.86	8.56	14.23
BG	430	4.53	33.67	3.42	29.56	37.59	47.91	47.84	51.52	23.73	12.39	22.25	4.03
CY	1258	5.79	22.33	3.68	36.86	28.77	43.87	42.26	58.72	50.88	10.15	8.51	26.18
CZ	1030	5.70	11.29	3.17	23.85	13.86	47.29	41.67	43.25	23.78	20.26	22.70	2.35
DE	1705	5.90	11.03	3.29	21.92	29.62	43.91	62.89	29.67	9.38	23.98	8.45	4.27
DK	1547	7.87	9.01	3.37	9.54	13.17	43.58	51.13	33.27	14.59	19.02	9.19	5.13
EE	741	5.82	29.75	3.07	18.06	26.98	41.05	56.92	35.31	14.27	14.92	12.71	6.04
EL	639	4.67	30.92	3.79	35.88	38.32	46.15	56.45	54.20	41.47	5.60	12.06	30.30
ES	1179	6.43	10.10	3.64	15.71	43.78	43.35	60.29	39.78	35.54	15.47	4.19	21.40
FI	1503	7.10	11.21	3.40	10.95	11.55	42.32	49.10	23.05	13.92	15.57	6.35	11.29
FR	1413	6.36	16.63	3.44	22.99	30.04	42.13	49.37	35.88	23.85	20.22	10.36	13.61
HU	669	4.83	24.13	3.32	18.28	27.18	42.79	63.75	34.09	14.93	17.00	13.92	0.57
IT	1300	6.20	13.38	3.60	29.71	18.99	44.41	46.21	29.10	21.34	8.19	12.39	14.51
LT	687	6.23	31.24	2.89	19.48	28.99	45.11	50.20	47.88	22.90	17.49	17.98	8.08
LU	2770	6.83	14.07	3.49	12.00	13.68	37.78	54.91	31.46	27.89	19.22	7.27	2.79
LV	505	5.49	41.45	3.04	16.92	45.54	39.34	49.65	35.07	20.48	17.21	12.20	0.00
NL	1848	7.11	10.39	3.29	9.16	14.29	40.88	40.70	29.41	19.70	15.57	7.81	3.15
PL	787	6.10	24.48	3.13	17.03	33.95	43.18	50.75	40.76	20.11	9.48	17.01	20.21
PT	913	5.73	18.31	3.12	12.31	34.70	47.31	43.60	47.20	29.68	15.43	11.23	47.46
RO	403	5.80	37.18	3.10	24.14	10.50	42.94	50.37	47.22	26.71	15.97	20.34	13.71
SE	1734	7.05	10.38	3.37	13.46	20.07	41.95	54.20	25.79	9.37	17.44	6.97	5.65
SI	1192	6.26	13.20	3.23	13.40	28.02	46.54	62.86	31.85	11.41	7.78	16.06	4.94
SK	981	5.17	18.50	3.17	17.76	27.77	45.89	49.56	42.55	15.26	28.80	48.91	2.90
UK	1386	6.20	17.36	3.11	23.35	20.72	43.14	62.60	43.08	17.94	18.31	8.83	5.47

Notes: All socio-demographic variables except age are represented in percentages. We have multiplied all non-income dimensions except health with 100. The results are weighted using the sampling weights.

Table 1.9: Overlapping of the worst off individuals in 2011

	Entire sample		Men		Women	
	p_{10}	p_{20}	p_{10}	p_{20}	p_{10}	p_{20}
AT	2.32	10.91	2.29	9.80	2.34	11.71
BE	2.62	11.03	1.97	11.55	3.24	10.54
BG	3.85	12.63	3.53	10.20	4.06	14.21
CY	4.64	12.37	3.42	8.97	5.46	14.66
CZ	4.05	9.68	3.38	6.15	4.63	12.81
DE	2.59	9.26	3.81	9.61	1.55	8.96
DK	2.27	9.32	1.71	7.56	2.81	11.01
EE	1.95	9.16	4.05	10.53	0.72	8.35
EL	4.15	12.44	4.93	12.68	3.54	12.26
ES	3.52	10.10	3.70	8.89	3.36	11.13
FI	2.95	8.73	2.65	7.16	3.18	9.98
FR	3.01	10.42	3.35	10.29	2.73	10.54
HU	4.14	8.86	5.14	11.58	3.28	6.56
IT	2.83	9.43	2.16	7.27	3.22	10.70
LT	4.14	11.97	4.92	12.00	3.68	11.95
LU	1.44	8.45	1.34	6.02	1.52	10.67
LV	2.60	10.11	2.78	10.71	2.50	9.79
NL	2.11	9.32	1.82	7.81	2.38	10.69
PL	2.99	10.09	3.38	9.52	2.72	10.47
PT	4.17	13.07	4.44	12.44	3.96	13.53
RO	3.91	10.61	4.40	7.80	3.48	13.07
SE	2.47	9.15	3.16	9.47	1.76	8.82
SI	2.26	8.39	3.93	8.93	0.88	7.94
SK	3.74	9.35	4.10	8.61	3.52	9.80
UK	3.69	9.92	4.08	9.72	3.36	10.09

Notes: Numbers denote the percentage of individuals who belong to the worst off according to both income and equivalent income measures. The results are weighted using the sampling weights.

Figure 1.1: The overall satisfaction with life across countries: Proportions by years

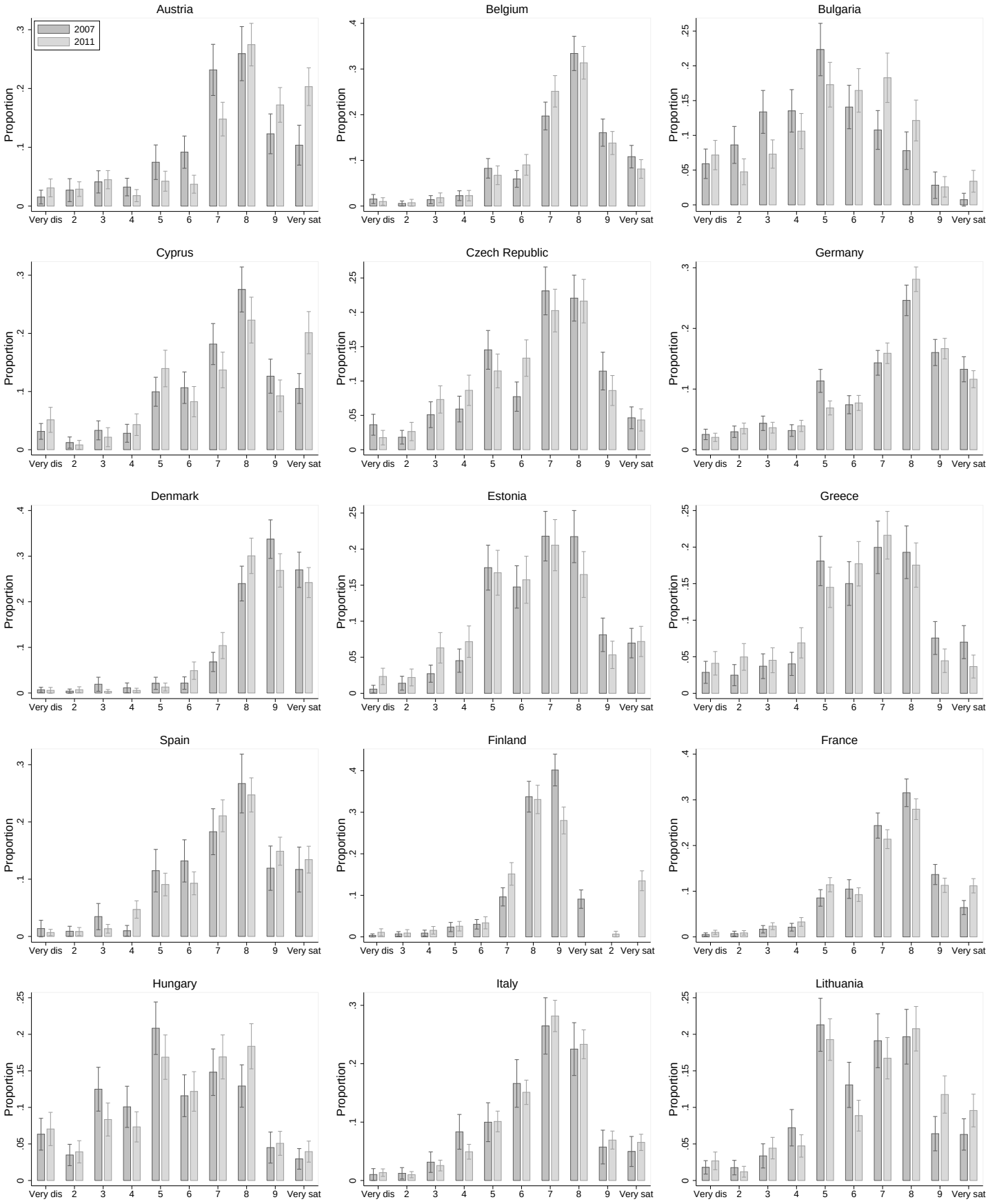


Figure 1.1: The overall satisfaction with life across countries: Proportions by years (continuation)

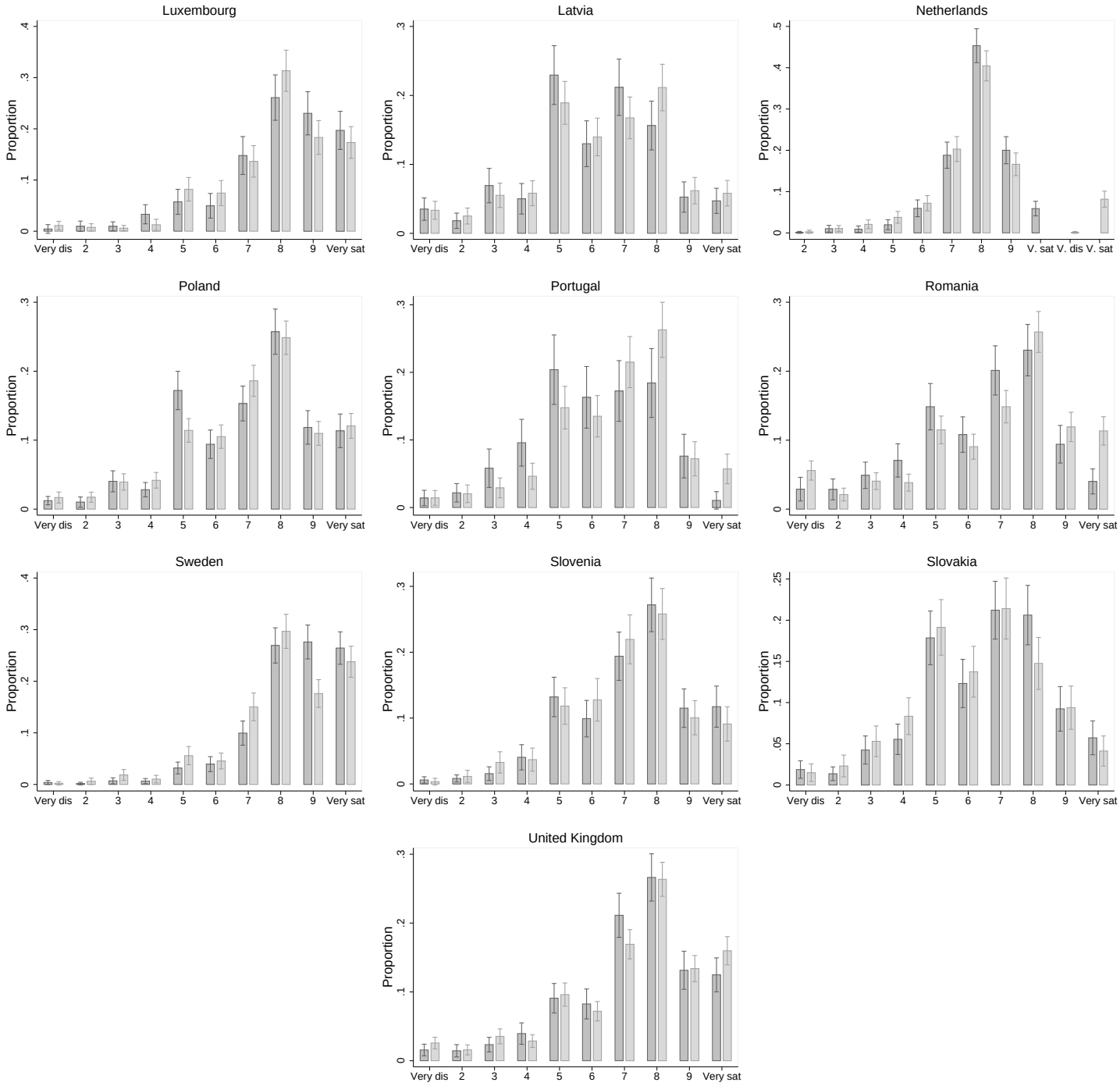


Figure 1.2: The overall satisfaction with life across countries: Proportions by gender

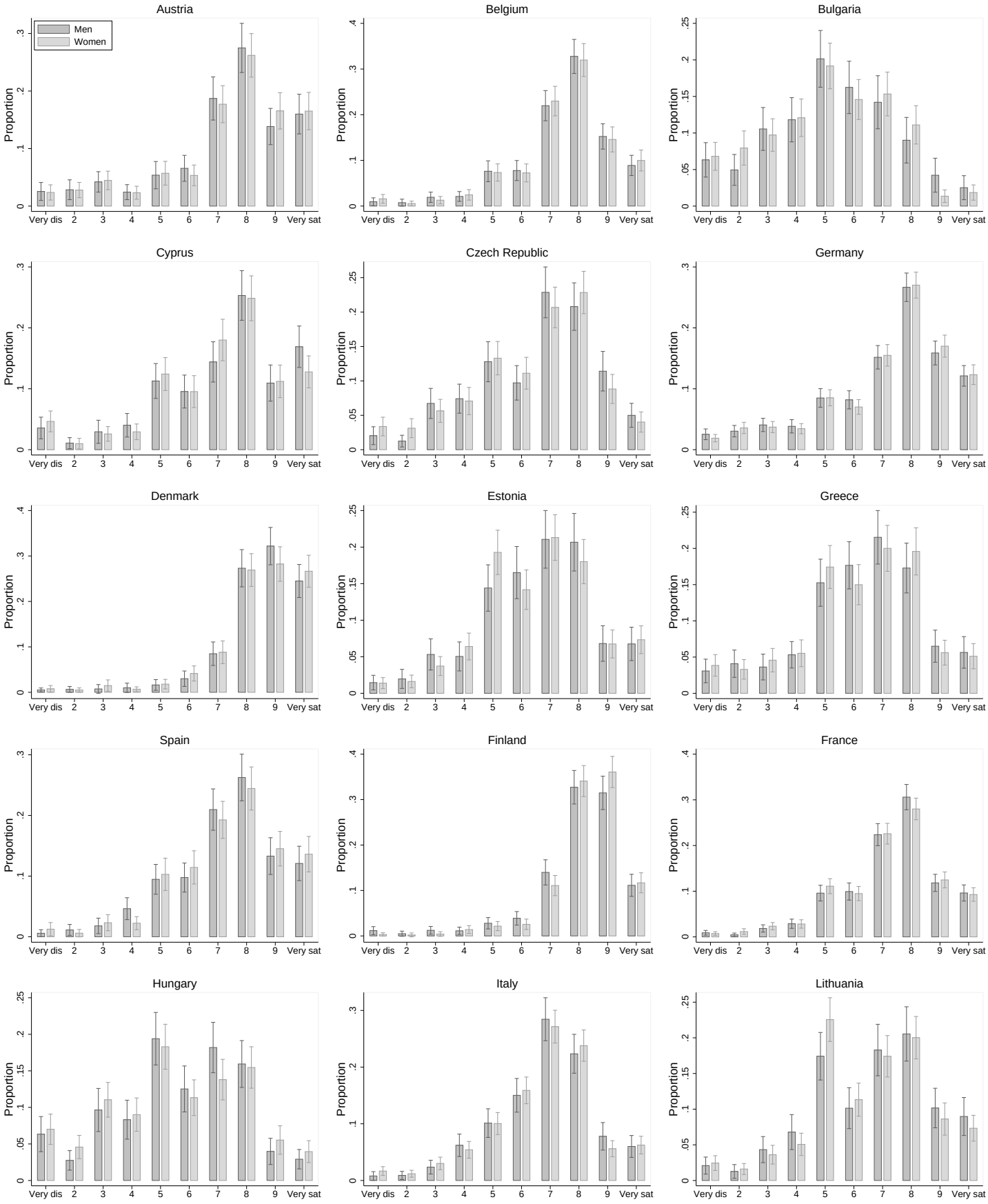


Figure 1.2: The overall satisfaction with life across countries: Proportions by gender (continuation)

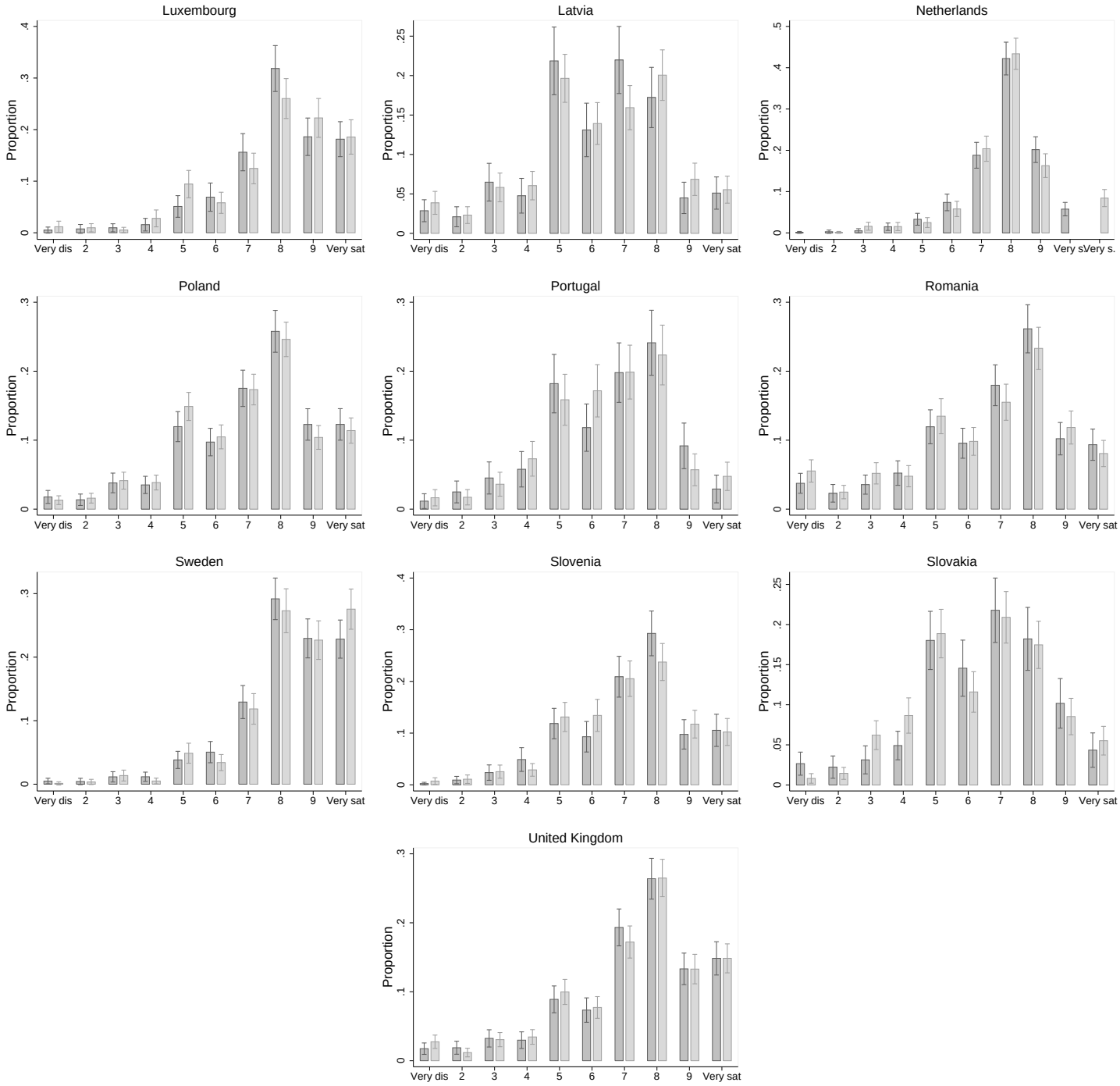
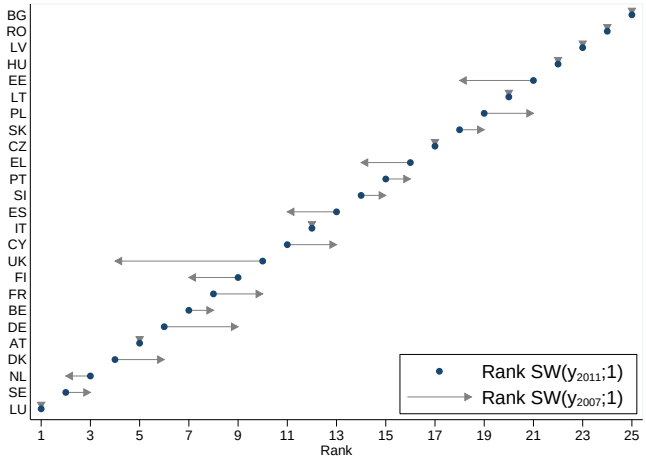
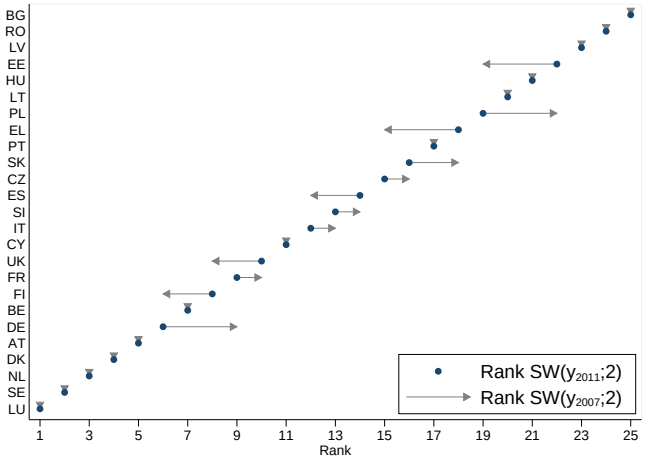


Figure 1.3: Ranking Social Welfare: Changes within Welfare Measure

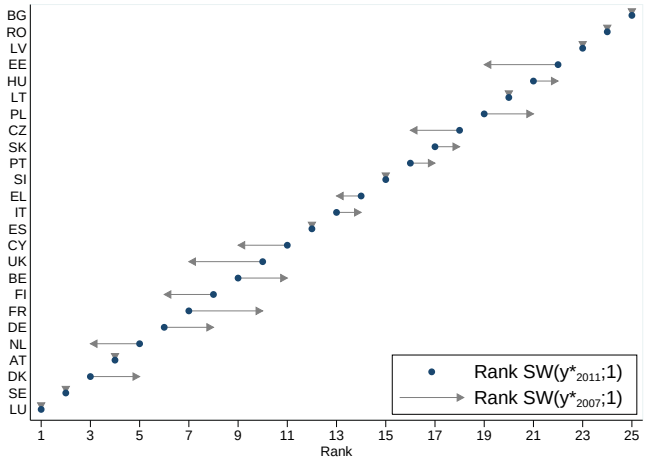
a) Rank $SW(y_{2007};1)$ - Rank $SW(y_{2011};1)$



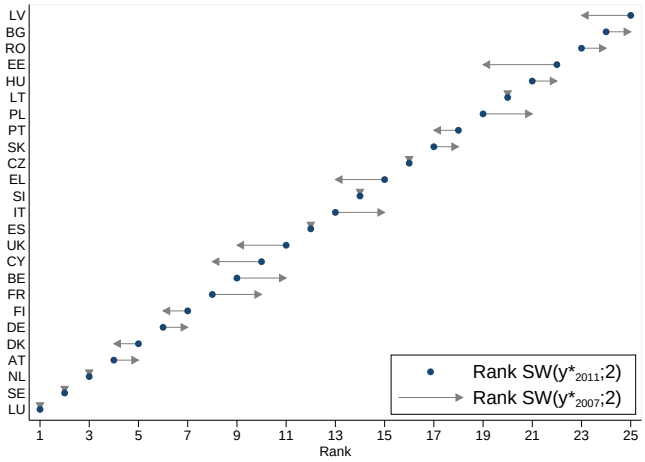
b) Rank $SW(y_{2007};2)$ - Rank $SW(y_{2011};2)$



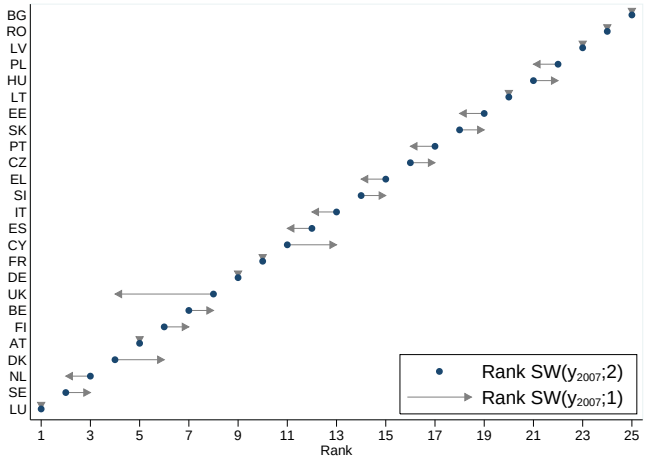
c) Rank $SW(y^*_{2007};1)$ - Rank $SW(y^*_{2011};1)$



d) Rank $SW(y^*_{2007};2)$ - Rank $SW(y^*_{2011};2)$



e) Rank $SW(y_{2007};1)$ - Rank $SW(y_{2007};2)$



f) Rank $SW(y_{2011};1)$ - Rank $SW(y_{2011};2)$

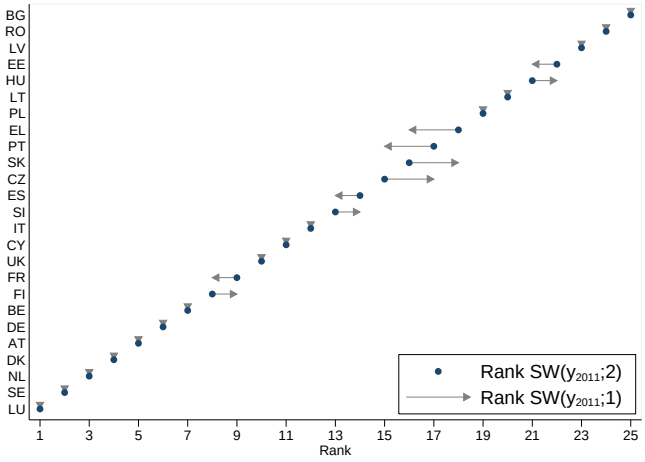
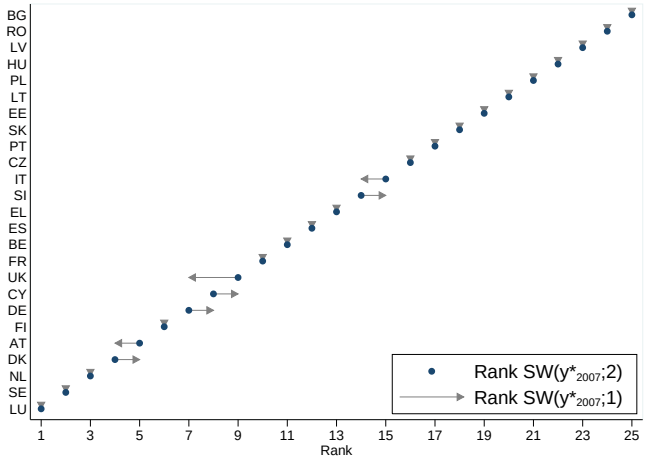


Figure 1.3: Ranking Social Welfare: Changes within Welfare Measure (continuation)

g) Rank $SW(y^*_{2007};1)$ - Rank $SW(y^*_{2007};2)$



h) Rank $SW(y^*_{2011};1)$ - Rank $SW(y^*_{2011};2)$

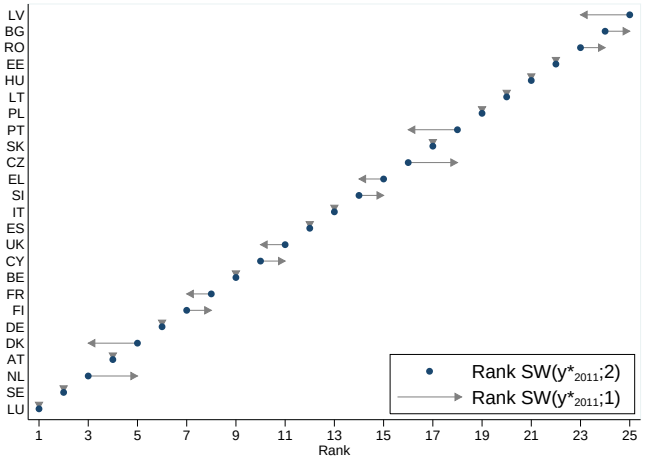
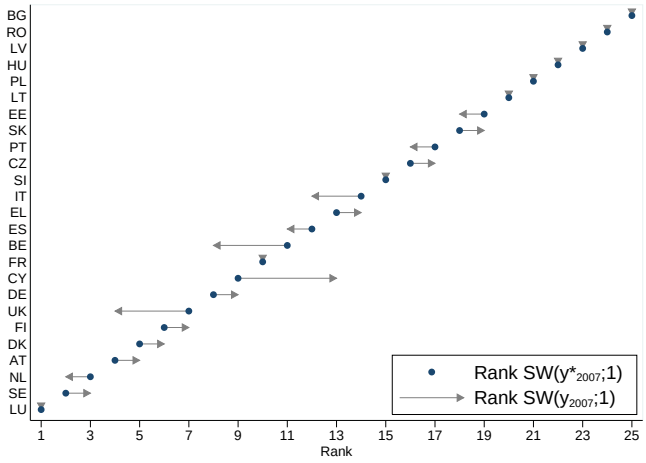
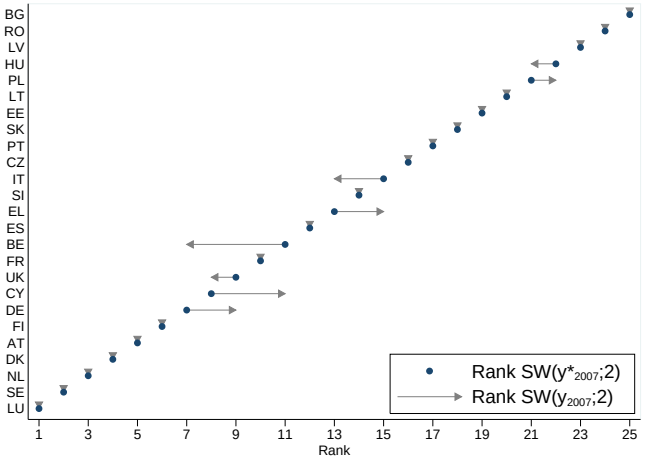


Figure 1.4: Ranking Social Welfare: Changes between Welfare Measure

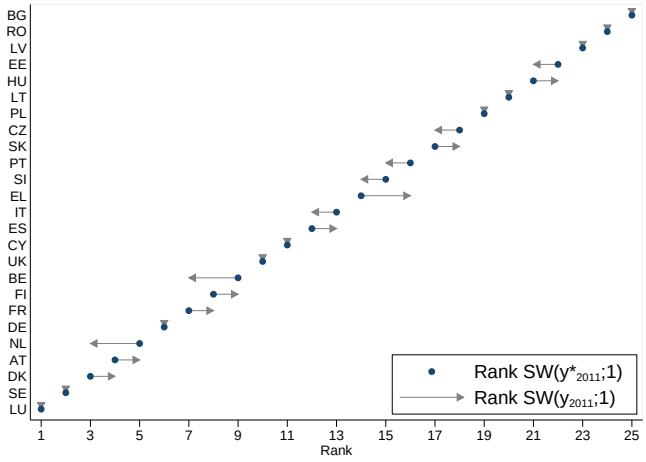
a) Rank $SW(y_{2007};1)$ - Rank $SW(y^*_{2007};1)$



b) Rank $SW(y_{2007};2)$ - Rank $SW(y^*_{2007};2)$



c) Rank $SW(y_{2011};1)$ - Rank $SW(y^*_{2011};1)$



d) Rank $SW(y_{2011};2)$ - Rank $SW(y^*_{2011};2)$

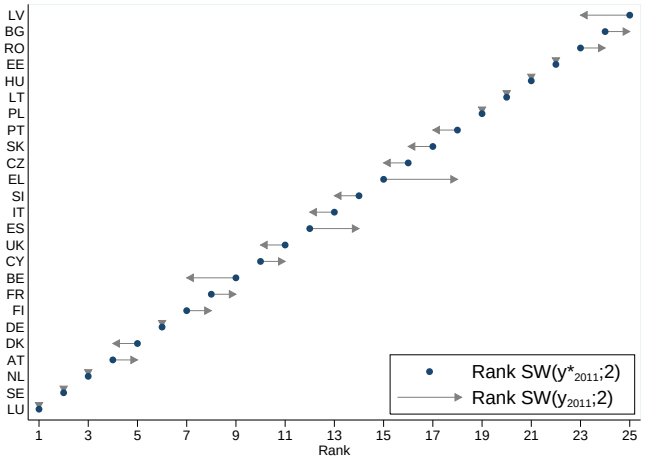
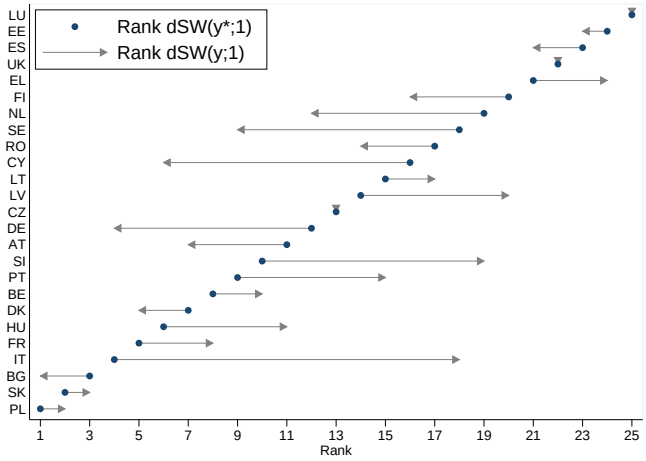


Figure 1.4: Ranking Social Welfare: Changes between Welfare Measure (continuation)

e) Rank d$SW(y^*;1)$ - Rank d$SW(y;1)$



f) Rank d$SW(y^*;2)$ - Rank d$SW(y;2)$

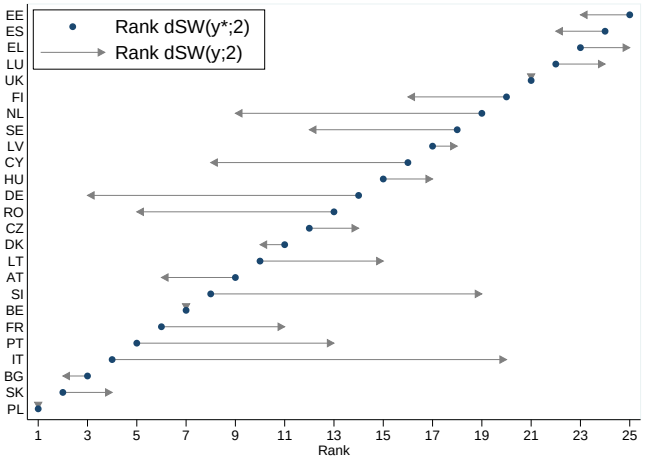
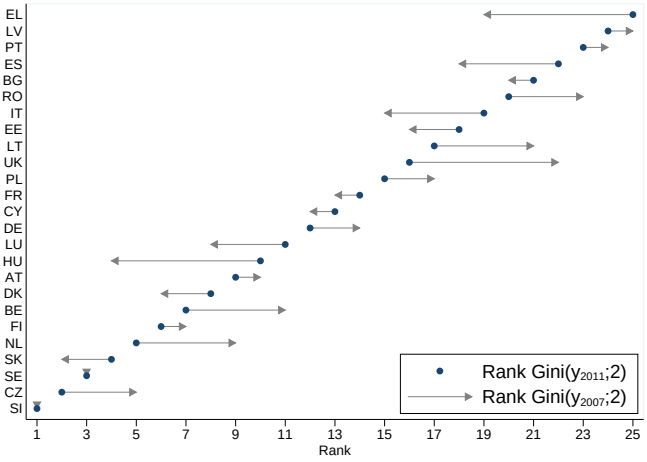


Figure 1.5: Ranking Gini Coefficients: Changes within Inequality measure

a) Rank $Gini(y_{2007};2)$ - Rank $Gini(y_{2011};2)$



b) Rank $Gini(y^*_{2007};2)$ - Rank $Gini(y^*_{2011};2)$

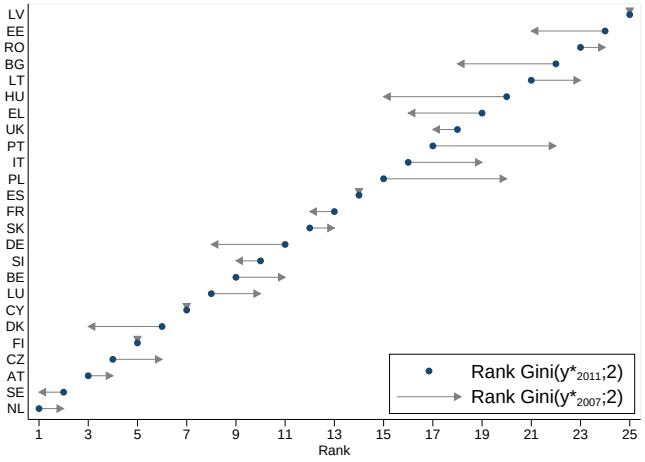
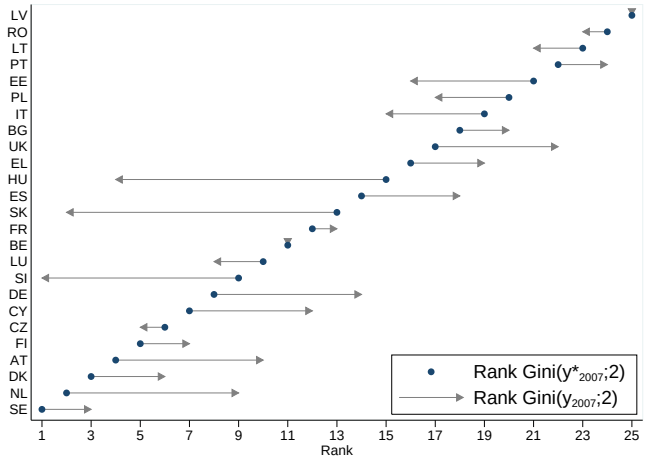


Figure 1.6: Ranking Gini Coefficients: Changes between Inequality measure

a) Rank $Gini(y_{2007};2)$ - Rank $Gini(y^*_{2007};2)$



b) Rank $Gini(y_{2011};2)$ - Rank $Gini(y^*_{2011};2)$

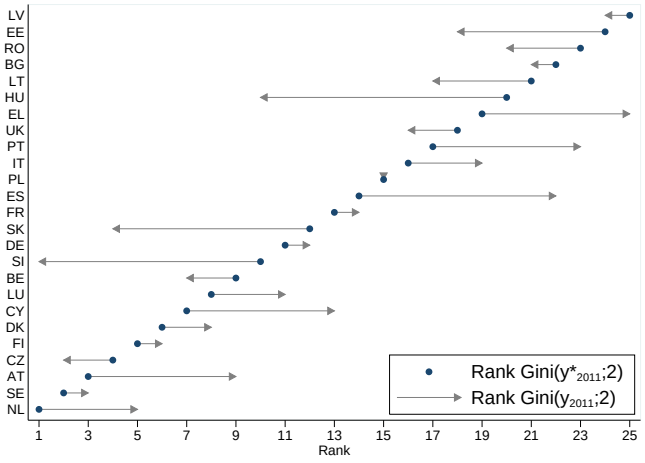
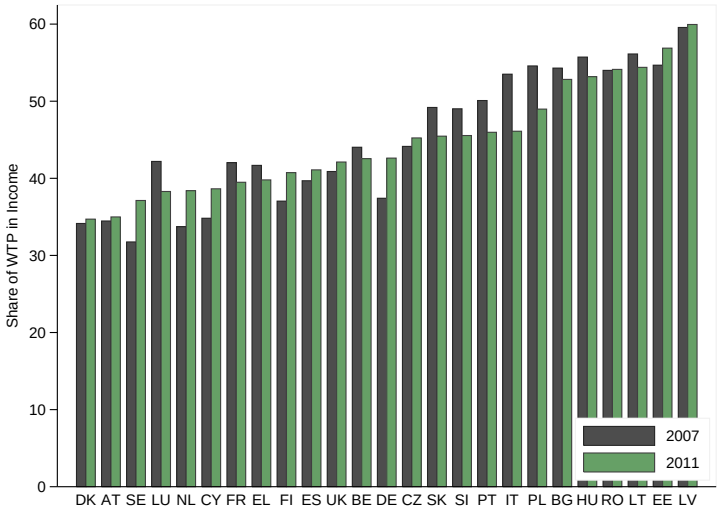
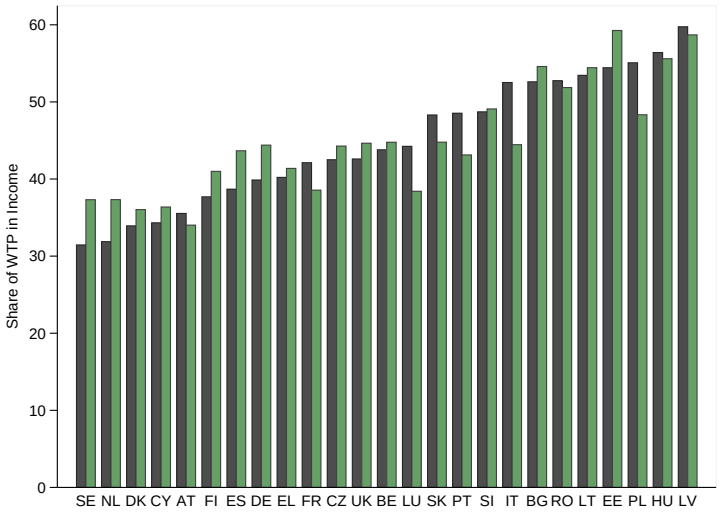


Figure 1.7: Share of WTP in Income: Gender and Age Groups

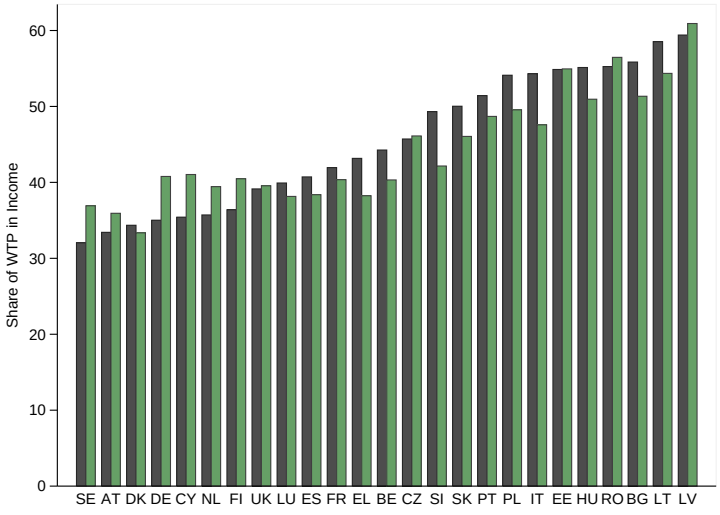
a) Men and Women



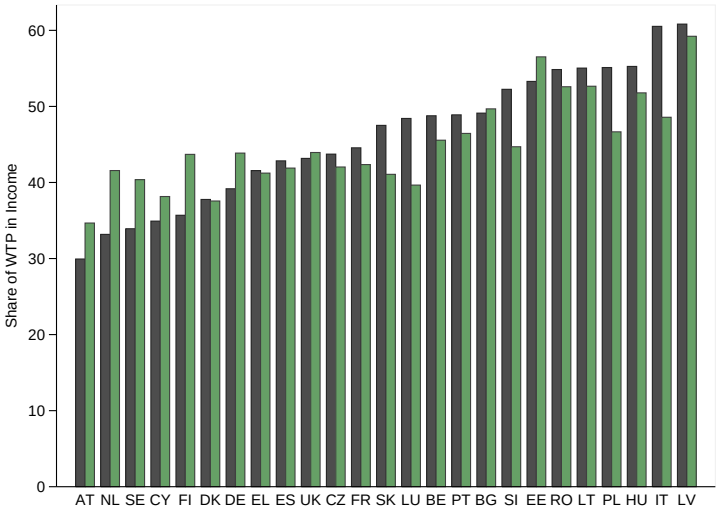
b) Men



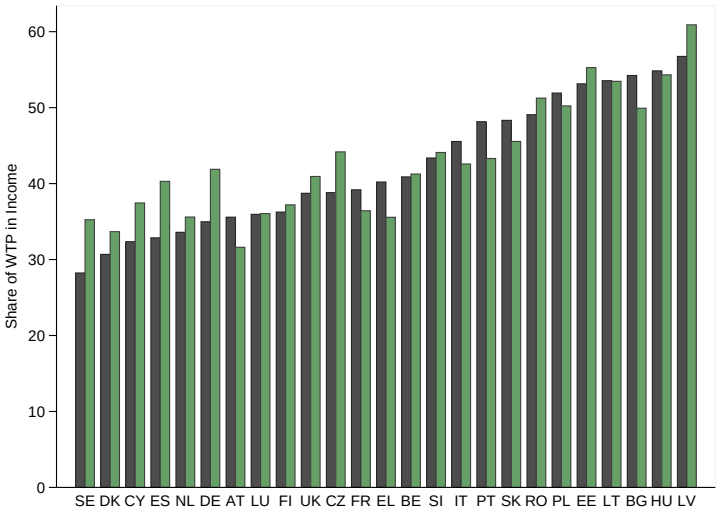
c) Women



d) Age Group 18-44



e) Age Group 45-64



f) Age Group 65-over

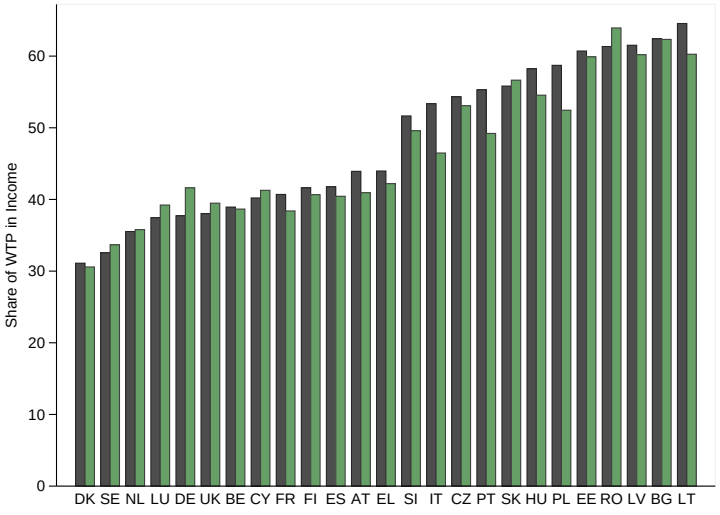
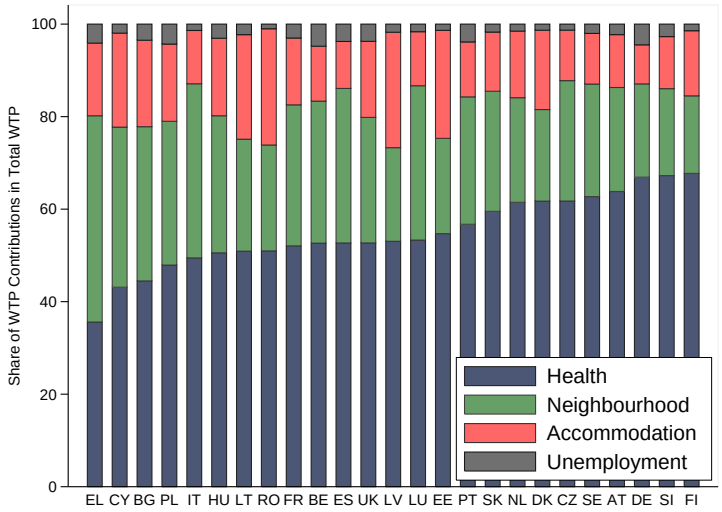
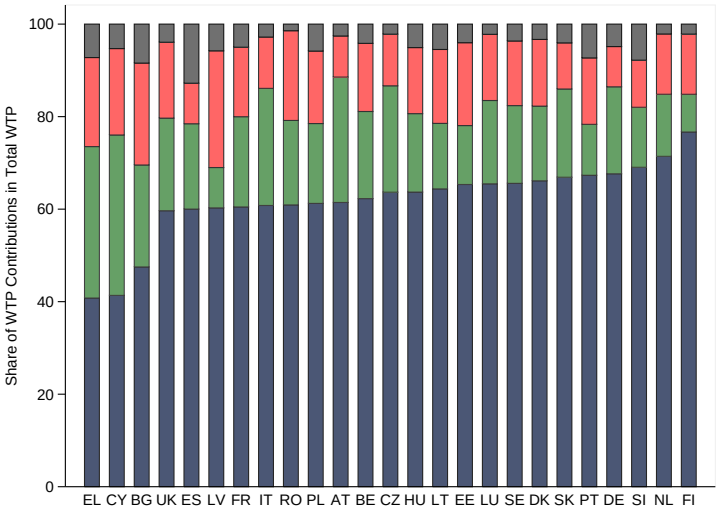


Figure 1.8: Shapley Decomposition of WTP: Gender

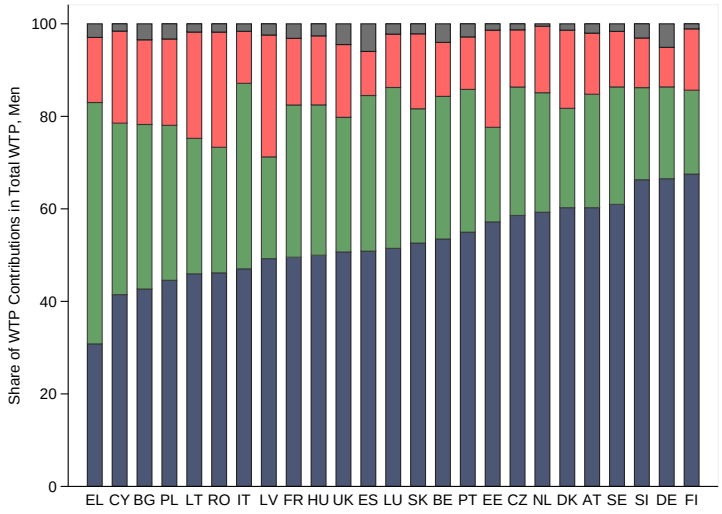
a) Men and Women, 2007



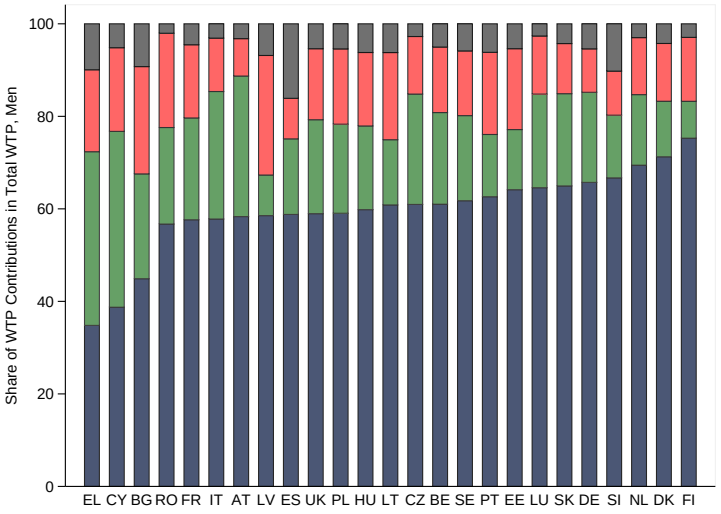
d) Men and Women, 2011



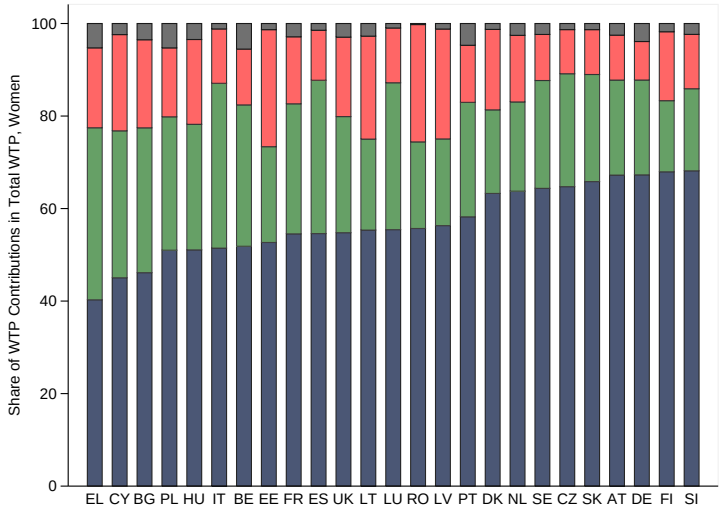
b) Men 2007



e) Men 2011



c) Women 2007



f) Women 2011

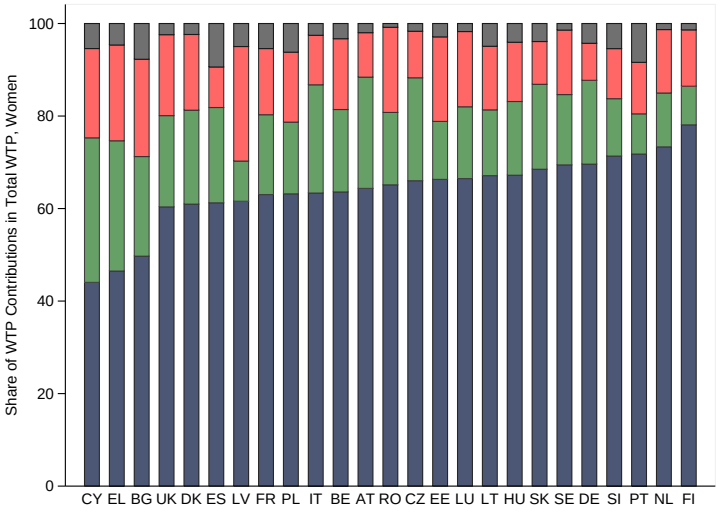
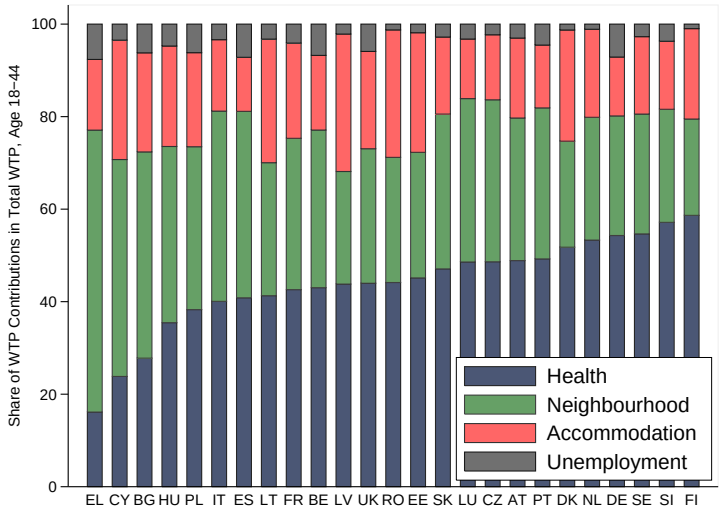
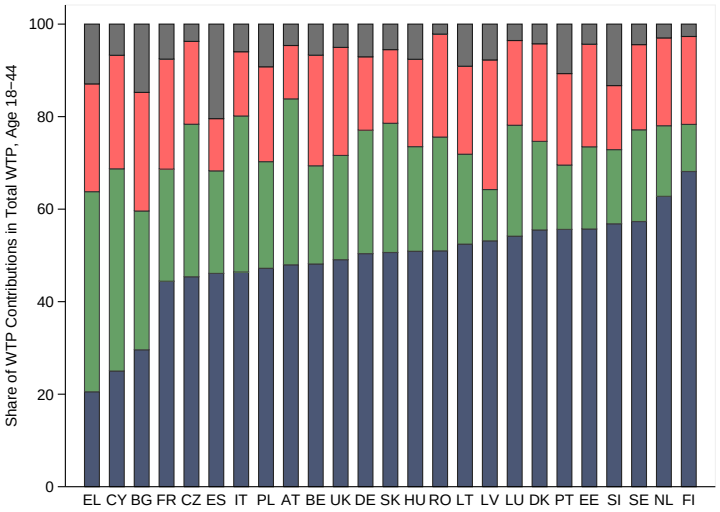


Figure 1.9: Shapley Decomposition of WTP: Age Groups

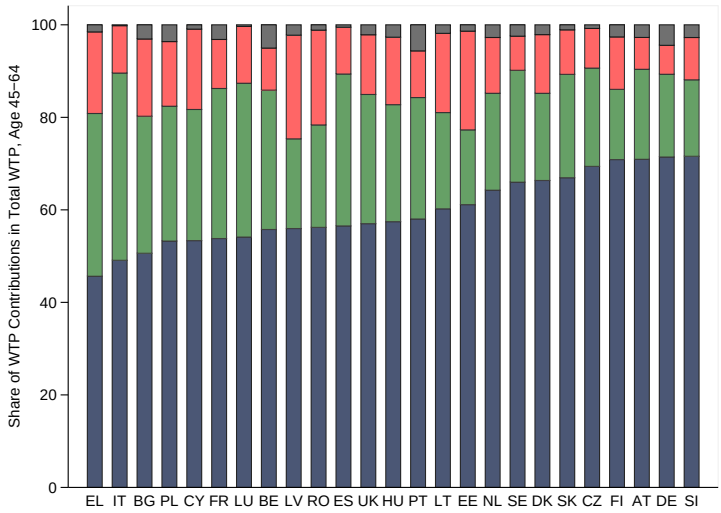
a) Age Group 18-44, 2007



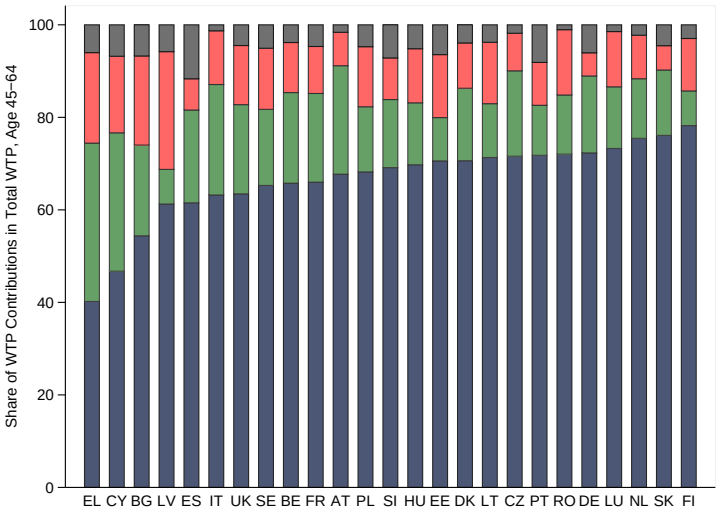
d) Age Group 18-44, 2011



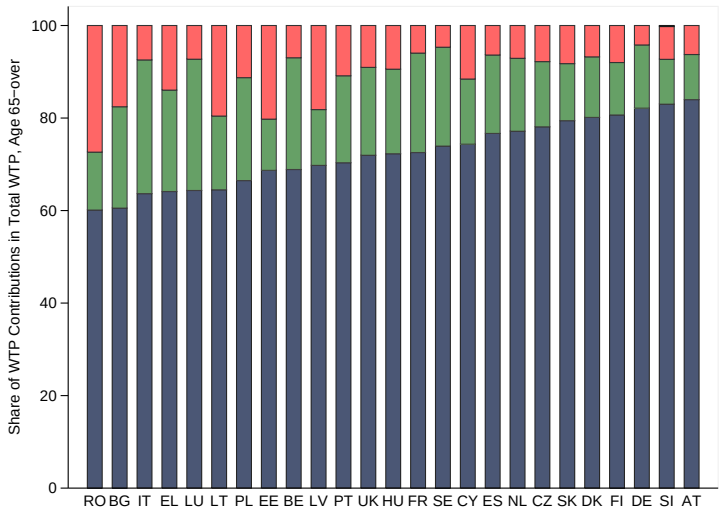
b) Age Group 45-64, 2007



e) Age Group 45-64, 2011



c) Age Group 65-over, 2007



f) Age Group 65-over, 2011

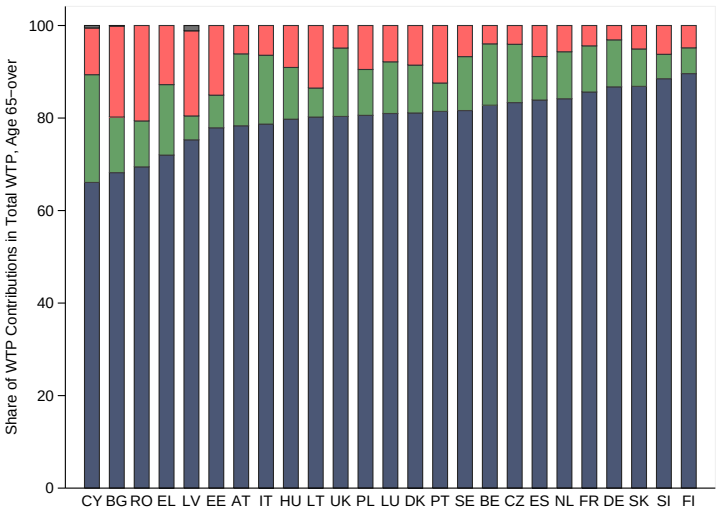


Figure 1.10: Re-ranking between Income and Equivalent Income

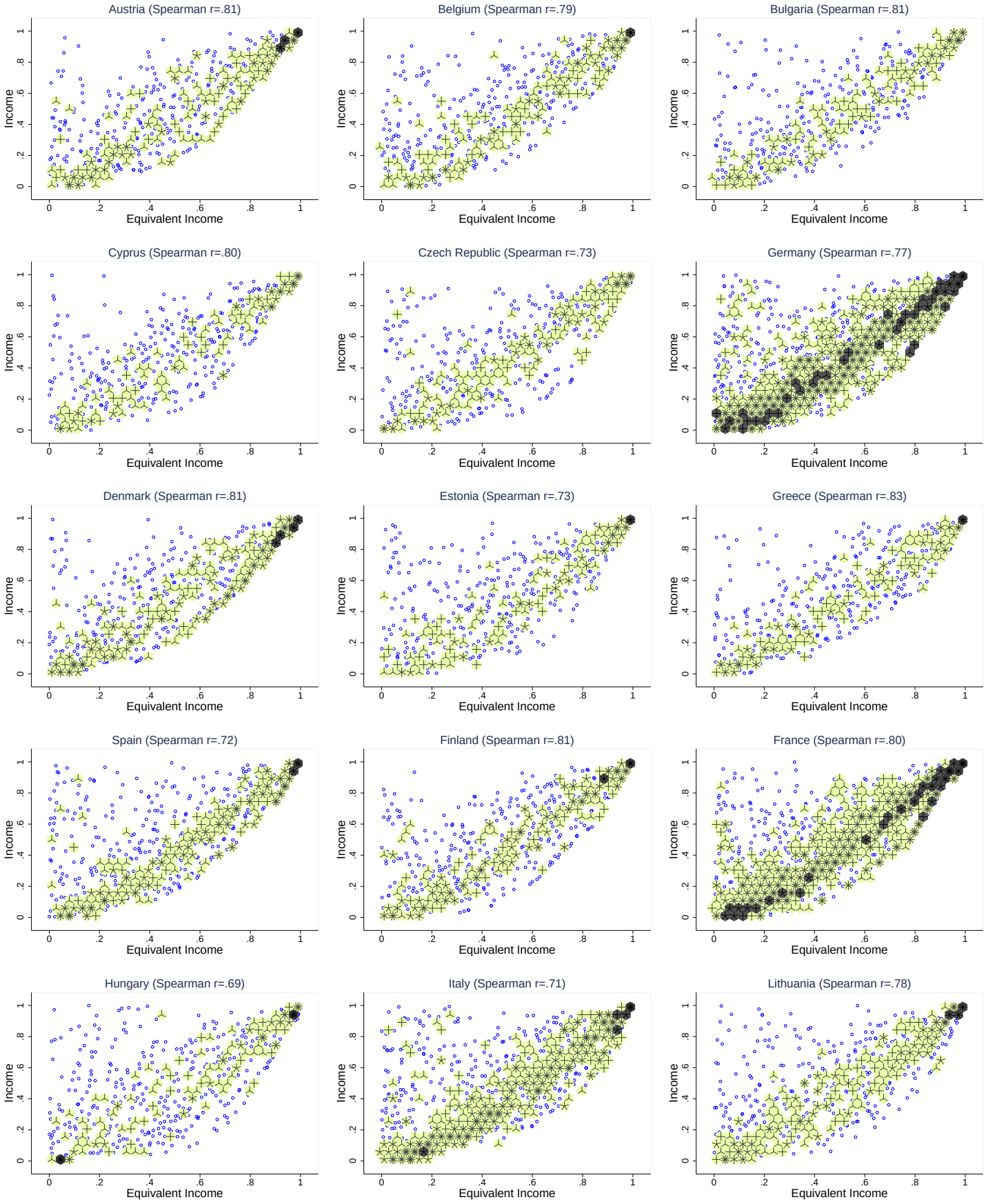
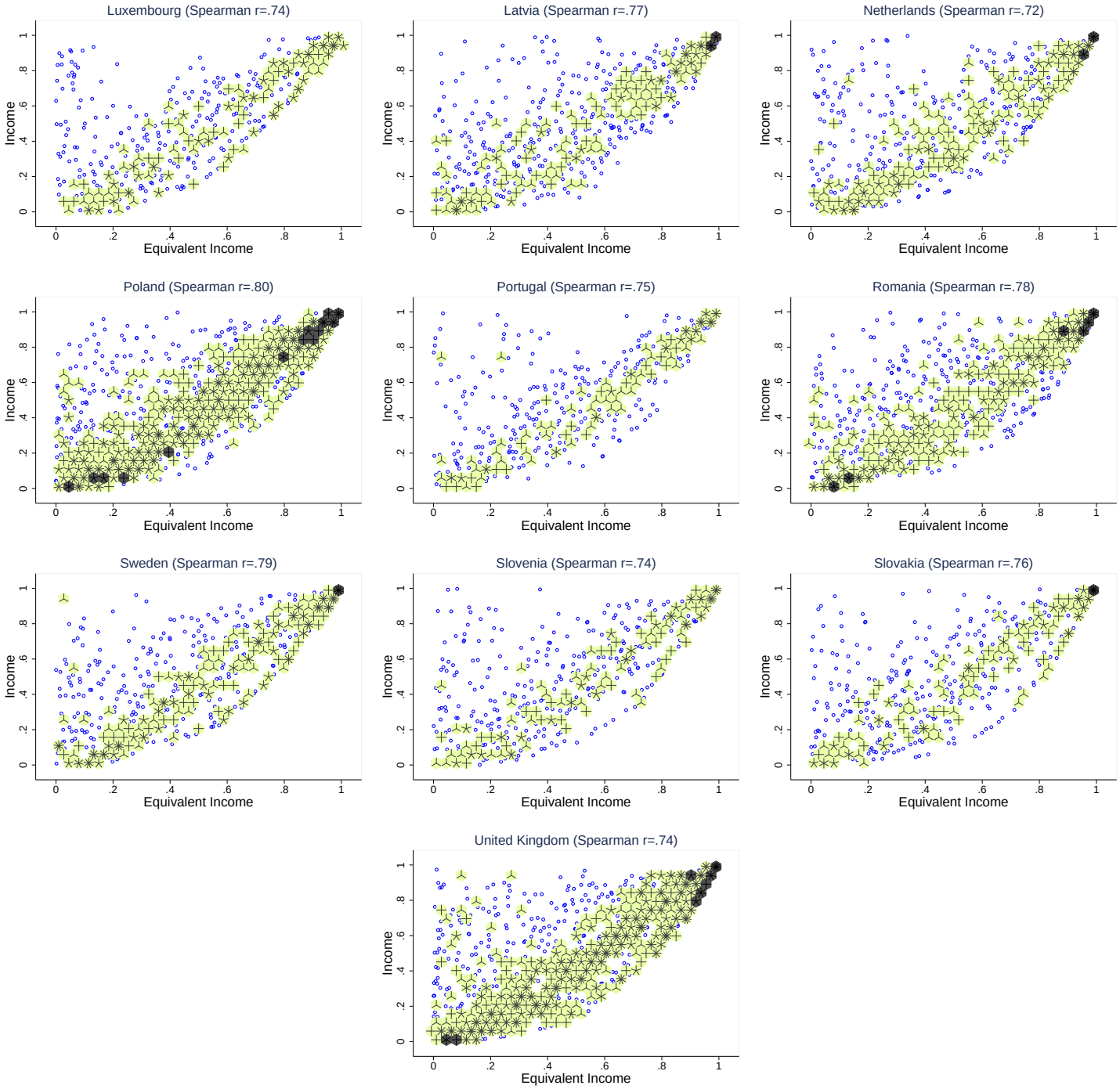


Figure 1.10: Re-ranking between Income and Equivalent Income (continuation)



Chapter 2

Multi-dimensional and Preference Respecting Well-Being on the Job: Evidence from Recent Graduates

2.1 Introduction

An important part of individual well-being comes from the well-being on the job. Given the fact that individuals spend much of their time at work, it is not surprising that the quality of job will be reflected in the evaluation of overall well-being of individuals. The individuals are not seeking for employment just to be paid but they have other reasons like realizing their own potentials and enriching their social life. Job quality is not only important for workers but for firms as well. According to the efficiency wage theory, the effort that workers will exert is determined by the job quality which is defined as the level of wage paid by the firm. Thus, higher job quality will induce workers to exert higher effort which will result in higher profits for firms.

The policy makers are interested in the job quality as well. As a matter of fact, an important part of the economic literature is concerned with the implementation and evaluation of public and social policies. Since the job quality provides the information on how well people are doing on their jobs, this information would allow the policy makers to identify those workers in low quality jobs. Accordingly, the labour market policies can be designed in such a way to increase the well-being of those workers who are in low quality jobs. Thus, the aim of these

policies is to enhance the decisions of economic agents since the actual behaviour of individuals may not bring them to achieve the best situation in life. Nevertheless, before we could assess the impact of a particular policy on the well-being of individuals, we would have to define the theoretical framework (concept) of well-being. For that matter, having a measure of well-being is quite useful.

An approach that has been used extensively is to construct an objective well-being measure. However, an immediate weakness of an objective well-being measure comes from the fact that such a measure will not care for the preferences of individuals. On the contrary, an objective measure has a paternalistic nature since the governments or policy makers would decide themselves which job aspects the individuals prefer. Certainly, this attempt would not be embraced by the economists who are emphasising the importance of individual preferences. The relative importance of various job aspects differ over individuals. Some individuals prefer to work longer hours, some prefer higher paid jobs, some prefer higher security at the job, etc. Thus, the information on preferences of workers is highly relevant for creating a good social and public policies.

In the literature we can normally find three approaches on how to obtain information on preferences (see Decancq et al. (2015)). The first approach is known as the *stated preference* approach where the individuals evaluate the importance between material and non-material dimensions. The disadvantage of the *stated preference* approach is that we either do not have the information about these evaluations or these evaluations are flawed due to cognitive difficulties individuals are exposed to while answering the questions in the contingent evaluation techniques. The second approach assumes that individuals declare their preferences through the observed behaviour and choices they make. This is know as the *revealed preferences* approach (see Bernheim and Rangel (2009)). The *revealed preferences* approach has a disadvantage that the individuals decisions contain various errors. Moreover, we rarely observe choices over different dimensions. The third approach consists of using the *subjective satisfaction* scores of individuals which allow us to obtain the information on the weights between material and non-material dimensions (see Schokkaert and Decancq (2013)).

The *subjective satisfaction* approach overcomes the disadvantages of the previous two approaches but it cannot be used directly for making interpersonal comparisons of well-being. However, the *subjective satisfaction* approach suffers from two problems which are suggested

by Sen (1985). The first problem concerns the *physical condition neglect* which means that the *subjective satisfaction* may not need to take into account the physical characteristics of the individuals but only their mental states. The second problem concerns the *valuation neglect* since the *subjective satisfaction* cannot be used to value a reflective activities.

These two problems restrain us to use the *subjective satisfaction* approach directly when we want to make interpersonal comparisons of well-being. In other words, the subjective responses to job satisfaction question may not contain independent variation to other variables of concern which we want to use to explain the individual behaviour. The responses to job satisfaction question reflect the objective situations in life of individuals but also on their psychological states such as aspirations, expectations and norms. Thus, the analysis of job satisfaction requires more comprehensive approach and our attempt will be to show that we can still use the subjective variable like job satisfaction in order to obtain useful information about the job quality of individuals but with certain adjustments.

Although, the well-being on the job is an important part of the overall well-being for many individuals, nevertheless, it is amazing that in contemporary economic literature, the topic of job quality remained quite under researched. The researches and policy makers are mainly concerned with the topic of job quantity (i.e. job creation, job stability and labour market participation). However, this shows a limited viewpoint of researchers and policy makers since the well-being of individuals is substantially determined by the quality of their jobs. Yet, we could noticed that recently, the topic of job quality has become increasingly important for the international organizations and governments. The European Union has shown a significant effort to incorporate the job quality in their agenda on the *European Employment Strategies*. In Leaken 2001, it was the first time that the job quality indicators have been considered as a part of employment and social policies. Within this initiative, the quality of employment was selected as an aspect that will define the quality of job (see European Commission (2001)).

The important incentive for measuring and evaluating multi-dimensional well-being of the current and future generations has been developed by the Stiglitz, Sen and Fitoussi Commission (see Stiglitz et al. (2009b)). The OECD has included the topic of job quality in their analysis of overall well-being *Better Life Initiative* but also to the analysis of *Inclusive Growth* (see OECD (2015a,b)), ILO constructed the "Manual on Concepts and Definitions of Decent Work Indicators" (ILO (2012)), the UNECE constructed the "Framework for Measuring Quality of

Employment" (UNECE (2015)) and the Eurofond constructed the "Job Quality Framework" (Eurofound (2012)). Even though a substantial effort has been exerted to improve the measurement of job quality and to develop its conceptual framework, it is evident that further effort is needed for constructing the operational framework for measuring job quality which can be then easily applied in different settings that respects the fundamental principles a reasonable job quality measure should incorporate (see Muñoz de Bustillo et al. (2011b)). Unfortunately, until today there is still no agreement on the definition of job quality and what will be the proper way to measure it.

The researchers and policy makers are confronted with two main impediments when they are analysing the job quality. The first difficulty bears upon finding a proper definition and how to find a measure of job quality which will be consistent with comparisons over countries, time and groups[1]. The second difficulty concerns the multi-dimensional concept of job quality which resulted in finding no agreement on the question about which dimensions we should include in a measure of job quality but also there is no agreement on how to measure these dimensions. Researches who have tackled the topic of job quality, were predominantly interested in the job quality from a one-dimensional prospect of wage (see Lucifora et al. (2005) and Grimshaw (2011)). This is obviously not a very realistic point of view since the job quality is not only determined with the material dimension (see Clark (2005)) but it is also determined by other dimensions which are not expressed in material terms.

Thus, a stepping-stone for measuring job quality comes from the fact that job quality is a multi-dimensional concept and trying to construct a measure of well-being which will aggregate various job dimensions in a single measure is not a trivial task. If one wants to tackle this issue then the first step is to create the weights ascribed to each dimension which have normative justification. In the literature there are two main approaches for creating an index of well-being on the job.

[1]Nevertheless, there are several approaches that researches have undertaken to analyse the differences and trends in job quality across countries. The most elementary approach for analysing job quality is based on the analysis of job dimensions (see Olsen et al. (2010) and Clark (2005)). Although, this approach is simple to apply, nevertheless a serious weakness of this approach is that it does not take into account the correlations between different job dimensions (i.e. low job security and high job autonomy) and also this approach is difficult to apply if we consider a large number of job dimensions. Second approach is to analyse the job quality on the basis of taxonomy of job types (see Holman (2013)). Third approach is to analyse the job quality from the macroeconomic perspective which is based on building a model of job quality at the national level (see Davoine et al. (2008)). The forth approach is to analyse the job quality by constructing an index of job quality which aggregates various job dimensions using particular weighting schemes for these dimensions (see Ritter and Anker (2002), Leschke et al. (2008), Muñoz de Bustillo et al. (2011a) and Schokkaert et al. (2011)).

The first approach is to compute the objective measure of well-being on the job which ascribes equal weights to all job dimensions. The objective well-being measure is computed either by using a factor analysis, regression analysis (see Jencks et al. (1988) and Kalleberg and Vaisey (2005)) or the researcher presupposes some arbitrary weights which are then ascribed to all job dimensions. Although, this approach is quite simple to implement, nevertheless it suffers from a serious weakness which is that the chosen weights do not reflect the fact that individuals have different preferences over various job attributes. As we have argued, different individuals may have different preferences over job dimensions.

The second approach is to measure job quality with the subjective job satisfaction revealed by individuals (see Freeman (1978), Clark and Oswald (1996), Hamermesh (1977, 2001), Blanchflower and Oswald (2004), Ritter and Anker (2002), Levy-Garboua and Montmarquette (2004) and D'Addio et al. (2007)). The concept of job satisfaction originates from the literature in sociology, industrial psychology and organizational behaviour (see Herzberg et al. (2011) and Spector (1997)). The subjective job satisfaction reflects the workers attitude for a various collection of job characteristics at their job. The proponents of this approach presuppose that the job satisfaction score reflects the true valuation of the well-being on the job of individuals (see Clark (1997a, 2001), Frey and Stutzer (2002a,b)).

One of the founders of the concept of job satisfaction, Locke (1976) suggested that the job satisfaction can be defined as the summation of job outcomes such that each job outcome is weighted by its importance to the worker. Nevertheless, as it has been argued in the literature, the subjective job satisfaction is affected by the adaptation and expectations (i.e. scaling factors) which means that one has to be careful with the direct interpretation of the job satisfaction measure (see Hamermesh (2001), Levy-Garboua and Montmarquette (2004), Muñoz de Bustillo et al. (2011b) and Sousa-Poza and Sousa-Poza (2000)). To illustrate this point, one can think of a worker who objectively holds a job of low quality but her subjective job satisfaction is high due to her low reference level of adaptations and expectations. We can also think of another worker who objectively holds a job of high quality but he has low job satisfaction due to his high level of aspirations and expectations. Thus, the well-being on the job is considered to be a more comprehensive concept than the concept of job satisfaction (see Danna and Griffin (1999)).

Obviously, these two approaches for measuring job quality are opposing each other. The objective measures of well-being do not take into account the importance of individual prefer-

ences but instead the relative importance of each dimension is imposed in a paternalistic way. The subjective job satisfaction measure is sensitive to individual preferences but these preferences are as well under the influence of scaling factors which can violate the assumption of having a genuine preferences.

In this study we aim our attention at measuring job quality using a large sample of countries. We restrict our analysis to a specific sub-population of recent graduates who have just entered the labour market. Since the literature on job quality for young and educated workers is quite scarce and moreover given the importance this sub-population have in the society, we have decided measure job quality among recent graduates in order to fill the following gap in the literature. The main reason why younger highly educated workers have been left out from the job quality analysis is based on opinion that this group of people have higher opportunities on the labour market relative to other groups in the society (see Kalleberg and Vaisey (2005)). However, these young and educated workers have job characteristics and job values that differ from the job characteristics and job values of previous generations of workers (see Ng et al. (2010)). Thus, what a former group of workers think of a god job may be quite different from the opinion of the later group of workers.

Since measures of job quality are of the utmost importance for constructing valuable labour market policies we have compared five different measures of well-being on the job. The job quality measures we have used include the objective measure of equal weights, objective measure of average preferences, subjective measure of job satisfaction, wage and equivalent wage. We have found that countries greatly differ according to the measure of job quality we use. This results imply that one should be extremely careful with selecting a particular measure of job quality since different measures embody different normative implications. In the upcoming sections we will explain in detail the implementation and informational requirement for each of these measures.

We also analyse the determinants of job satisfaction among the recent graduates. From the perspective of policy makers and governments it is important to know the effects of various job characteristics on job satisfaction. The literature on job satisfaction suggests that there are various determinants that have an effect on job satisfaction. The first set of determinants refers to monetary and non-monetary job characteristics. The effect of wage on job satisfaction is found to be positive although some researches claim that the relationship between the abso-

lute wage level and job satisfaction is not substantial (see Levy-Garboua and Montmarquette (2004)). It has been found that the effect of wage on job satisfaction is reducible since workers can adapt to higher wages (see Groot and Maassen van den Brink (1999)), that job satisfaction can be influenced by wage inequality (see Hamermesh (2001)) or it is the wage of some reference group which matters (see Clark and Oswald (1996)). On the other hand, the important list of non-monetary job characteristics includes recognition, achievement, responsibility, variety, task identity, autonomy, skill utilization and security (see Herzberg et al. (2011) and Muñoz de Bustillo et al. (2011b)). We have shown that besides wage, young graduates care much about the non-wage job characteristics. Both men and women find a good career prospect to be relatively the most important non-wage job characteristic while they find job security to be relatively the least important non-wage job characteristic.

Our work connects the measurement of job quality with the literature on gender economic inequality[2]. We do so by analysing the gender differences in job quality within and across counties. Although the economic position of men and women has become more equal from the 1950s until today, we still observe that women are on average less paid and that they work on the jobs of lower quality (see Ponthieux and Meurns (2015) for an overview). The evidence that shows persisting gender wage gaps across countries is indeed puzzling since women have gained comparable level of education relative to men, women have prolonged their decision about maternity and the family structures have changed such that marriages are not stable as before and women showed increased economic independence by discarding their male spouse as a breadwinner. Nevertheless, women are still treated unequal to men on the labour market. The importance of this evidence has greatly reflected in recent work of policy makers who have designed policies in order to equate the conditions which led to gender wage inequality (see OECD (2012)).

The approach we have taken to analyse the gender differences in job quality consists of comparing the wage and equivalent wage measure. In addition, after comparing the gaps in the job quality at the mean, we have proceed further into the distributional analysis of the gender gaps in job quality. We have found that the quality of jobs is higher for men in almost all countries if we use the wage measure. However, as soon as we use a multi-dimensional and preference sensitive measure of job quality, we have observed that in some countries women are

[2]Although the following term is a quite broad we would concentrate on the issue of the gender wage gap and gender equivalent wage gap.

either faring equal to men or they are even faring better than men. We have also compared the gender differences in the willingness-to-pay for reaching the reference values of non-wage job characteristics. The results have shown that men are having higher total willingness-to-pay which means that they are suffering more than women for not reaching the reference values in non-wage job characteristics. Finally, we have illustrated the Shapley value decomposition of the total willingness-to-pay on the contributions attributed to each non-wage job characteristic. We have found that for both men and women across all countries, having a good career prospect is relatively the most important non-wage job characteristic, while job security is found to be the least important non-wage job characteristic.

This chapter is structured as follows. In section 2.2 we describe the conceptual framework for each measure of job quality. In section 2.3 we present a set of measures of job quality that we will use. Section 2.4 illustrates the empirical strategy for estimating job satisfaction model. In the same section we illustrate the methodology for estimating the equivalent wage from the job satisfaction data. Section 2.5 describes the data and it shows the distribution of job quality across countries and across gender. Section 2.6 presents the results. Section 2.7 concludes.

2.2 Satisfaction, Individual Preferences and Job Characteristics

In this section we illustrate the theoretical framework for measuring job quality that will be used in our empirical analysis. The purpose of constructing a measure of job quality is to provide an information on the well-being of individuals at their jobs. It is important to note that before constructing a measure of job quality one should justify the assumptions on which each measure is based on. We present a set of propositions which serve as a normative underpinnings for these measures. For the presentation of these propositions we follow Fleurbaey et al. (2009), Schokkaert et al. (2011).

2.2.1 The Framework

Let us assume that a job of each individual i (where $i \in 1, 2, \ldots, N$) is defined by a vector of job characteristics or aspects that we denote with θ_i. The vector of job characteristics represents the complete characterisation of the job of individuals such that it includes the outcomes and achievements of the jobs. We assume that the vector of job characteristics consists of a material job characteristic which is captured by wage of the individual w_i and it consists of other (non-wage) job characteristics (i.e. security, autonomy, etc.) which are represented with the m-dimensional vector, $X_i = (X_i^1, X_i^2, \ldots, X_i^m)$, where $m \in (1, 2, \ldots, M)$. The vector of job characteristics can be written as $\theta_i = (w_i, X_i)$, where $\theta_i \in \mathbb{R}_+^m$.

We assume that individuals are well-informed about what represents a good job. In other words, each individual i has an ordinal preference ordering over the vectors of job characteristics which are denoted with $\mathcal{R}_i$ for a weak preference ordering, $\mathcal{P}_i$ for a strict preference ordering and $\mathcal{I}_i$ for an indifferent preference ordering. In addition, we assume that individual preferences are complete, continuous, transitive and weakly monotonic. We can represent any preference ordering that satisfy these requirements by a utility function which we denote with U_i. Formally this relation can be written as

$$\forall \theta_i, \theta_i' \in \mathbb{R}_+^m, \ \theta_i \succeq \theta_i' \iff U_i(\theta_i) \geq U_i(\theta_i') \tag{2.1}$$

where $U_i : \mathbb{R}_+^m \to \mathbb{R}$. Since we will be interested in ordinal ranking of bundles of job characteristics, we can use the indifference curves obtained from the utility function as a description of preference rankings for these bundles. Nevertheless, in order to be able to make the inter-

personal comparison of utilities we must have individuals with exactly the same preferences which does not seem as a plausible assumption since different individuals may have different preferences. Once we introduce the heterogeneity of preferences we may not longer use the same indifference curves for comparing bundles of goods between individuals.

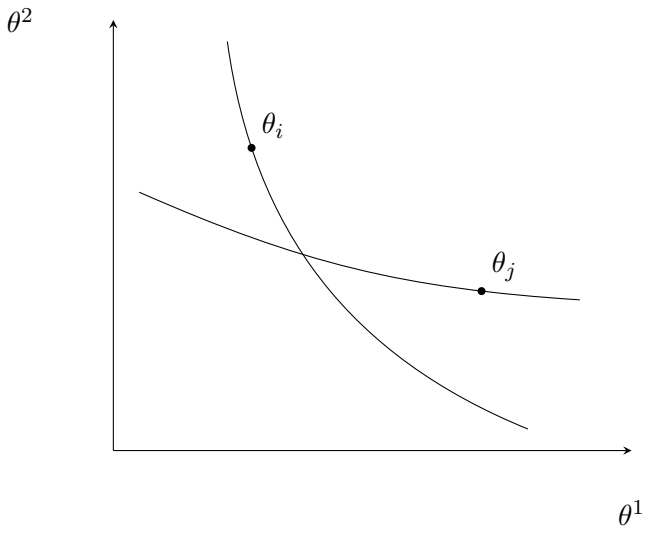


Figure 2.1: Preferences

A situation where the heterogeneity of preferences does not allow us to use the indifference curves for utility comparison is depicted in figure 2.1. Suppose there are two individuals i and j and both of these two individuals are having preferences over two job characteristics, θ^1 and θ^2. The slope of indifference curves reveal that an individual i relatively prefers θ^1 while on the opposite an individual j relatively prefers θ^2. Since their indifference curves cross we are not able to tell whether individual i in point θ_i is better or worse off that individual j in point θ_j. A solution to this problem is found by cardinalizing the utility function such that to each indifference curve we ascribe a number according to which we can precisely rank the well being of individuals by looking at their indifference curves.

An approach that we will follow in order to achieve the cardinalization of utility function is to use the information on the subjective satisfaction of individuals S_i as a way of assigning a number to indifference curves of individuals. As long as the satisfaction function of individuals S_i complies with individual preferences $\mathcal{R}_i$ one can achieve a cardinalization of utility function

which is consistent with preferences. The following requirement can be written as

$$\forall \theta_i, \theta_i' \in \mathbb{R}_+^m,\ \theta_i \mathcal{R}_i \theta_i' \Longleftrightarrow S_i(\theta_i) \geq S_i(\theta_i') \tag{2.2}$$

Nevertheless, we could be suspicious about whether this requirement that tells us that a cardinal representation of S_i could be achieved from the preference ranking $\mathcal{R}_i$ will be satisfied. For instance, individuals may report the level of subjective satisfaction which is affected with their mental states or feelings that they are endure and therefore their level of satisfaction will not be consistent with the preference ordering (see Adler (2013)).

Another reason why the consistency between the subjective satisfaction and preference ordering may fail concerns the evidence which has found that individuals change their aspirations and expectations in life when they compare their current life situations with a life situation at the particular reference point (see Loewenstein and Ubel (2008)). That is to say, if we want to have a proper cardinal representation of S_i which is consistent with the representation of preference ranking $\mathcal{R}_i$, we have to take into account the influence of aspirations, expectations and other scaling factors. It is important to note that these scaling factors affect the labels (position) of indifference curves but they do not have an effect on the slope of indifference curves.

Finally, we arrive at the condition that guarantees that the cardinal representation of the satisfaction function S_i is consistent with the representation of the preference ordering $\mathcal{R}_i$. This is called the *Consistency assumption* and it can be written as

$$\theta_i \mathcal{R}_i \theta_i' \Longleftrightarrow S_i(\theta_i, \mathcal{R}_i, \Sigma_i) \geq S_i(\theta_i', \mathcal{R}_i, \Sigma_i) \tag{2.3}$$

where Σ_i represents the scaling factors such as aspiration and expectation of individuals. We can immediately see that after we control for the scaling factors, the preference orderings over vectors of job characteristics is logically equivalent to a situation where we compare the subjective satisfaction of individuals holding the vector of job characteristics and preferences constant.

2.2.2 The Principles of Job Quality Measures

We now turn to present a set of propositions which a sound measure of job quality should satisfy. A measure of job quality represents the well-being on the job that an individual holds.

The job situation of the individual i is completely characterized by a triplet $(\theta_i, \mathcal{R}_i, \Sigma_i)$. The well-being on the job is denoted with WB. Putting this notation into use we can compare the well-being of an individual i across different job situations. Let us suppose that we have to evaluate the well-being of individual i at two job situations, $(\theta_i, \mathcal{R}_i, \Sigma_i)$ and $(\theta_i', \mathcal{R}_i', \Sigma_i')$. If we have that $(\theta_i, \mathcal{R}_i, \Sigma_i) \succeq (\theta_i', \mathcal{R}_i', \Sigma_i')$ (or equivalently $(\theta_i, \mathcal{R}_i, \Sigma_i)\ \mathcal{R}_i\ (\theta_i', \mathcal{R}_i', \Sigma_i')$) then we conclude that $\text{WB}(\theta_i, \mathcal{R}_i, \Sigma_i) \geq \text{WB}(\theta_i', \mathcal{R}_i', \Sigma_i')$.

As we are predominantly interested in comparing well-being between individuals we have to come up with a reasonable and acceptable properties that these measures of well-being satisfy. For that matter, showing respect for individual preferences play a decisive role. If we assume that individuals have identical preferences then we do not have to worry that the principle of sovereignty of individual preferences would be violated in the process of well-being comparison. Nevertheless, we are confronted with a non-trivial question on how to compare the well-being between individuals when we assume that individuals do not have the identical preferences. In order to find the solution to the following dilemma we could start with the so-called *Dominance principle*.

Principle 4 (*Dominance principle*)**.** *Let us assume that there are two individuals i and j which differ in their preference rankings such that $\mathcal{R}_i \neq \mathcal{R}_j$. Then this principle imply that $\text{WB}(\theta_i, \mathcal{R}_i, \Sigma_i) \geq \text{WB}(\theta_j, \mathcal{R}_j, \Sigma_j)$ if $\theta_i \geq \theta_j$ and similarly for the strict preference relations $\mathcal{P}$ and indifference preference relations $\mathcal{I}$.*

In line with this principle we can say that if the bundle of job characteristics of the individual i is not smaller than the bundle of job characteristics of the individual j then the well-being on job of individual i is at least as good as the well-being on job of individual j. It is obvious that a weakness of this principle is that it does not imply a complete preference ordering but it implies only a partial preference ordering.

The *Dominance principle* completely disregards individual preferences (and the scaling factors) when it compares the job quality of individuals. Nevertheless, the preferences of individuals can be quite distinctive and since we believe that the idea of respecting individual preferences is important, we would look for a principle which would require that a measure of well-being on the job takes into account the preferences of individuals over a vector of job characteristics. In order to do this we introduce the principle which is called the *Conditional respect for individual preferences*.

Principle 5 (*Conditional respect for individual preferences*)**.**

Let us assume that there are two individuals i and j which have identical preference rankings, $\mathcal{R}_i = \mathcal{R}_j = \mathcal{R}$ and they have identical scaling factors, $\Sigma_i = \Sigma_j = \Sigma$. The following principle implies that (i) $\text{WB}(\theta_i, \mathcal{R}_i, \Sigma_i) \geq \text{WB}(\theta_i', \mathcal{R}_i, \Sigma_i) \iff \theta_i \mathcal{R}_i \theta_i'$, (ii) $\text{WB}(\theta_i, \mathcal{R}, \Sigma) \geq \text{WB}(\theta_j, \mathcal{R}, \Sigma) \iff \theta_i \mathcal{R} \theta_j$, *and similarly for the strict preference relations $\mathcal{P}$ and indifference preference relations $\mathcal{I}$.*

We can use the following principle to compare the individual well-being on the job over two different bundles of job characteristics. Moreover, this principle asserts that if we have two individuals with the same preference ordering and the same scaling factors, we can compare their well-being by using the preference orderings that these two individuals have over the bundles of job characteristics. Nevertheless, it is important to emphasise that it is not possible to find a measure of job quality which satisfies at the same time the *Dominance principle* and *Conditional respect for individual preferences* because these two principles are mutually not consistent. Fleurbaey (2007) and Decancq et al. (2015) show that if we consider both of these principles then the axiom of transitivity of preferences will be violated.

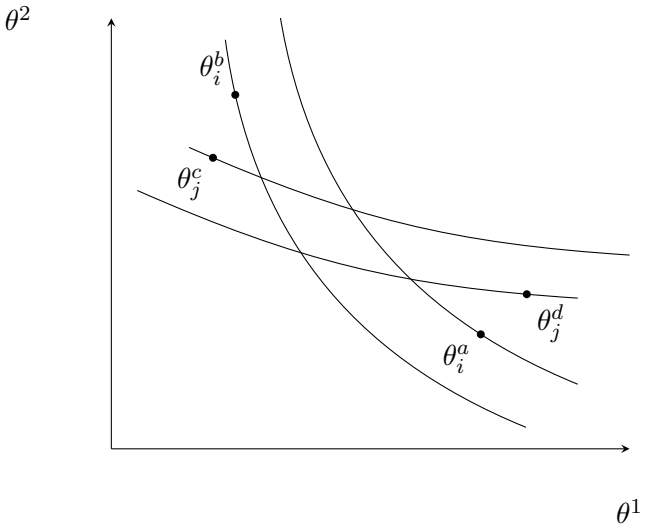


Figure 2.2: Contradiction between dominance and conditional respect for preferences

This can be easily shown in the figure 2.2. Suppose there are four jobs available which we denote with a, b, c and d. Each of these four jobs are characterized with a different vector of job characteristics, θ. If we apply the *Dominance principle* we would obtain $\text{WB}^b(\theta_i^b, \mathcal{R}_i, \Sigma_i) \geq \text{WB}^c(\theta_j^c, \mathcal{R}_j, \Sigma_j)$ and $\text{WB}^d(\theta_j^d, \mathcal{R}_j, \Sigma_j) \geq \text{WB}^a(\theta_i^a, \mathcal{R}_i, \Sigma_i)$ while if apply the *Conditional re-*

spect for individual preferences we would obtain $\text{WB}^c(\theta_j^c, \mathcal{R}_j, \Sigma_j) \geq \text{WB}^d(\theta_j^d, \mathcal{R}_j, \Sigma_j)$ and $\text{WB}^a(\theta_i^a, \mathcal{R}_i, \Sigma_i) \geq \text{WB}^b(\theta_i^b, \mathcal{R}_i, \Sigma_i)$. Obviously, it is not possible to satisfy both of these two results.

Although the previous principle gave rise to the important notion for respecting individual preferences, yet the underlining assumption was that the scaling factors are assumed to be constant across individuals. Nevertheless, as we have argued the scaling factors such as the level of aspirations and expectations can vary across individuals or they can vary across time for a given individual. Therefore, we have to consider the principle which takes into account individual preferences in the setting where the scaling factors might not be constant. This principle can be formally stated as

Principle 6 (*Unconditional respect for individual preferences*)**.** *Let us assume that there are two individuals i and j which have identical preference rankings, $\mathcal{R}_i = \mathcal{R}_j = \mathcal{R}$ but their scaling factors differ, $\Sigma_i \neq \Sigma_j$. Then the following principle imply that (i) $\text{WB}(\theta_i, \mathcal{R}_i, \Sigma_i) \geq \text{WB}(\theta_i', \mathcal{R}_i, \Sigma_i') \iff \theta_i \mathcal{R}_i \theta_i'$, (ii) $\text{WB}(\theta_i, \mathcal{R}, \Sigma_i) \geq \text{WB}(\theta_j, \mathcal{R}, \Sigma_j) \iff \theta_i \mathcal{R} \theta_j$, and similarly for the strict preference relations $\mathcal{P}$ and indifference preference relations $\mathcal{I}$.*

Nevertheless, since the *Conditional respect for individual preferences* is not consistent with the *Dominance principle* and since the *Unconditional respect for individual preferences* implies the *Conditional respect for individual preferences*, this means that the *Unconditional respect for individual preferences* will not be consistent with the *Dominance principle*. In order to solve the following problem one can either weaken the *Conditional respect for individual preferences* or one can weaken the *Dominance principle*. Fleurbaey (2007) and Decancq et al. (2015) argue that we should weaken the *Dominance principle* if we want to respect individual preferences over important dimensions in life. A weaker form of the *Dominance principle* is given in the following principle.

Principle 7 (*Subset dominance principle*)**.** *Let us assume that there are two individuals i and j which might have different preference rankings, $\mathcal{R}_i \neq \mathcal{R}_j$ and they might have different scaling factors, $\Sigma_i \neq \Sigma_j$. In addition, let us assume that there exists a subset $\Gamma \in \mathbb{R}_+^m$, such that $\theta_i, \theta_j \in \Gamma$. Then we have $\text{WB}(\theta_i, \mathcal{R}_i, \Sigma_i) \geq \text{WB}(\theta_j, \mathcal{R}_j, \Sigma_j)$ if $\theta_i \geq \theta_j$.*

It is important to note that the *Subset dominance principle* still applies the same rationale as the *Dominance principle* but the former principle is constrained at the specific subset of the

space of job characteristics which we denote with Γ. Fleurbaey (2009) has shown that the *Conditional respect for individual preferences* and *Unconditional respect for individual preferences* are both satisfying the *Subset dominance principle* and this proves the existence of a well-being measure which respect individual preferences. This is known as the *Equivalent income* (*wage*) measure (see Fleurbaey (2009) and Decancq et al. (2015)). In the next section, we provide the description of this measure in detail.

2.3 Measures of Job Quality

We present five measures of well-being on the job. Each of these measures are conceptually different and they use different part of information to evaluate job quality. We will differentiate between the well-being measures according to the arguments contained in these measures. These arguments are a vector of job characteristics θ_i, preference orderings $\mathcal{R}_i$ and the scaling factors Σ_i. In other words, a measure of well-being on the job uses the information which is included in a triple $(\theta_i, \mathcal{R}_i, \Sigma_i)$. However, it is not necessary that all measures of well-being on the job use the entire information included in a triple but rather they may use only some part of it.

2.3.1 Subjective Measures of Well-being on the Job

The subjective measure of well-being on the job is based on the job satisfaction question where individuals self report their level of satisfaction on the job. The convenience of this approach is that we can use the answers on the job satisfaction question as a measure of job quality. The subjective measure of well-being on the job of individual i is represented with the job satisfaction function S as follows

$$\mathrm{WB}^s(\theta_i, \mathcal{R}_i, \Sigma_i) = S(\theta_i, \mathcal{R}_i, \Sigma_i) \tag{2.4}$$

Yet, one has to be cautious when using the subjective job satisfaction as an instrument to compare job quality. As we have already mentioned in the previous section, the numbers assigned to subjective job satisfaction (that is, the calibration of the job satisfaction function) will be under the influence of the scaling factors like the aspirations, adaptation, and expectations.

Moreover, one can reasonably be sceptical about whether the subjective measure of well-being on the job appreciate the preferences of individuals. As long as the *Consistency assumption* is satisfied, this measure will comply with the ordinal preference rankings of individuals $\mathcal{R}_i$ such that we could legitimately be involved in making *intrapersonal* comparisons of well-being on the job. In other words, if the *Consistency assumption* holds, we can argue that this measure satisfies the *Conditional respect for preferences*. Of course, one can easily imagine the situation where for instance the individual i prefers θ_i over θ_i', $\theta_i \mathcal{R}_i \theta_i'$, while due to altering scaling factors, the individual i would still be better off with θ_i' than with θ_i, so that $S(\theta_i, \mathcal{R}_i, \Sigma_i) < S(\theta_i', \mathcal{R}_i, \Sigma_i')$.

Nevertheless, even if the *Conditional respect for preferences* is satisfied still this does not allow us to make the *interpersonal* comparisons of well-being on the job. For instance, it is easy to imagine the situation where two individuals i and j, both have the same preferences, $\mathcal{R}_i = \mathcal{R}_j = \mathcal{R}$, where they both prefer job b over job a but nevertheless the satisfaction of individual i that holds job b may be lower than the satisfaction of individual j that holds job a. Since these two individuals assign a different number to their satisfaction functions and since the later depend on the scaling factors (i.e. adaptations, norms and expectations) which may be different for different individuals, it is indeed possible that this situation occurs.

Since the scaling factors play a role, the subjective job satisfaction will not satisfy the *Unconditional respect for preferences*. In the work by Sen (1985) the influence of aspiration and adaptations on the subjective satisfaction is well described in his notion of *physical condition neglect* according to which a person i can adapt to her poor situation such that she is more satisfied than the other person j who might be in the better situation but due to a higher expectations of person j, still person i will be more satisfied than person j. Thus, if we want to satisfy the stronger condition for respecting individual preferences, then obviously our choice for the subjective job satisfaction measure would be wrong.

2.3.2 Wage

A vector of job characteristics θ includes the monetary asset of the individual which is represented with wage. Using wage as a measure of well-being on the job of individual i we arrive at the following expression

$$\mathrm{WB}^{w}(\theta_i, \mathcal{R}_i, \Sigma_i) = w_i \tag{2.5}$$

One can immediately notice that the multi-dimensionality of the job quality measure falls apart with the wage measure. This is obviously a noticeable weakness of the following measure since we could find two individuals with the same wage but with quite different non-wage job characteristics, yet the well-being on the job of these two individuals would be identical.

2.3.3 Objective Measures of Well-being on the Job

Those who are interested in the multi-dimensional concept of well-being would not find the wage measure useful since it only takes into consideration one aspect of the job. The weakness of a

one-dimensional measure can be resolved by taking into account additional aspects of the job which we would include in the well-being measure. Unfortunately, even when these additional aspects of the job are included in a measure of well-being, still the remaining challenge is how to make the *interpersonal* comparisons of well-being based on a vector of job characteristics. Using the *Dominance principle* we would require that all elements of a vector of job characteristics are larger for the individual i than the individual j (that is, we would require $\theta_i \gg \theta_j$). It seems that the later requirement would be rather difficult to satisfy.

A solution to this problem consists of finding the importance weights for each aspect of the job which we will use to aggregate aspects of the job in one composite measure. Such measure will be used for making *interpersonal* comparisons of well-being. The weights ascribed to each aspect of the job would reflect the relative importance of a particular aspect of the job in respect to other aspects of the job. The selection of weights for the objective well-being measures on the job is based either on the statistical-data driven procedure (i.e. factor or principal component analysis) or on the normative decision. Neither of these two approaches allow that the constructed weights use the information on individual preferences. Particularly, the weights for the objective measure of well-being would reflect the notion that the comparison of well-being should be based on some reference individual whose preferences and scaling factors we take for granted. We will denote the reference value for preferences by $\widetilde{\mathcal{R}}$ while the reference value for a vector of scaling factors is denoted by $\widetilde{\Sigma}$. The objective measure of well-being on the job for the individual i can be defined as follows

$$\mathrm{WB}^o(\theta_i, \mathcal{R}_i, \Sigma_i) = S(\theta_i, \widetilde{\mathcal{R}}, \widetilde{\Sigma}) \tag{2.6}$$

Notice that the objective well-being measure uses the subjective job satisfaction score evaluated at the vector of job aspects θ_i, the reference value for preferences $\widetilde{\mathcal{R}}$ and the reference value for scaling factors $\widetilde{\Sigma}$. Since the preferences and scaling factors differ across individuals, the objective measures of well-being do not satisfy the *Conditional respect for preferences* and thus they do not satisfy the *Unconditional respect for preferences*. Yet, the objective well-being measures would satisfy the *Dominance principle* if we select a positive weight to each aspect of the job.

We will compute two different objective well-being measures which are based on a specific reference value for the indifference curves and a specific reference value for the scaling factors.

The first measure is called an equal weights objective measure ($WB^{o,ew}$) which is computed as the arithmetic mean of the normalized values of wage and non-wage job characteristics. The normalization of the wage and non-wage job characteristics is done by the min-max method at the country level. In other words, within each country we have computed the minimum and maximum values for all job characteristics and then the minimum value for a given job characteristic is subtracted from the actual value of that job characteristic and this difference is divided by the difference between maximum and minimum value of that job characteristic.

The second measure is called the average preferences objective measure ($WB^{o,ap}$) which is computed from the job satisfaction equation where the reference values of indifference curves and scaling factors set at the average values in the sample. Although $WB^{o,ap}$ will not respect individual preferences, still this measure will take into account the relative importance of wage and non-wage job characteristics for the average individual in the sample. Both objective measures will be presented more formally in an upcoming section.

2.3.4 Equivalent Wage

The well-being on the job measures we have yet presented suffer from some serious weaknesses. Although the subjective measure of well-being may respect individual preferences in the *intrapersonal* well-being comparisons if the *consistency assumption* holds, still the following measure cannot be used in the *interpersonal* well-being comparisons since the *Unconditional respect for preferences* would be violated as a result of the presence of scaling factors. On the other hand, the objective well-being measures are paternalistic in ascribing the weights to job dimensions and thus these measures do not show respect for individual preferences over job dimensions that individuals find important. Yet, there exists an approach which appreciates individual preferences and which can be used in *inter-personal* comparisons of well-being. It is called the *equivalent income* (*wage*) (see Fleurbaey et al. (2009) and Decancq et al. (2015)). We can describe the well-being on the job of individual i using the equivalent wage measure as follows

$$\mathrm{WB}^{w^*}(\theta_i, \mathcal{R}_i, \Sigma_i) = w_i^* \; \textit{such that} \; (w_i, X_i) \; \mathcal{I}_i \; (w_i^*, \widetilde{X}_i) \tag{2.7}$$

The following measure represents the hypothetical level of wage w_i^* of an individual i when all of her non-wage dimensions x_i are set on the reference value $\widetilde{X}$ such that she is indifferent between this position and her original position. A graphical illustration of the equivalent wage

is presented in figure 2.3. Let us assume that there are two individuals i and j and there are only two job characteristics which are wage w and job security s. The solid horizontal line represents the reference value for job security which we denote with $\widetilde{s}$. The vectors of job characteristics are represented by θ_i and θ_j for individual i and j, respectively. One can notice that individual i has a lower wage than individual j though individual j has more security on the job than individual j.

In addition, we can see that these two individuals have different ideas on what makes a good job. For instance, individual j has a steeper individual curve which tells us that she prefers less job security. On the other hand, the indifference curve of individual i is sloped less which means that he attaches a higher weight on job security. The intersection point between the reference value for security $\widetilde{s}$ and indifference curve represents the equivalent wage. These two points are denoted with θ_i' and θ_j'. Notice that in order to reach the equivalent wage we are moving along the indifference curves of individuals i and j so that these two individuals are equally well-off in their initial positions (θ_i, θ_j) and when they reach the reference value for job security (θ_i', θ_j').

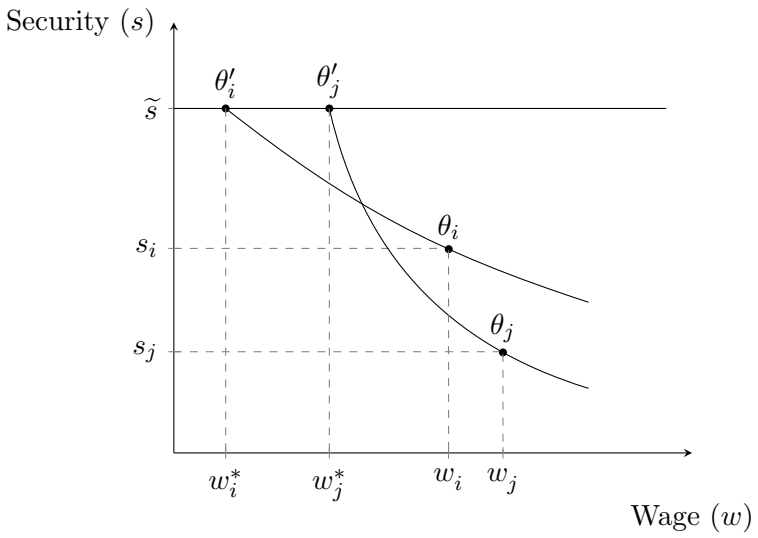


Figure 2.3: Equivalent wage

It is obvious that the equivalent wage is equal to wage when all non-wage job characteristics of individuals are taking the reference values. In addition, we can see that the equivalent wage of individuals does not depend on their preferences over job attributes. Even though the individual i has a higher job security, yet the equivalent income of individual i is lower than

the equivalent wage of individual j because individual j has a higher wage and he cares less for job security. Nevertheless, even if the individual i would have higher wage and job security then individual j, $w_i > w_j$ and $s_i > s_j$, still the individual i could have a lower equivalent wage then individual j, $w'_i < w'_j$. For that matter, the equivalent wage measure would not satisfy the *Dominance principle* but the equivalent wage measure would satisfy the preferences of individuals (*Conditional and Unconditional respect for individual preferences*) and the *Subset dominance principle.*

Additional information that we obtain before computing the equivalent wage is the individual willingness-to-pay (WTP_i) for having the non-wage job characteristics at the reference values. Taking the difference between the equivalent wage and wage of the individual i we arrive at the following expression

$$\text{WTP}_i(x_i \to \widetilde{X}; \theta_i) = w_i - w_i^* \tag{2.8}$$

where $\text{WTP}_i(X_i \to \widetilde{X}; \theta_i)$ represents the of willingness to pay of individual i for a change from X_i to $\widetilde{X}$. We can see in our example that although the individual i has higher job security than individual j ($s_i > s_j$) yet, individual i has a higher WTP than individual j. The reason for this lies in the fact that individual i cares more about job security than individual j does and thus individual i is ready to pay more of his wage to reach the reference value for job security.

2.4 Methodology

2.4.1 Estimating Equivalent Wage

In this section we present the methodological framework for estimating the equivalent wage from the individual data on job satisfaction (see Fleurbaey et al. (2009), Schokkaert et al. (2011) and Decancq et al. (2015)). The estimation of the equivalent wage requires that we have available information on subjective job satisfaction S_i, information about job characteristics θ_i and information on preferences of individuals $\mathcal{R}_i$. Normally, one can find the information on S_i and θ_i in surveys which are immediately ready to use in the estimation of the equivalent wage. However, the information on $\mathcal{R}_i$ is usually not directly accessible from the data so we will follow the procedure which infer information on individual preferences from the data on job satisfaction.

Typically, one can find in the surveys the job satisfaction question such as *What is your overall satisfaction with your job?* The respondents are normally offered a categorical or discrete (or combination of both) scale on which they can choose their answer. The scale of answers ranges from the lowest level of job satisfaction ("very dissatisfied") to the highest level of job satisfaction ("very satisfied"). The relationship between the job satisfaction and the explanatory variables can be represented with the following equation

$$S_i = \alpha + (\beta + \Omega Z_i) \ln w_i + (\gamma + \Lambda Z_i)' X_i + Z_i \sigma + \epsilon_i \tag{2.9}$$

where $\ln w_i$ is the logarithm of wage, X_i is a vector of other (non-wage) job characteristics, Z_i is a vector of personal characteristics, ϵ_i is the error term while $\alpha, \beta, \gamma, \Omega, \Lambda$ and σ are parameters to be estimated. The logarithmic transformation of wage is applied in order to capture the non-linear effect of wage on job satisfaction. That is to say, we are assuming that the effect of wage on job satisfaction is marginally decreasing.

The important point that has to be emphasized from the outset concerns the impact of personal characteristics on job satisfaction. We distinguish between two different effects. The direct effects of personal characteristics on the subjective job satisfaction, which we denote with σ, capture the effect of aspirations, adaptations and norms. These effects scale the indifference curves of individuals but do not change the slope of indifference curves. The indirect effects of personal characteristics on the subjective job satisfaction are captured with the interaction

terms. In other words, a matrix of coefficients Ω and Λ change the slope of indifference curves of individuals since they affect the marginal rate of substitution between wage and non-wage job characteristics. These interaction terms between job characteristics and personal characteristics are of great importance for us in obtaining the information on individual preferences.

The heterogeneity of individual preferences is certainly an important issue and we take the view that individual preferences over job characteristics should definitely be respected. In that respect, we model the heterogeneity of individual preferences by assuming that workers with different socio-demographic and other work related characteristics have a distinctive view over the job characteristics which they find important. We represent the marginal rate of substitution between wage and non-wage job characteristic k for an individual i as follows

$$MRS_i^{w,X_{ik}} \equiv \frac{\partial S_i/\partial X_{ik}}{\partial S_i/\partial w_i} = \frac{(\gamma + \Lambda Z_i)w_i}{\beta + \Omega Z_i} \tag{2.10}$$

One should note that we are not precisely able to obtain the information on individual preferences but rather we can estimate the preferences of certain groups defined by personal characteristics, Z. Thus, we assume that individuals with the same values for Z have the same preferences. In addition, we will assume that the marginal rates of substitution between wage and non-wage job characteristics are constant, although we are certainly aware this may be an oversimplification.

After we have specified the job satisfaction regression we can proceed further with the estimation of equivalent wage. In the next step we define the reference values for all non-wage job characteristics which we denote with $\overline{X}_i$. Plugging these reference values and the level of wage w_i^* into the job satisfaction regression we obtain the following expression

$$S_i = \alpha + (\beta + \Omega Z_i)\ln w_i^* + (\gamma + \Lambda Z_i)'\overline{X} + Z_i\sigma + \epsilon_i \tag{2.11}$$

where $\overline{X} = (\overline{X}_1, \cdots, \overline{X}_k)$. We calculate the equivalent wage w_i^* such that a worker i is indifferent between the hypothetical job situation $(w_i^*, \overline{X})$ and her actual job situation (w_i, X_i). In other worlds, we equate the equations 2.9 and 2.11 which gives us the following expression

$$\alpha+(\beta+\Omega Z_i)\ln w_i+(\gamma+\Lambda Z_i)'X_i+Z_i\sigma+\epsilon_i = \alpha+(\beta+\Omega Z_i)\ln w_i^*+(\gamma+\Lambda Z_i)'\overline{X}+Z_i\sigma+\epsilon_i \tag{2.12}$$

The previous expression can be simplified further to

$$(\beta + \Omega Z_i) \ln w_i + (\gamma + \Lambda Z_i)' X_i = (\beta + \Omega Z_i) \ln w_i^* + (\gamma + \Lambda Z_i)' \overline{X} \tag{2.13}$$

Solving this equation for w_i^* we obtain the equivalent wage equation

$$w_i^* = w_i \exp \left[\left(\frac{\gamma + \Lambda Z_i}{\beta + \Omega Z_i} \right)' \left(X_i - \overline{X} \right) \right] \tag{2.14}$$

We can notice that a vector σ has vanished from the equivalent wage equation since the coefficients capturing aspirations, adaptations and norms do not play a role any more. The error term ϵ_i has been dropped since any stochastic dissimilarities over workers are not important for computing the equivalent wage. Nevertheless, the interaction terms between personal characteristics and job characteristics are included in the equation since the equivalent wage measure respect preferences over job characteristics. The term in the second (round) bracket shows by how much a worker is deprived in each of his non-wage job dimension from the reference value of that non-wage job dimension. This immediately implies that if a worker has no deprivation in non-wage job characteristics then his equivalent wage equates to his wage.

2.4.2 Estimating the Job Satisfaction Equation

This section illustrates our empirical strategy that for estimating the job satisfaction regression. We have worked with five different specifications for the job satisfaction regression. We start with the simplest specification while each consecutive specification is enriched with the additional control variables. The dependent variable which we denote with S_i represents the job satisfaction of the individual i. The main independent variables are wage and non-wage job characteristics. Obviously one important job characteristic represents the monetary remuneration of workers for the effort they have exerted. In our work, this characteristic is represented with wage[3].

The remaining job characteristics refer to non-wage job characteristics which we denote with a vector X_i. In order to construct these non-wage job characteristics we have used the question in which individuals were asked to assess eight job characteristics. The question was formulated as follows *Please indicate to what extent the following job characteristics actually apply to your current work situation?* A vector of non-wage job characteristics includes the autonomy at work (*Autonomy*), job security (*Security*), opportunity to learn new things (*Learn*), new challenges (*Challenges*), good career prospects (*Career*), social status (*Social Status*), chance of doing something useful for society (*Valuable*) and good chance to combine work with family task (*Family Work*). The individuals were offered a discrete-categorical scale where the possible answers from which they could choose ranged from 1 which means "not at all" to 5 which means "to a very high extent".

It is important to note that this set of job characteristics we have chosen, is not to be considered as the exhaustive set of job characteristics that workers find important at their jobs. Yet, our choice of job characteristics matches the choice of job characteristics we have found in other studies. A vector of personal characteristics which we denote with Z_i, consists of a set of socio-demographic variables such as age, gender, dummy variable if an individual has at least one child, a dummy variable if an individual is living with a partner, a dummy variable if an individual is living with his parents, relatives or friends, level of education measured as

[3]We have used the gross monthly wage of the individuals in their full-time working equivalent. A full-time working equivalent is calculated on the basis of the average working hours in the country where the individual works. The gross monthly wage includes the gross monthly earnings in the main employment per contractual hours and overtime hours. Wages for all countries are measured in euros and they have been corrected for the purchasing power parity (PPP) between countries. In addition, we have used a Consumer Price Index (CPI) in order to have a comparable measures of inflation since the data for five countries (Hungary, Lithuania, Poland, Slovenia and Turkey) is collected in 2002/2003 while for the remaining countries the data is collected in 1999/2000. The reference period for a CPI is 2005.

the number of years of education currently attained (i.e. the number of years which is required to earn the highest degree which individual has attained at present), a dummy variable if an individual works in the medium company (50-249 employees), a dummy variable if an individual works in a large company (250 employees and more), a dummy variable if an individual followed any work related course or training in the past 12 months, a dummy variable if an individual work in public sector, a dummy variable if an individual works part time (i.e. less than 30 hours per week) and a five points scale variable for work risk which measures the degree of damage that could happen if a worker made major mistakes or omissions in the performance of his work (i.e. the scale ranged from 1 which means "hardly damaging" to 5 which means "extremely damaging").

The richness of the data allowed us to include a self-assessment of the workers on a set of 14 competencies required at their job. We denote these competencies with a vector F_i. The individuals were asked to provide the information on the their own level of competence by answering at the following question *How do you rate your own level of competence?*. This list of competencies includes the mastery of their own field or discipline (*Masterfield*), knowledge of other field or discipline (*Knowfield*), analytical thinking (*Think*), ability to perform well under pressure (*Pressure*), alertness to new opportunities (*Alert*), ability to use time efficiently (*Use Time*), ability to work productively with others (*Work Productivity*), ability to mobilize the capacities of others (*Mobilize Others*), ability to make their meaning clear to others (*Make Clear*), ability to use computers and the internet (*Use Computers*), willingness to question their own and others ideas (*Quest*), ability to present products, ideas and reports to an audience (*Present*), ability to write reports, memos and documents (*Write*) and ability to write and speak in a foreign language (*Foreign Language*). These variables are measured on a categorical-discrete scale which ranges from 1 which means "very low" to 7 which means "very high".

Normally, the information on competencies of workers is not available to researches so having these variables at our disposal enable us to control for the unobserved heterogeneity. Since we do not have a panel data set we were prevented from using the fixed effects which control for the unobserved (time-invariant) heterogeneity. Nevertheless, we are interested to obtain estimates on some time-invariant variables which would not be the available strategy to follow with the fixed effects and it can also bias the estimates (see Boyce (2010)). In addition, we have included in the regression a dummy variables for the type of occupation and industry

and country dummies. These variables are contained in a vector G_i. The full specification of the job satisfaction regression can be written as

$$S_i = \alpha + \beta \ln w_i + X_i\gamma + F_i\pi + G_i\kappa + Z_i\sigma + \epsilon_i \tag{2.15}$$

where $\alpha, \beta, \gamma, \sigma, \pi$ and κ are parameters of interest to be estimated while ϵ_i is the error term. Since our objective is to obtain information on individual preferences we will calculate the marginal rate of substitution between wage and each non-wage job characteristics. Thus, we will use coefficients β and γ for obtaining the slopes of indifference curves for individuals. We are still left with coefficients α, σ and κ which we do not use for estimation of individual preferences but they rather represent the scaling factors or shifters for labelling the indifference curves. We have assumed that our job satisfaction regression is linear in the parameters of non-wage job characteristics which then implies that the indifference curves for non-wage job characteristics are linear and parallel lines. In other words, the marginal rates of substitution between wage and other (non-wage) job characteristics are held constant.

Another important issue concerns the issue of heterogeneity of individual preferences. One way to achieve a more flexible functional specification of the job satisfaction regression is to permit the coefficients on wage and non-wage job characteristics to vary between those individuals who are having different socio-demographic characteristics and personal characteristics related to the job. We denote a vector of these socio-demographic characteristics and personal characteristics related to the job with Θ_i.

We permit the coefficients on job characteristics to vary for different socio-demographic characteristics which are defined with a vector of dummy variables where a variable contained in a vector equals 1 if an individual is male ($male_i$), if an individual is the age range 25-34 ($young_i$), if an individual has at least one child ($child_i$), if an individual lives with a partner ($partner_i$) and if an individual lives with his family or relatives ($family_i$). The coefficients on job characteristics are also allowed to vary for different personal characteristics related to the job, which are defined with a vector of dummy variables where a variable contained in a vector equals 1 if an individual works in a medium sized company ($compmed_i$), if an individual works in the large company ($complarge_i$), if an individual has followed any work-related course or training in the past 12 months ($training_i$), if an individual works in a public sector ($sector_i$) and if an individual works part time ($part_i$).

After we have interacted wage (w_i) and non-wage job characteristics (X_i) with the variables that we believe will change the slope of individual preferences (Θ_i), we are left to include these terms into our model given in equation 2.15. Therefore, the final specification of the satisfaction regression which includes an interaction terms can be written as

$$S_i = \alpha + (\beta + \Omega\Theta_i) \ln w_i + (\gamma + \Lambda\Theta_i)' X_i + F_i\pi + G_i\kappa + Z_i\sigma + \epsilon_i \tag{2.16}$$

where $\alpha, \beta, \gamma, \sigma, \pi$ and κ represents direct effects while Ω and Λ are matrices of interaction terms to be estimated. As a result of natural ordering of our dependent variable, we have estimated the equation 2.16 with the ordered logit model (see Cameron and Trivedi (2005) and Train (2009)). All parameters are estimated by the maximum likelihood estimation (MLE).

2.5 Data

We have employed the Reflex (Research into Employment and professional flexibility) and Hegesco (Higher Education as a Generator of Strategic Competencies) data, which are two large-scale surveys among higher education graduates (i.e. including bachelor, master and doctoral graduates). While the Reflex data relates to the study programme which individuals have finished in 1999/2000, the Hegesco data relates to the study programme which individuals have finished in 2002/2003. Since the objective for collecting these data sets was among others to analyse the transitional process of individuals with higher education on the labour market, we could exploit the information about the labour market status of individuals once they have left their education. More precisely, the information on the labour market status of individuals contained both the information about the first job after graduation and the current job of an individual.

In our analysis we will use only the information on the current job of individuals although it may happen that the current job for some individuals is actually their first job after graduation. Both of these two surveys are compatible in their methodology and they contain information on a various topics such as socio-demographic conditions, a type of study programme individuals have finished, attained level of education, other educational and related experiences, job satisfaction, own level of competencies and the required level of competencies at work, job outcomes and job characteristics. Concerning the geographical coverage of the data, the Reflex data contains 14 countries (Austria, Finland, France, Germany, Italy, the Netherlands, Norway, Spain, the UK, Belgium (Flanders), Czech Republic, Portugal, Estonia and Japan) while the Hegesco data contains 5 countries (Slovenia, Turkey, Lithuania, Hungary and Poland).

The distribution of overall job satisfaction over countries is illustrated in figure 2.4. The question on the overall job satisfaction that we have used was formulated as follows *How satisfied are you with your current work?* The individuals were offered a discrete-categorical scale of possible answers which ranged from 1 denoting those who are "very dissatisfied" to 5 denoting those who are "very satisfied". Each sub-figure in figure 2.4 represents the estimated proportions and confidence intervals of the overall job satisfaction for a given country. Vertical bars represent the categories of job satisfaction while the capped spike lines at each vertical bar represent 95 percent confidence intervals. We have shaded vertical bars in darker color for men while the bars in lighter color denote women. One can immediately notice that the distribution

of job satisfaction within countries does not differ much between men and women. Within each country, the highest proportion of individuals is to be found in the category "satisfied" while the smallest proportion of individuals is to be found in the category "very dissatisfied". Moreover, the distribution of job satisfaction is gently skewed to the left for every country.

Table 2.1 provides the descriptive statistics of the main variables (tabulated in rows). On average the job satisfaction level is highest in Norway and Austria while it is lowest in Turkey and Japan. The oldest graduates are found in Slovenia while youngest in Belgium. On average the highest share of couples are found in Norway and Finland while the lowest share is found in Japan. On the other side, we find the largest share of individuals living with their families in Japan while the lowest in Norway and Finland. The perception of risk at work is on average the lowest in Czech Republic and highest in Slovenia. The average wage is lowest in Turkey and highest in Germany. Moreover, on average the graduates in Turkey earn around 11% of their counterparts in Germany.

The highest level of work autonomy is found in Austria and lowest in Turkey. Job security and opportunity to learn new things is highest in Estonia. Workers in Norway are mostly confronted with new challenges while workers in France are the least confronted with new challenges. Good career prospects are highest in the UK and lowest in Germany. Chance of doing something useful for society is highest in Norway and lowest in Hungary. Good chance to combine work with family task is the worst in the UK and the best in Lithuania.

2.6 Results

In this section we first present the results obtained from the job satisfaction regression. Then we present the results that illustrate the average quality of jobs across countries using five different measures of job quality and accordingly we rank countries. We show the rank correlations between all pairs of measures which provides us with the information about the strength and direction of relationship between the pairwise rank of measures. We illustrate the average overlap across countries for the worst off and the best off individuals according to different combinations of measures. We also illustrate the gender differential in job quality across countries using the equivalent wage and wage measure. We present the results obtained from the Shapley value decomposition which enabled us to decompose the total willingness-to-pay to its contributions to non-wage job characteristics. Finally, we show the gender differences in the total willingness-to-pay along the distribution.

2.6.1 Job Satisfaction Regression

We illustrate the estimation results for the job satisfaction regression in table 2.2. Our results represent five different specifications we have used for the job satisfaction model. We start from the most parsimonious specification (model I) and then we enrich each succeeding model with the additional control variables until we have reached the full specification (model V). We have estimated each model on a pooled sample of 19 countries. As our dependent variable is categorical and ordered we have decided to use the ordered logistic regression in order to fit the model.

We have applied the backward-selection estimation for each five models we have estimated. The logic of the backward-selection estimation is to fit the full specification of the model on all regressors where the least significant regressors will be removed from the estimation and then the model is re-estimated. Using this stepwise selection procedure, the model is re-estimated until all insignificant regressors are dropped from the specification of the model. The significance level for removal from the model was set at 5%. The only regressors which were not subjected to the stepwise-selection procedure were the job characteristics, socio-demographic and other personal characteristics and county dummies. We have used the robust standard errors in order to weaken the assumption that explanatory variables and error term are identically distributed although we have still assumed these terms to be independent.

The results in the first column refer to the specification where we have controlled for the logarithm of wage ($\ln w_i$), a vector of non-wage job characteristics (X_i) and a vector of personal characteristics (Z_i). In addition, we have included the interaction terms between the job characteristics and personal characteristics which allow us to obtain the information on preferences. One can see that all job characteristics have highly significant effect on the job satisfaction (except the social status). The gross monthly wage increases the likelihood of being more satisfied on the job. We have found that jobs with more autonomy (*Autonomy*), security (*Security*), opportunity to learn new things (*Learn*), new challenges (*Challenge*), good career prospects (*Career*), chance of doing something useful to society (*Valuable*) and a chance to combine work with family tasks (*Family Work*) have a positive effect on job satisfaction. The direct effects of personal characteristics on job satisfaction are operating through out the scaling factors (i.e. aspiration and expectations of individuals). These effects are picked up by variables measuring age, gender, number of children, whether living with the partner, whether living in a family, attained level of education, dummy variable for the company size, the degree of risk at work, dummy variable if an individual has followed any training in the past 12 months, dummy variable for the public sector, dummy variable for a part-time working hours, industry, occupational and country dummies and a vector of abilities and competencies.

The results from the model I show that the effect of age on job satisfaction is found to be convex with the minimum level of job satisfaction at age 40. Having a child increases the job satisfaction. Individuals who are living with their partners have a higher level of job satisfaction. The interaction terms between the personal characteristics and job characteristics allowing us to obtain the information on preferences. In other words, these indirect effects are representing the preference shifters for a certain socio-demographic and work characteristic an individual belongs to. We interpret the statistical significance on the interaction terms as the evidence of preference heterogeneity that certain groups of individuals have over certain jobs. Notice that a job that has a higher social status is more preferred by young people. Higher autonomy on the job generates less job satisfaction for the young people. A job with good career prospects is more preferred by men while on the other hand men prefer less jobs which offer a chance of doing something useful for the society. Having a child reduces the preferences for a job where there is a possibility to learn new things. The positive effect of a job that brings new challenges is reduced for the individuals living with their parents, relatives or friends.

In the second column we illustrate the results obtained from the model II where in addition to the previous model we controlled for a set of variables capturing abilities and competencies of individuals. This set of variables represents the unobserved heterogeneity of individuals since they are not observed normally (see Di Tella et al. (2010)). Since the abilities and competencies may be correlated with the job characteristics and the job satisfaction, it is important to control for the variables that capture abilities and competencies. In fact, a great number of studies in the economics have been devoted to the problem of dealing with the unobserved heterogeneity (see Ferrer-i-Carbonell and Frijters (2004), Frijters et al. (2004), Boyce (2010)). Our results indicate that the variables capturing abilities and competencies have a significant effect on job satisfaction. We have found that a higher mastery of their own field or discipline (*Masterfield*), higher ability to perform well under pressure (*Pressure*) and higher ability to use time efficiently (*Use Time*) increase the job satisfaction. On the other hand we have found that higher knowledge of other fields or disciplines (*Knowfield*), analytical thinking (*Think*), willingness to question your own ideas and ideas of others (*Quest*), ability to write reports (*Write*) and ability to write and speak in a foreign language (*Foreign Language*) reduce job satisfaction.

Comparing the results between model I and model II, we can see that once we have introduced the abilities and competencies of individuals, the coefficients on wage and non-wage job characteristics have slightly changed. The direction of this change went in both ways so that some of the variables capturing abilities and competencies were positively correlated with the job characteristics and others were negatively correlated with the job characteristics. In other words, the following evidence points out that individuals would have a higher or lower level of job satisfaction which is only due to the positive or negative effects of abilities and competencies but not due to the effects coming from the job characteristics.

In model III we have included a set of country dummies where Italy represents the base category. The country dummies are needed to capture the possible heterogeneity between countries. Although, due to lack of space, we do not report in the table the coefficients on country dummies, the significant coefficients on country dummies would indicate that the job satisfaction in these countries is different from the job satisfaction in Italy. While the coefficients on the job characteristics have not changed much once we have introduced the country dummies, we can observe that the coefficient on log wage has increased notably relative to the previous specifications.

In model IV, we have included a set of personal characteristics related to the job. The following set contains a dummy variable if an individual works in a medium company, dummy variable if an individual works in a large company, dummy variable if an individual followed any work related course or training in the past 12 months, dummy variable if an individual work in public sector, dummy variable if an individual works part time and a categorical variable that measures risk at work. We treat all these variables (except a variable that measures risk at work) as the preference shifters and therefore we interact them with wage and non-wage job characteristics. The variable that measures the risk at work is treated as a scaling factor which means that it only has a direct effect on the job satisfaction through a change in aspiration and expectations of individuals. While workers in the medium companies are less satisfied at their job than workers in the small companies, the opposite is true for those working in the large companies (although the later effect is not significant). Individuals who are working in a public sector have a higher job satisfaction. Job satisfaction is lower for a part-time workers which seems reasonable to expect from highly educated young people who do not want to waste their human capital investment (see De Witte and Näswall (2003), Booth and Van Ours (2008) and Booth and van Ours (2013)). Increasing the degree of risk that could occur if an individual makes a serious mistake at their work has a positive effect on job satisfaction. The later evidence would indicate that the recent graduates prefer to take the risk.

Model V contains the additional control variables for the type of industry and occupation that a worker belongs to. We have included a list of 17 dummy variables for the type of industry and 9 dummy variables for the type of occupation[4]. However, we have kept only a few of industry and occupational dummies in our regression since many of them failed to be significant after the backward selection estimation. The industry and occupational dummies are assumed to have only a direct effect on the job satisfaction or in other words we treat them as the scaling factors affecting aspirations and expectations. Clerks, craft and related trade workers and workers in elementary occupations have a lower level of job satisfaction than the legislators, officials and managers (i.e. the base category). Workers employed in the industries

[4]The dummies for the type of industry include the agriculture, hunting and forestry, fishing, mining and quarrying, manufacturing, electricity, gas and water supply, construction, wholesale and retailtrade, accommodation, transport, storage and communication, financial intermediation, real estate, renting and business, public administration and defence, education, health and social work, other services, activities of private households and extraterritorial organizations. The dummies for the type of occupation include the legislators, officials and managers, professionals, technicians and associate professionals, clerks, service workers and salesman, agricultural and fishery worker, craft and related trades workers, plant, machine operators and assemblance and elementary occupations.

of accommodation, education, health and social work and other service activities are more satisfied at their job than the workers in the real estate, renting and business industry (i.e. the base category). Notice that after we have introduced the industry and occupational dummies in the regression, the coefficient on the log wage becomes larger. The non-wage job characteristics have positive and significant effect on the job satisfaction (except for the variable measuring social status which is not significant). One can notice that workers attach more weight in order to have new challenges on the job than to earn a higher wage.

We have not found any significant gender differences in the job satisfaction. Obtaining the additional year of higher education decreases the job satisfaction. Although this result may seem surprising, it confirms the interpretation made by Verhofstadt et al. (2007) that the direct effect of education brings the expectations of more educated individuals upward and thus they feel less satisfied[5]. While, young people prefer less those jobs that offer a higher salary, they would prefer jobs with higher social status. Men have greater preferences for jobs which provide better career prospects but they less prefer jobs which offer a chance to combine work with family tasks. While those workers who have a child favour less jobs where there is a chance of doing something useful for society, on the other hand they favour more jobs where there is a good chance to combine work with family tasks. A job that provides new challenges is less preferred by those workers who are living with a partner or family. Workers in the large companies prefer less jobs that are secure and better paid. On the other hand, those working in large companies have higher preferences for jobs that offer opportunities to learn new things and jobs that offer a chance to combine work with family tasks. Workers in the public sector prefer less jobs that give a chance to learn new things.

2.6.2 Comparing Measures of Job Quality

The first well-being measure that we use is the gross monthly wage in full time equivalent (WB^w), which is calculated on the basis of the mean contractual and overtime working hours in each country. Since we knew the earnings per contractual hours and overtime hours and we knew the contractual and overtime hours individuals spent in main employment, we have derived the wage variable on the basis of both of these information. In addition, we made corrections for the purchasing power parity and differences in CPI between 1999/2000 and 2002/2003.

[5]The effect of education on job satisfaction has been found to be both positive (see Clark and Oswald (1996) and Grund and Sliwka (2005)) and negative (see Hall and Buttram (1994)).

The equivalent wage measure (WB^{w^*}) is computed from the equivalent wage equation (equation 2.14). The reference value for all non-wage job characteristics is set at the value of 4. Although the choice for setting the reference values for the non-wage job characteristics may not seem to be obvious, still this choice is not arbitrary since we want to choose these reference values at the level that is aspired by all individuals. Yet someone may wonder why we have not set the reference values at 5 which is the highest value for all non-wage job characteristics. We believe that the individuals who have reported their values of non-wage job characteristics at the level of 4 are already in an excellent position and therefore by setting the reference value at 5 would be excessively harsh in evaluating the situations of individuals on their jobs. In order to obtain the coefficients in the equivalent wage equation we have opted to use our results from the model V since in that specification we have controlled for the largest set of regressors and the following model had the best fit by the pseudo-R^2 score.

The job satisfaction measure (WB^s) is represented with the subjective job satisfaction score. An equal weights objective measure ($WB^{o,ew}$) is computed as the arithmetic mean of the normalized values of the same job characteristics that we used when we calculated the equivalent wage[6]. The average preferences objective measure ($WB^{o,ap}$) uses the job satisfaction equation (equation 2.9) but the values of variables in Z_i are replaced with their arithmetic means[7].

In table 2.3 we present the average values of each well-being measure and the country rankings according to these averages. Ranking countries according to average wages indicates that the highest wages (i.e. lowest ranking) for recent graduates are in Germany, Norway and Belgium while the lowest wages (i.e. highest ranking) are in Poland, Hungary and Turkey. Obviously the wage measure does not respect individual preferences, it does not take into account non-wage job characteristics and it is not affected by scaling factors of expectations and adaptations.

[6]We have computed the equal weights objective measure for each country c as follows

$$WB_c^{o,ew} = \frac{1}{N_c}\frac{1}{M}\sum_{i=1}^{N_c}\sum_{j=1}^{M}\frac{\theta_{i,c}^j - \min(\theta_c^j)}{\max(\theta_c^j) - \min(\theta_c^j)}$$

where N_c denotes the total number of individuals in country c, while $\min(\theta_c^j)$ and $\max(\theta_c^j)$ denote the lowest and highest value of job characteristic j in country c, respectively.

[7]In other words, we have computed the following equation

$$WB_i^{o,ap} = \alpha + (\beta + \Omega\overline{Z})\ln w_i + (\gamma + \Lambda\overline{Z})'X_i + \overline{Z}\sigma + \bar{\epsilon}$$

where $\overline{Z}$ is a vector of arithmetic means of personal characteristics, while $\bar{\epsilon}$ denotes the arithmetic mean of the error term.

We can notice that a significant re-ranking occurs when we move from wage to the equivalent income measure, although the re-ranking is less pronounced for those countries which were at the bottom or top of the ranking according to wage. The equivalent wage measure respects individual preferences and it is not sensitive to scaling factors. We have found that the highest equivalent wage is in Norway, Belgium and Germany while lowest in Hungary and Turkey. A considerable increase in ranking occurred when we moved from the wage measure to the equivalent wage measure for France (an increase from [*5*] to [*16*]) and Japan (an increase from [*6*] to [*15*]). On the other hand, there has been a considerable drop in ranking as we moved from the wage to the equivalent wage measure for Spain (a drop from [*12*] to [*6*]), Czech Republic (a drop from [*13*] to [*8*]), Poland (a drop from [*17*] to [*12*]) and Estonia (a drop from [*14*] to [*10*]). To make it easier to visualize the changes in country rankings for each pair of measures, we have plotted these changes in figure B.1. As one can notice, the absolute values for the equivalent wages are substantially lower compared to wages. This is a consequence of the equivalent wage measure which respect individual preferences over job characteristics and it corrects the wage level for deprivations in non-wage job characteristics.

The subjective job satisfaction measure, given in the third column, satisfies the *Conditional respect for individual preferences* and in addition this measure takes into account the difference in aspirations and expectations. One can notice that the subjective job satisfaction measure shows little variations across countries. The highest job satisfaction is found in Austria and Norway while the lowest job satisfaction is found in Japan and Turkey.

In the last two columns we illustrate two objective measures of job quality. The property of the equal weights objective measure and the average preference objective measure is that both of these measures satisfy the *Dominance principle* but they do not pay attention on the individual preferences. In case of the equal weights measure, the marginal rates of substitution between job dimensions are equal for all individuals. The objective equal weights measure shows that the job quality is highest in Norway, Belgium and Czech Republic, while the lowest job quality is in Hungary, Italy and Turkey. Measuring job quality with the average preference objective measure reveals that Germany, Norway and Belgium are having the highest well-being on the job, while the lowest well-being on job is in Italy, Japan and Turkey. The evidence shows that the rankings given by the two objective measures are giving us a quite distinctive picture on the well-being on the job across countries. Since the average preference objective measure uses

the information on preferences of the average individual, this measure then produces a ranking which is closer to other two measures who are using information on individual preferences (i.e. the subjective job satisfaction and equivalent wage measures). This is also a reason why the two objective measures produce a quite distinctive ranking over countries.

In table 2.4 and table 2.5 we illustrate the average values of job quality measures and accordingly their ranks for men and women, respectively. The results for the wage measure show that the average job quality for both men and women is highest in Germany and Norway, while the lowest job quality is in Hungary, Poland and Turkey. We can see that women are having higher average wages in Norway and Belgium, while the opposite holds true for all other countries, except Turkey where the average wage is the same for both men and women. Turning to the preference sensitive measure of equivalent wage we obtain a quite different picture of job quality over countries. The best job quality according to the equivalent wage measure is found in Germany, Norway and Austria for men and in Belgium, Norway and United Kingdom for women. On the other hand, the worst job quality for both men and women is found in Hungary and Turkey. Again we can see that for both men and women the absolute value of the equivalent wage has substantially decreased compared to the wage measure since the former measure is sensitive to preferences and it is also a multi-dimensional measure which takes into account deprivations in other non-wage job characteristics. This evidence points out that individuals across countries suffer to a large extent from not achieving the reference values of non-wage job characteristics.

Comparing the job quality between men and women reveals that the average equivalent wage is higher for men in all countries except the United Kingdom, Norway, Czech Republic, Belgium Slovenia and Hungary. An interesting evidence comes from Norway where the average value of equivalent wage for women is higher by around 100 euros per month although the average wage between men and women are almost the same. Thus, men in Norway are willing-to-pay more to achieve the reference values of non-wage job characteristics although both men and women are earning the same wage on average.

Another interesting evidence concerns the changes in rankings for men and women as we move from the wage measure to the equivalent wage measure. We can notice that in some countries there is a substantial increase in ranking (i.e. worsening of the relative position) when we moved from the wage measure to the equivalent wage measure. For instance, in case of men

we see an increase in ranking in France (from [3] to [17]), Japan (from [5] to [15]) and Belgium (from [6] to [13]) while in case of women we see an increase in ranking in Italy (from [10] to [17]), France (from [6] to [14]) and Japan (from [7] to [16]). On the other hand, for some countries we have seen a substantial decrease in ranking (i.e. improving of the relative position) once we switched from the wage measure to the equivalent wage measure. For instance, in case of men we have observed a drop in Spain (from [12] to [6]), Czech Republic (from [15] to [10]), Poland (from [18] to [14]), Estonia (from [13] to [9]) and the Netherlands (from [9] to [5]). In case of women we have observed a drop in Spain (from [12] to [7]), Czech Republic (from [13] to [6]), Estonia (from [14] to [10]) and Poland (from [17] to [13]). The average job quality according to the subjective job satisfaction measure is highest for both men and women in Austria and Norway while it is lowest in Italy, Turkey and Japan.

Finally, we will consider the two objective measures. The equal weight objective measure indicates that for both men and women the average job quality is highest in Norway, Estonia and Czech Republic while the lowest job quality is in Hungary, Turkey and Italy. However, these findings raise doubts about the validity of the equal weights objective measure since the country rankings obtained with this measure differ noticeably from the rankings obtained with other measures. The average preferences objective measure indicates that for both men and women, the highest job quality is in Norway and Austria while the worst job quality is in Japan and Turkey.

2.6.3 Rank Correlation between Job Quality Measures

In the previous section we have seen that the ranking of countries changes according to the job quality measure we use. Thus, for some countries we have observed a considerable re-ranking between different measures. Yet, we are also interested in finding the strength and direction of the relationship between the ranking for each pair of measures. In order to do so, we have used the Spearman rank correlation which is a non-parametric measure of rank correlation. The Spearman rank correlation coefficient r determines if there exist a monotonic relationship between two variables, such that when r equals 1 there is a perfect monotone increasing relationship while when r equals -1 there is a perfect monotone decreasing relationship.

The rank correlations between all pairs of job quality measures are illustrated in table 2.6. Since we work with an individual data for a relatively large number of countries, the presentation

of our results have to be simplified and therefore, we illustrate the rank correlation coefficients which are computed between the averages of all job quality measures computed at the country level. In other words, we are computing rank correlations using 19 observations which is the number of countries contained in our sample. We can see that the correlation is positive and statistically significant at the 5% level for each pair of measures (except for a pair of WB^{w} and $WB^{o,ew}$). We have found that the lowest correlation is between pairs WB^{w} and $WB^{o,ew}$ and pairs WB^{w} and WB^{s}. The low correlation between WB^{w} and WB^{s} is intuitively appealing result since there is no overlap of variables that have been used to construct either of these two measures. A high correlation between $WB^{o,ew}$ and WB^{s} is somehow surprising since by construction $WB^{o,ew}$ does not contain the subjective satisfaction score.

We have found a moderate correlation between WB^{w^*} and $WB^{o,ew}$ which seems appealing since only the first measure is sensitive to preferences over job characteristics. One can notice that WB^{w^*} is more strongly correlated with WB^{w}, $WB^{o,ap}$ and WB^{s}. These results seem quite reasonable since the second to last measure involves respecting preferences in a weaker form while the last measure respects the average preferences of individuals. Finally, our results indicate almost a perfect positive relationship between WB^{s} and $WB^{o,ap}$ which conveys a useful information to policymakers who are deciding between the well-being measure on the job which respects individual preferences in a weaker form and the objective well-being measure that respects the average preferences of individuals.

2.6.4 Identifying the Worst off and the Best off Individuals

In this section we focus on the identification of the worst off and the best off individuals according to different combinations of measures of job quality. This aspect is of great importance for creating a reasonable public policy which has the aim to target those individuals at the bottom end of the distribution or to identify those individuals at the top end of the distribution. Since we have computed five different measures of job quality we could analyse what percentage of individuals is identified as the worst off or the best off according to each measure. In other words, for each measure of job quality we can label individuals either as the worst (best) off or not. We analyse all possible combinations of five different measures according to which an individual is identified as the worst (best) off or not. This leaves us with 32 possible combinations to work with.

An important decision we have to make at the beginning concerns the choice of the threshold level according to which we will identify the worst off and the best off individuals. Although the choice for the threshold level is not obvious, we believe that an acceptable solution in order to define the worst off is to focus on the percentage of individuals whose level of job satisfaction is not larger than 2 while for the best off we focus on the percentage of individuals whose level of job satisfaction is at least 4. This gives us different percentages of the worst off and the best off individuals across countries. For instance, in the case of the worst off, we focus on the bottom 6.4% of the population in Czech Republic while in Turkey we focus on the bottom 22.4% of population. On the other hand, in the case of the best off we focus on the top 74.6% of population in Austria while in Turkey we focus on the top 48.2% of population.

After we compute the percentage of the worst (best) off individuals for all countries and for all possible combinations of measures, we normalize these percentages with the amount of the worst (best) off individuals according to the job satisfaction threshold. This step is necessary since the number of individuals identified as the worst (best) off varies across countries. The results are presented in table 2.7 for the worst off and in table 2.8 for the best off. Each table shows different well-being measure in each column while each row represents a combination of measures according to which an individual is identified as the worst (best) off. In the last column we show the average percentage of individuals who are identified as the worst (best) off according to each combination.

We first interpret the results for the worst off. In the first five rows (panel a) we present the percentage of individuals who are designated as the worst off according to only one well-being measure. Since the percentage of the worst off individuals is approximately the same across all measures, this gives us approximately the perfect overlap with respect to the percentage of the worst off according to the subjective job satisfaction measure. Panel b shows the percentage of individuals identified as the worst off according to all combinations of pairs of measures. As we would expect, the overlap of worst off individuals is reduced when we switch from one measure to a pair of measures. A substantial reduction in the overlap of the worst off occurs between wage and equivalent wage and between wage and subjective job satisfaction measure. These two pairs identify only around 20% of individuals among the worst off. The highest overlap of the worst off is between two objective measures (80.2%), between equivalent wage and average preferences measure (73.6%) and between equivalent wage and equal weights measure (67.7%).

Panel c shows that the overlap of the worst off is further reduced when we consider a triplet of measures. The lowest overlap is between a triplet of wage, equivalent wage and subjective job satisfaction (10.3%) while the largest overlap is between a triplet of equivalent wage, equal weights measure and average preferences measure (62.3%). When we use a combination of four measures the overlap of the worst off ranges from 9.2% in case of quadruplet of wage, equivalent wage, subjective job satisfaction and equal weights measures to 32.9% in case of quadruplet of equivalent wage, subjective job satisfaction, equal weights and average preferences measures. From the last panel we can see that the overlap of the worst off according to all measures is 9.2%.

We are turning to the results for the best off. In panel a we can see the percentage of individuals who are identified as the best off according to only one measure. We observe that the overlap of the best off individuals decreases when we move from one measure (panel a) to a pair of measures (panel b). The largest overlap of the best off at 93% occurs for a pair of objective measures and between equivalent wage and average preferences measure. A combination of wage and subjective job satisfaction gives us the lowest overlap of the best off for a pair of measures which equals 69%. The following evidence makes perfect sense since the information requirement for computing the equivalent wage and average preference measure is closer than the informational requirement between wage and subjective job satisfaction. We observe that the highest overlap of best off individuals equals 88% when we consider a triplet of equivalent wage, equal weights and average preferences measures. The degree of overlap for a combination of four measures ranges from 52.1% for quadruplet of wage, equivalent wage, subjective job satisfaction and equal weights measures to 71.2% for quadruplet of equivalent wage, subjective job satisfaction, equal weights and average preferences measures. Finally, we observe that the overlap off the best off according to all five measures is 51.2%.

2.6.5 Wage and Equivalent Wage Gender Gaps

Although in the recent decades the participation of women in the labour market has increased and they have caught up with the level of education of men, we still observe inequality in labour market outcomes for women (see Ponthieux and Meurns (2015)). The evidence has pointed out that over recent decades the gender wage gap has initially started to decrease across many countries but then the catching up trend slowed down (Blau and Kahn (2006a,b)). Thus,

the gender wage inequality is still persistent across many countries[8] and the literature on the gender wage gap tells us that this evidence occurs as a result of inequality in the national wage structure, differences in employment rates of men and women, due to predominantly part-time work of women and due to gender differences in occupations (i.e. occupational segregation).

In order to analyse the gender differences in job quality we compare the gender ratios of wage and equivalent wage across and within countries. We will first compare the wage and equivalent wage gender ratios at the mean and then we show a more detailed picture about these differences by computing the gender ratios of wage and equivalent wage across the distribution. In order to keep the analysis of distributional inequality simple we illustrate the ratios computed at the 10th, 50th and 90th percentiles and then we show the ratios computed over the entire distribution (i.e. from 5th till 95th percentile).

We first illustrate the gender ratios of mean wage and mean equivalent wage computed at the country level (see table 2.9). We can see that in Norway and Turkey there are no differences in the mean wages between women and men. The most unequal country is Lithuania where on average women are paid 68% of what men are paid. On the other hand in Belgium women are on average paid 16% percent more then men. We can see that the lowest equivalent wage gap at the mean value is present in Hungary and France with a 3 and 4% higher equivalent wage for women, respectively. The largest lagging behind is found in Germany and Italy where women have around 40% lower equivalent wage. We have found that on average women have higher equivalent wage in France, Finland, Norway, Czech Republic, Belgium, Slovenia and Hungary.

Turning to the results that illustrate the percentile ratios, we can immediately notice that the equivalent wage ratio show evidently larger distributional variation than the wage ratio. That is to say, this evidence points out to the fat that wage shows a greater distributional equality than the equivalent wage. While in the United Kingdom both men and women earn almost the same wage at 10th percent (or more precisely women earn 2% more than men), in Lithuania women are paid only 71% of what men are paid. The opposite evidence applies to Turkey where women earn 34% higher wage at the 10th percent of distribution. At the median women earn less than men in all countries except in Turkey where the gap is not present. We can see that at the top 10th percent of distribution, women earn less than men in all countries apart from Turkey where women are paid 4% more.

[8]The average gender wage gap in most industrialized countries by the end of 2010 stands between 10% and 20%.

The percentile ratios of the equivalent wage show different picture which reflects primarily from larger distributional inequality of equivalent wage both between and within countries. At the bottom 10% of distribution women have higher equivalent wage in the Netherlands, United Kingdom, Norway, Japan, Estonia and Poland while in all other countries women are lacking behind men with respect to the equivalent wage. The magnitude of the differences in ratios at the bottom 10% percent of distribution between countries is striking. While in Lithuania women have the equivalent wage which is only 13% that of men, on the other hand in Norway women have a three-fold higher equivalent wage than men.

As we move from the 10% to the 50% of distribution, the ratios of equivalent wage between men and women increases for most of the countries (with the exception of the Netherlands, United Kingdom, Norway, Japan and Estonia). We see that the difference in ratios of equivalent wage at the median decreases between countries. The lowest ratio of the equivalent wage at the median is found in Lithuania where women have the equivalent wage which is 46% of equivalent wage for men while the highest ratio of the equivalent wage is found in Poland where women have the equivalent wage which is 39% higher than the equivalent wage for men. At the top 10% of distribution women have lower equivalent wages in all countries except the United Kingdom, Slovenia, Belgium, Lithuania, Hungary, Spain and Czech Republic. The results show that at top 10% of distribution, the lowest ratio of equivalent wage is found in Austria where women have 40% lower equivalent wage, while the highest ratio is found in the United Kingdom where women have the equivalent wage which is 15% higher.

A more detailed understanding of the gender gaps across the distribution is provided in figure 2.5 which illustrates women to men ratios for wage and equivalent wage from the 5th till 95th percentile. We can notice that for almost all countries the wage ratio stays below one almost over the entire distribution which means that women earn less than men across the distribution. The only exception is Turkey where women earn more than men both at the bottom and top of the distribution. The wage ratio is close to one across the distribution in Italy, Finland, Czech Republic and Belgium. In Germany, Estonia and Hungary the wage ratio is decreasing as we move from the bottom to the top of distribution while in the Netherlands the wage ratio is increasing as we move from the bottom to the top of distribution.

The ratio of equivalent wage shows a more complex pattern. We observe that the ratio is either decreasing over the distribution or increasing over the distribution, of for some countries

the ratio has an inverted U-shaped pattern. In Italy, Spain, France, Portugal, Belgium, Turkey, Lithuania, Austria and Slovenia the equivalent wage ratio is increasing which means that women are catching up with men as we move from the bottom to the top of distribution. The opposite pattern is present in the United Kingdom, Finland, Norway, Japan, Estonia and Poland where at the bottom of distribution women are having higher equivalent wages but then as we move towards the top of distribution the ratio becomes smaller. An interesting pattern occurs in the Netherlands, Germany, Czech Republic and Hungary where the ratio is increasing up until the median but then it starts to decrease.

Further, we can notice that within countries the ratio of equivalent wage and ratio of wage differ to a large extent. We observe that the ratio of equivalent wage is higher than the ratio of wage in the United Kingdom, Spain, Finland, Czech Republic; Norway, Japan, Poland and Estonia. In other words, this evidence points out that in the following countries women are faring relatively better on the job than men as soon as we switch from wage to equivalent wage measure. On the contrary, if we use the equivalent wage measure, women are lacking behind men in job quality for the remaining countries.

2.6.6 Shapley decomposition of willingness-to-pay

In this section we discuss the results obtained from the Shapley value decomposition (see Shapley (1988) and Shorrocks (2013)) of the total willingness-to-pay (WTP). The Shapley decomposition enabled us to compute the individual contributions of each non-wage job characteristics to the total WTP. Since the Shapley value decomposition has a property to be exact, the summation of all non-wage contributions add up to the total WTP without any residual term that is left.

Figure 2.6 presents the shares of WTP contributions for the entire sample (top panel), a sample of men (middle panel) and sample of women (bottom panel). The results in the top panel show that on average the most important non-wage job characteristic is to have a good career prospect. The following evidence is observed across all countries. Since we are considering relatively younger and more educated individuals who are usually having stronger preferences for making a career, this evidence makes perfect sense. We can notice that the relative importance of a career across countries is the most important in Austria and Germany, while in the UK and Spain this job characteristic is the least important. These differences can

be explained by the fact that workers in Austria and Germany are having lower average value of career characteristic than the workers in the UK and Spain. Therefore, workers in Austria and Germany are suffering more for not having better career prospects. Nevertheless, it is important to note that we are measuring the relative importance of the WTP contributions which are attributed to a certain non-wage characteristic and hence the size of these terms will depend on the size of all other WTP contributions.

We have found that the second most important job characteristic in most of the countries is to have a valuable job. The exceptions are France, Japan, Czech Republic, Slovenia and Turkey were the second most important characteristic is to have a challenging job, while in Noway, Portugal and Hungary the second most important characteristic is to have a social status. Workers in France and Czech Republic are on average ready to give up around 20% of their total WTP for a job that is challenging. We can see that the social status and a good chance to combine work with family tasks are somehow of the same importance for most of the countries. The opportunity to learn new things is of highest importance in Japan while in Finland is the most unimportant job characteristic. Job autonomy is for most of the countries on the second to last place of importance. The relative importance of job autonomy is highest in Turkey while it is lowest in Germany. Impressive as it may sound but the job security is the least important job characteristics. Although, one will find this evidence a bit surprising at first, however it should be noted that we are concerned with the preferences of young and educated individuals who have recently entered the labour market. Since their worries about job security may come later in life or since it can turn out that more educated people are less concerned with the issue of job quality, the following evidence might not be surprising after all.

The relative importance of having a good career prospect is the most important priority for both men and women in almost every country. On the other hand, both men and women are willing to give up relatively the smallest amount of their WTP to achieve a perfect job security. The following evidence that says that men and women are having similar relative WTP contributions for non-wage job characteristics comes from the fact that the preferences between these two groups are not considerably different (although women prefer more challenging jobs and jobs with a good chance to combine work with family tasks, while men prefer more to have a good career prospects) but also due to the fact that on average both men and women experience similar deprivation in these non-wage job characteristics.

2.6.7 Gender differences in willingness-to-pay

In previous section we have shown the results from the Shapley value decomposition of the total willingness-to-pay on its contribution to each non-wage characteristic. The following results have provided us with the information about the relative importance of various non-wage characteristics. In this section we illustrate the (total) willingness-to-pay for men and women across the distribution and we compare the gender differences in willingness-to-pay.

We observe from figure 2.7 that men are having higher willingness-to-pay over the entire distribution in each country except Turkey where women are having higher willingness-to-pay in the first half of the distribution. This evidence points out to the fact that in absolute terms men suffer more than women for not being at the reference levels of non-wage job characteristics and thus they are willing to give up more of his wages to reach the reference points. Nevertheless, the following evidence is not surprising since we know that the willingness-to-pay is a function of wage and since we have seen that men are having higher wages across the distribution in all countries except in Turkey where the opposite is true. Thus, we clearly see that men more able to afford a job of higher quality. However, once we normalize the (total) willingness-to-pay with the wage level the evidence points out that the differences in willingness-to-pay between gender almost disappear (see figure B.2).

We can notice that the willingness-to-pay for both men and women is monotonically increasing over percentiles with the sharp increase on the top of distribution. The following pattern is observed across all countries. While the differences in willingness-to-pay between men and women are less pronounced at the bottom of distribution across countries, these differences start to widen at the top of distribution. A few countries like Italy, Netherlands, Japan, Belgium and Turkey are having a quite equal distributions of willingness-to-pay for men and women while on the other hand in Germany, Hungary and Lithuania the gender difference in the willingness-to-pay increases substantially at the top of the distribution although the differences are less pronounced at the bottom of the distribution. It is important to note that the gender differences in willingness-to-pay are resulting from the gender differences in wages but also due to differences in preferences and differences in non-wage job characteristics. Since we have shown that differences in preferences between men and women are not greatly pronounced, the gender differences in willingness-to-pay are to be explained mostly by differences in wage and non-wage job characteristics between men and women.

2.7 Conclusion

The objective of this chapter was to analyse the well-being on the job as one important sphere of life of many individuals. We have limited our analysis to a specific sub-population of recent graduates in a large sample of countries. Since the literature on well-being on the job have been predominantly concerned with understanding job quantity, we have decided to broaden the literature by analysing the important topic of job quality. In doing so, we first have to select a reasonable well-being measure which evaluates the well-being of individuals on their jobs. We have distinguished between five different well-being measures which include wage, equivalent wage, subjective job satisfaction score, average preferences objective measure and equal weights objective measure. It is important to bear in mind that the choice for each of these measures is based on the normative assumptions that these measures materialise.

In recent years, a lot of interest for measuring the well-being on the job has received by the subjective job satisfaction measure. Although the implementation of the following measure does not require a lot of effort, yet it does not allow us to introduce one important normative assumption for measuring well-being, that of respecting individual preferences. The underlying reason why this conflict occurs lies in fact that the subjective satisfaction measure is contingent on the scaling factors (i.e. adaptations, expectations and aspirations) which may differ across different individuals in a given point of time or it may differ across time for a given individual. In order to be able to make a proper interpersonal well-being comparisons, we have decided to use the equivalent wage measure which respect individual preferences but on the other hand it is not dependent on scaling factors.

We have also illustrated two objective well-being measures (i.e. equal weights and average preferences) which do not respect individual preferences over job characteristics but instead they are based on the aggregation procedure that ascribes objective weights to all job characteristics contained in such a measure. The reason why some of researchers favour these objective well-being measures comes from the fact that they are in line with the *Dominance principle*, which neither the subjective satisfaction measure nor the equivalent wage measure satisfy. Nevertheless, as we have argued, the objective well-being measures may be deceptive since they rely on a paternalistic nature of ascribing weights to job characteristics.

We have shown that the choice of well-being measure is quite important since different measures will lead to different job quality rankings of countries. Thus, have to take the well-being

measurement seriously. In this chapter we have raised the important critique of the prevailing measures which seem to neglect the multi-dimensional concept of individual well-being. It is reasonable to argue that individual well-being on the job does not only depend on wage but also on other non-wage job characteristics. Taking into account both wage and non-wage job characteristics we are able to construct a genuine measure of well-being which reflects more closely the job quality of individuals.

We have seen that recent graduates care about wage but also about non-wage job characteristics. Among the non-wage job characteristics, having a good career prospect is relatively the most important characteristic for both men and women. On the other hand, relatively the least important non-wage characteristic for both men and women is job security. Accepting the idea that the well-being is a multidimensional concept introduces additional challenge of dealing with the correlation between job characteristics and finding a proper way to aggregate various dimensions into a single well-being measure. Accomplishing these tasks do not seem to be a trivial thing to do for the creators of public and social policies and ultimately it is up to them to consider whether these additional steps are worthwhile doing. As we have argued we find these additional steps for constructing a well-being measure indeed fundamental if one is interested in making appropriate interpersonal comparisons of well-being.

Table 2.1: Summary Statistics

	Countries																		
	IT	ES	FR	AT	DE	NL	UK	FI	NO	CZ	JP	PT	BE	EE	SI	TR	LT	PL	HU
Satisfaction	3.51	3.69	3.84	3.98	3.81	3.76	3.72	3.73	3.98	3.88	3.46	3.64	3.90	3.89	3.74	3.38	3.79	3.70	3.71
Age	32.28	29.83	29.16	33.17	33.16	30.58	30.31	32.11	33.41	29.36	28.51	30.53	28.28	31.34	34.22	29.20	29.21	29.90	29.47
Male	46.72	36.29	34.90	47.62	52.33	41.47	40.26	39.26	40.06	45.78	51.27	35.76	42.59	33.70	37.13	62.21	33.77	33.75	32.00
Child	16.63	8.96	25.82	27.87	29.28	21.54	16.93	38.80	55.73	19.13	10.02	23.78	20.16	49.96	53.56	19.02	40.78	38.62	28.37
Partner	45.70	44.81	64.18	63.83	65.66	67.76	55.10	75.29	75.86	61.55	27.76	53.80	64.61	66.97	71.93	44.82	67.37	66.45	62.93
Family	38.24	40.96	4.89	5.10	3.17	5.73	22.22	1.85	1.81	22.35	41.50	30.44	16.10	9.46	14.27	38.66	13.26	18.05	22.65
Education	5.05	4.47	4.20	5.18	5.02	3.45	3.22	4.17	4.13	4.68	4.40	4.04	4.65	4.69	5.23	4.64	4.99	4.89	4.47
Company Small	35.24	30.34	17.92	31.34	23.37	20.68	20.28	21.39	22.36	32.49	17.70	28.80	21.05	31.42	29.77	35.32	30.20	29.56	40.13
Company Medium	20.71	17.22	13.50	18.71	13.79	20.47	16.77	20.28	19.19	24.08	18.26	20.39	18.59	31.45	31.13	24.44	29.29	27.44	27.90
Company Large	39.09	47.15	56.87	45.94	42.16	56.18	59.49	54.21	50.96	40.34	59.61	42.97	52.80	35.69	35.86	33.47	34.15	38.68	31.40
Training	55.38	71.62	48.87	72.15	66.69	64.71	68.79	71.71	53.21	73.52	57.15	61.71	69.27	66.98	68.13	48.81	65.92	68.07	54.31
Sector	28.75	31.37	40.99	39.07	43.32	50.11	47.94	42.84	60.07	35.05	27.81	40.32	32.78	48.51	55.09	38.54	42.15	46.00	47.55
Work Risk	3.95	3.56	3.18	4.00	4.02	3.88	3.82	3.51	3.91	2.26	3.47	4.05	3.85	3.98	4.49	3.49	3.48	3.49	4.20
Part Time	13.90	11.50	8.50	11.14	10.67	12.58	6.16	8.34	8.39	8.29	14.68	9.41	6.05	8.11	6.20	8.78	7.13	14.00	7.48
Wage (€/mnth)	2057	1812	2815	2853	4531	2464	2680	2441	3531	1680	2770	1982	3093	1653	1546	178	1447	1294	1282
Autonomy	3.61	3.77	4.04	4.47	4.42	3.80	3.66	3.91	4.20	4.30	3.54	4.08	4.14	3.68	3.89	3.27	4.33	4.23	3.75
Security	3.47	3.68	3.72	3.68	3.52	3.72	3.78	3.68	3.95	3.92	3.70	3.57	3.61	4.18	3.91	3.58	3.85	3.97	3.84
Learn	3.67	3.64	3.65	3.91	3.73	3.69	3.80	3.92	3.83	3.87	3.27	3.56	3.77	4.09	3.75	3.60	3.84	3.70	3.60
Challenge	3.30	3.40	3.24	3.76	3.64	3.53	3.66	3.73	3.87	3.50	3.30	3.33	3.52	3.73	3.43	3.25	3.38	3.45	3.45
Career	2.77	3.24	2.88	2.72	2.56	3.01	3.41	2.75	2.91	3.48	2.84	2.76	2.92	3.13	2.92	3.02	2.92	3.05	2.66
Social Status	2.91	3.05	3.21	3.40	3.20	3.14	3.02	3.15	3.06	3.47	3.08	3.01	3.13	3.63	3.03	3.26	3.47	3.34	2.73
Valuable	3.01	3.25	3.46	3.44	3.28	3.32	3.29	3.15	3.69	3.37	3.46	3.44	3.16	3.51	3.41	3.40	3.25	3.32	3.20
Family Work	3.24	3.32	3.41	3.17	3.03	3.49	2.77	3.59	3.62	3.24	3.12	3.07	3.37	3.14	3.24	3.22	3.65	3.37	3.20
Observations	1315	2593	953	1111	1054	2219	1063	1831	1625	4500	1517	438	971	649	2085	629	609	947	431

Notes: Mean values of variables computed at the country level. The job satisfaction variable takes an integer value from 1 to 5. The variables that are given in percentages pertain to age, male, child, partner, family, education, company small, company medium, company large, training and sector. Work risk and non-wage job characteristic variables take an integer value that ranges from 1 to 5. The results are weighted using the weights that do sum up to 1.

Table 2.2: Satisfaction Equation

	Model I		Model II		Model III		Model IV		Model V	
	Coef.	s.e	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.
Job Dimensions										
Log Wage	0.211***	(0.017)	0.196***	(0.018)	0.260***	(0.024)	0.306***	(0.039)	0.375***	(0.037)
Autonomy	0.364***	(0.029)	0.353***	(0.031)	0.349***	(0.032)	0.285***	(0.016)	0.275***	(0.017)
Security	0.072***	(0.011)	0.065***	(0.012)	0.062***	(0.012)	0.095***	(0.016)	0.102***	(0.017)
Learn	0.341***	(0.018)	0.348***	(0.018)	0.350***	(0.018)	0.329***	(0.024)	0.315***	(0.023)
Challenge	0.287***	(0.017)	0.301***	(0.018)	0.303***	(0.018)	0.336***	(0.022)	0.384***	(0.034)
Career	0.240***	(0.016)	0.251***	(0.017)	0.260***	(0.017)	0.257***	(0.018)	0.268***	(0.019)
Social Status	0.028	(0.033)	0.016	(0.036)	0.014	(0.036)	0.068	(0.041)	0.068	(0.042)
Valuable	0.253***	(0.014)	0.251***	(0.015)	0.251***	(0.015)	0.205***	(0.016)	0.176***	(0.015)
Family Work	0.084***	(0.011)	0.093***	(0.011)	0.093***	(0.011)	0.066***	(0.016)	0.075***	(0.019)
Personal Characteristics										
Age	-0.051*	(0.022)	-0.068**	(0.023)	-0.076**	(0.026)	-0.079**	(0.027)	-0.081**	(0.028)
Age squared/1000	0.629*	(0.283)	0.855**	(0.302)	0.975**	(0.332)	0.970**	(0.338)	0.997**	(0.349)
Male	-0.047	(0.092)	-0.038	(0.095)	-0.029	(0.096)	0.100	(0.110)	0.151	(0.122)
Child	0.392***	(0.112)	0.393***	(0.117)	0.371**	(0.117)	0.291*	(0.119)	0.007	(0.114)
Partner	0.067*	(0.032)	0.044	(0.033)	0.045	(0.033)	0.044	(0.033)	0.283*	(0.121)
Family	0.140	(0.105)	0.153	(0.110)	0.168	(0.110)	0.195	(0.111)	0.413**	(0.142)
Education	-0.013	(0.011)	0.004	(0.012)	-0.020	(0.013)	-0.022	(0.013)	-0.036**	(0.013)
Company Medium							-0.111**	(0.035)	-0.096**	(0.036)
Company Large							0.355	(0.306)	0.403	(0.325)
Training							-0.190	(0.283)	0.379***	(0.090)
Sector							0.540***	(0.104)	0.505***	(0.107)
Part-time Work							-0.407**	(0.142)	-0.178***	(0.050)
Work Risk							0.069***	(0.013)	0.073***	(0.014)
Abilities										
Masterfield			0.166***	(0.014)	0.156***	(0.014)	0.147***	(0.015)	0.138***	(0.015)
Knowfield			-0.060***	(0.012)	-0.059***	(0.012)	-0.065***	(0.012)	-0.066***	(0.013)
Think			-0.027*	(0.013)	-0.030*	(0.013)				
Pressure			0.064***	(0.012)	0.063***	(0.013)	0.064***	(0.013)	0.069***	(0.013)
Use Time			0.036**	(0.013)	0.036**	(0.013)	0.030*	(0.013)	0.029*	(0.014)
Work Productivity			0.046**	(0.014)	0.043**	(0.015)	0.050***	(0.015)	0.050**	(0.015)
Use Computers									0.031*	(0.014)
Quest			-0.050***	(0.013)	-0.041**	(0.013)	-0.044***	(0.013)	-0.053***	(0.014)
Present							-0.022*	(0.011)	-0.034**	(0.011)
Write			-0.064***	(0.012)	-0.061***	(0.012)	-0.062***	(0.012)	-0.057***	(0.013)
Foreign Language			-0.019*	(0.008)	-0.028***	(0.008)	-0.020*	(0.008)	-0.024**	(0.008)

Table 2.2: Satisfaction Equation (Continued)

	Model I		Model II		Model III		Model IV		Model V	
	Coef.	s.e	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.	Coef.	s.e.
Occupation and Industry										
Clerks Occ.									-0.236***	(0.057)
Craft/Trade Occ.									-0.488*	(0.220)
Elementary Occ.									-0.876***	(0.233)
Accommodation Ind.									0.452**	(0.163)
Education Ind.									0.356***	(0.042)
Health/Social Ind.									0.177***	(0.044)
Other Services Ind.									0.288***	(0.064)
Interactions										
Log Wage*Young							-0.040*	(0.018)	-0.043*	(0.018)
Social Status*Young	0.106**	(0.034)	0.114**	(0.037)	0.116**	(0.037)	0.107**	(0.039)	0.112**	(0.039)
Autonomy*Young	-0.076**	(0.028)	-0.076*	(0.030)	-0.078*	(0.030)				
Challenge*Male							-0.070*	(0.029)	-0.070*	(0.030)
Career*Male	0.065**	(0.022)	0.064**	(0.023)	0.061**	(0.023)	0.086**	(0.027)	0.083**	(0.028)
Valuable*Male	-0.068**	(0.021)	-0.060**	(0.021)	-0.060**	(0.022)	-0.044*	(0.022)		
Fam. Work*Male									-0.051*	(0.023)
Valuable*Child									-0.052*	(0.026)
Learn*Child	-0.085**	(0.028)	-0.091**	(0.030)	-0.091**	(0.029)	-0.068*	(0.030)		
Fam. Work*Child									0.057*	(0.026)
Challenge*Partner									-0.065*	(0.032)
Challenge*Family	-0.076**	(0.029)	-0.080**	(0.030)	-0.081**	(0.030)	-0.086**	(0.031)	-0.143***	(0.039)
Log Wage*Co. Large							-0.086*	(0.038)	-0.091*	(0.041)
Security*Co. Large							-0.093***	(0.023)	-0.090***	(0.024)
Learn*Co. Large							0.081**	(0.026)	0.078**	(0.026)
Fam. Work*Co. Large							0.044*	(0.022)	0.056*	(0.023)
Log Wage*Training							0.082*	(0.037)		
Social Status*Training							-0.069*	(0.027)	-0.058*	(0.028)
Learn*Sector							-0.085**	(0.027)	-0.101***	(0.027)
Fam. Work*Part Time							0.081*	(0.038)		
Occupation	No		No		No		No		Yes	
Industry	No		No		No		No		Yes	
Country	No		No		Yes		Yes		Yes	
Pseudo-R^2	0.1201		0.1266		0.1283		0.1322		0.1353	
Log-likelihood	-36975.2		-33916.0		-33850.6		-33073.0		-31295.7	
Observations	30714		28439		28439		27927		26540	

Notes: Results obtained from the ordinal logistic regression. The estimation procedure includes weighting. Robust standard errors in parentheses where *, ** and *** indicate statistical significance at the 5% level, 1% level, and 0.1% level, respectively

Table 2.3: Job Quality Indicators: Mean and Rank

	WB^{w}		WB^{w^*}		WB^{s}		$WB^{o,ew}$		$WB^{o,ap}$	
	Mean	*Rank*	Mean	*Rank*	Mean	*Rank*	Mean	*Rank*	Mean	*Rank*
Italy	2057	*10*	258	*17*	3.513	*17*	0.288	*19*	7.408	*17*
Spain	1812	*12*	378	*6*	3.692	*15*	0.473	*14*	7.847	*13*
France	2815	*5*	267	*16*	3.843	*6*	0.509	*12*	8.196	*5*
Austria	2853	*4*	459	*4*	3.983	*1*	0.649	*4*	8.487	*1*
Germany	4531	*1*	569	*3*	3.813	*7*	0.492	*13*	8.087	*7*
Netherlands	2464	*8*	372	*7*	3.759	*9*	0.541	*8*	7.928	*9*
United Kingdom	2680	*7*	458	*5*	3.717	*12*	0.516	*9*	7.907	*10*
Finland	2441	*9*	353	*9*	3.731	*11*	0.563	*7*	7.843	*14*
Norway	3531	*2*	664	*1*	3.979	*2*	0.753	*1*	8.451	*2*
Czech Republic	1680	*13*	366	*8*	3.880	*5*	0.696	*3*	8.182	*6*
Japan	2770	*6*	276	*15*	3.461	*18*	0.361	*16*	7.287	*18*
Portugal	1982	*11*	316	*11*	3.644	*16*	0.403	*15*	7.717	*16*
Belgium	3093	*3*	584	*2*	3.903	*3*	0.516	*10*	8.226	*3*
Estonia	1653	*14*	332	*10*	3.888	*4*	0.738	*2*	8.216	*4*
Slovenia	1546	*15*	285	*14*	3.739	*10*	0.510	*11*	7.907	*11*
Turkey	178	*19*	32	*19*	3.377	*19*	0.307	*18*	7.130	*19*
Lithuania	1447	*16*	286	*13*	3.795	*8*	0.616	*5*	8.076	*8*
Poland	1294	*17*	290	*12*	3.702	*14*	0.595	*6*	7.841	*15*
Hungary	1282	*18*	159	*18*	3.713	*13*	0.341	*17*	7.853	*12*

Notes: Mean values of indicators computed at the country level. The indicators of job quality include wage (WB^{w}), equivalent wage(WB^{w^*}), job satisfaction score(WB^{s}), equal weights objective indicator ($WB^{o,ew}$) and average preference objective indicator ($WB^{o,ap}$). The results are weighted using the sampling weights.

Table 2.4: Job Quality Indicators for Men: Mean and Rank

	WB^{w}		WB^{w^*}		WB^{s}		$WB^{o,ew}$		$WB^{o,ap}$	
	Mean	*Rank*	Mean	*Rank*	Mean	*Rank*	Mean	*Rank*	Mean	*Rank*
Italy	2085	*11*	331	*11*	3.508	*17*	0.288	*19*	7.500	*17*
Spain	1940	*12*	393	*6*	3.700	*13*	0.473	*14*	7.817	*15*
France	3300	*3*	261	*17*	3.854	*4*	0.509	*12*	8.222	*5*
Austria	3142	*4*	531	*3*	4.003	*1*	0.649	*4*	8.557	*1*
Germany	5111	*1*	712	*1*	3.848	*5*	0.492	*13*	8.147	*6*
Netherlands	2628	*9*	415	*5*	3.729	*11*	0.541	*8*	7.947	*10*
United Kingdom	2831	*7*	427	*4*	3.643	*16*	0.516	*9*	7.778	*16*
Finland	2635	*8*	387	*7*	3.731	*10*	0.563	*7*	7.865	*13*
Norway	3520	*2*	607	*2*	3.911	*2*	0.753	*1*	8.394	*2*
Czech Republic	1783	*15*	355	*10*	3.867	*3*	0.696	*3*	8.117	*8*
Japan	2980	*5*	292	*15*	3.317	*19*	0.361	*16*	7.316	*18*
Portugal	2276	*10*	370	*8*	3.654	*14*	0.403	*15*	7.905	*11*
Belgium	2840	*6*	319	*13*	3.836	*6*	0.516	*10*	8.244	*4*
Estonia	1923	*13*	365	*9*	3.826	*8*	0.738	*2*	8.142	*7*
Slovenia	1671	*16*	276	*16*	3.706	*12*	0.510	*11*	7.952	*9*
Turkey	178	*19*	34	*19*	3.364	*18*	0.307	*18*	7.222	*19*
Lithuania	1830	*14*	328	*12*	3.785	*9*	0.616	*5*	8.270	*3*
Poland	1516	*18*	317	*14*	3.644	*15*	0.595	*6*	7.827	*14*
Hungary	1587	*17*	156	*18*	3.833	*7*	0.341	*17*	7.894	*12*

Notes: Mean values of indicators computed at the country level. The indicators of job quality include wage (WB^{w}), equivalent wage(WB^{w^*}), job satisfaction score(WB^{s}), equal weights objective indicator ($WB^{o,ew}$) and average preference objective indicator ($WB^{o,ap}$). The results are weighted using the sampling weights.

Table 2.5: Job Quality Indicators for Women: Mean and Rank

	WB^{w}		WB^{w^*}		WB^{s}		$WB^{o,ew}$		$WB^{o,ap}$	
	Mean	*Rank*	Mean	*Rank*	Mean	*Rank*	Mean	*Rank*	Mean	*Rank*
Italy	2032	*10*	194	*17*	3.518	*18*	0.288	*19*	7.327	*17*
Spain	1738	*12*	370	*7*	3.687	*14*	0.473	*14*	7.864	*12*
France	2555	*6*	271	*14*	3.837	*6*	0.509	*12*	8.182	*6*
Austria	2590	*4*	394	*5*	3.965	*2*	0.649	*4*	8.424	*2*
Germany	3893	*1*	411	*4*	3.775	*9*	0.492	*13*	8.020	*7*
Netherlands	2347	*8*	341	*8*	3.780	*8*	0.541	*8*	7.915	*10*
United Kingdom	2579	*5*	479	*3*	3.768	*10*	0.516	*9*	7.994	*8*
Finland	2315	*9*	331	*9*	3.730	*13*	0.563	*7*	7.829	*15*
Norway	3539	*2*	703	*2*	4.024	*1*	0.753	*1*	8.489	*1*
Czech Republic	1593	*13*	375	*6*	3.890	*5*	0.696	*3*	8.237	*4*
Japan	2550	*7*	259	*16*	3.612	*17*	0.361	*16*	7.255	*18*
Portugal	1818	*11*	286	*12*	3.638	*16*	0.403	*15*	7.612	*16*
Belgium	3280	*3*	780	*1*	3.953	*3*	0.516	*10*	8.213	*5*
Estonia	1516	*14*	316	*10*	3.919	*4*	0.738	*2*	8.254	*3*
Slovenia	1471	*15*	291	*11*	3.758	*11*	0.510	*11*	7.880	*11*
Turkey	178	*19*	28	*19*	3.398	*19*	0.307	*18*	6.978	*19*
Lithuania	1252	*16*	265	*15*	3.800	*7*	0.616	*5*	7.977	*9*
Poland	1181	*17*	276	*13*	3.732	*12*	0.595	*6*	7.849	*13*
Hungary	1138	*18*	161	*18*	3.657	*15*	0.341	*17*	7.833	*14*

Notes: Mean values of indicators computed at the country level. The indicators of job quality include wage (WB^{w}), equivalent wage(WB^{w^*}), job satisfaction score(WB^{s}), equal weights objective indicator ($WB^{o,ew}$) and average preference objective indicator ($WB^{o,ap}$). The results are weighted using the sampling weights.

Table 2.6: Spearman rank correlations between the well-being measures

	WB^{w}	WB^{w^*}	WB^{s}	$WB^{o,ew}$	$WB^{o,ap}$
WB^{w}	1				
WB^{w^*}	0.6719*	1			
	(0.0016)				
WB^{s}	0.4825*	0.6368*	1		
	(0.0364)	(0.0034)			
$WB^{o,ew}$	0.1614	0.5737*	0.7667*	1	
	(0.5092)	(0.0102)	(0.0001)		
$WB^{o,ap}$	0.5018*	0.6456*	0.9807*	0.7070*	1
	(0.0286)	(0.0028)	(0.0000)	(0.0007)	

Notes: Numbers denote Spearman rank correlation coefficients for all pairs of measures. Numbers in brackets denote a two sided p-value. * indicates statistical significance at the 5%.

Table 2.7: Overlap of the Worst off over different measures

	WB^{w}	WB^{w^*}	WB^{s}	$WB^{o,ew}$	$WB^{o,ap}$	Overlap (%)
Panel a						
	×					101.7
		×				100.0
			×			100.0
				×		100.1
					×	100.1
Panel b						
	×	×				20.6
	×		×			20.0
	×			×		22.1
	×				×	22.4
		×	×			43.0
		×		×		67.7
		×			×	73.6
			×	×		43.7
			×		×	45.4
				×	×	80.2
Panel c						
	×	×	×			10.3
	×	×		×		16.2
	×	×			×	17.9
	×		×	×		10.7
	×		×		×	11.1
	×			×	×	18.6
		×	×	×		34.5
		×	×		×	37.1
		×		×	×	62.3
			×	×	×	38.9
Panel d						
	×	×	×	×		9.2
	×	×	×		×	9.7
	×	×		×	×	15.7
	×		×	×	×	10.0
		×	×	×	×	32.9
Panel e						
	×	×	×	×	×	9.1

Notes: Numbers denote the degree of overlap of the worst off according to different measures.

Table 2.8: Overlap of the Best off over different measures

	WB^{w}	WB^{w^*}	WB^{s}	$WB^{o,ew}$	$WB^{o,ap}$	Overlap (%)
Panel a						
	×					100.0
		×				100.0
			×			100.0
				×		100.0
					×	100.0
Panel b						
	×	×				69.9
	×		×			68.8
	×			×		69.5
	×				×	70.1
		×	×			78.4
		×		×		90.5
		×			×	92.8
			×	×		78.6
			×		×	78.6
				×	×	93.0
Panel c						
	×	×	×			55.9
	×	×		×		63.4
	×	×			×	65.5
	×		×	×		55.9
	×		×		×	56.2
	×			×	×	65.5
		×	×	×		72.8
		×	×		×	74.4
		×		×	×	88.0
			×	×	×	74.4
Panel d						
	×	×	×	×		52.1
	×	×	×		×	53.2
	×	×		×	×	62.1
	×		×	×	×	53.4
		×	×	×	×	71.2
Panel e						
	×	×	×	×	×	51.2

Notes: Numbers denote the degree of overlap of the best off according to different measures.

Table 2.9: Ratios of Wage and Equivalent Wage between men and women

	W_w/W_m				W^*_w/W^*_m			
	Mean	p_{10}	p_{50}	p_{90}	Mean	p_{10}	p_{50}	p_{90}
Italy	0.97	0.96	0.92	0.97	**0.59**	0.40	0.63	0.69
Spain	0.90	0.89	0.90	0.92	0.94	0.75	1.08	1.03
France	0.77	0.91	0.77	0.79	1.04	0.29	0.83	0.84
Austria	0.82	0.79	0.84	0.85	0.74	0.66	0.71	**0.60**
Germany	0.76	0.84	0.83	0.74	**0.58**	0.92	0.97	0.66
Netherlands	0.89	0.85	0.93	0.92	0.82	1.08	1.08	0.76
United Kingdom	0.91	1.02	0.87	0.86	1.12	2.57	1.07	**1.15**
Finland	0.88	0.84	0.80	0.85	0.86	0.99	1.06	0.81
Norway	1.01	0.91	0.87	0.90	1.16	**3.08**	1.10	0.90
Czech Republic	0.89	0.93	0.88	0.89	1.06	0.91	1.18	1.01
Japan	0.86	0.88	0.86	0.94	0.89	1.99	1.18	0.97
Portugal	0.80	0.83	0.78	0.85	0.77	0.36	0.60	0.63
Belgium	**1.16**	0.97	0.96	0.99	**2.44**	0.89	0.98	1.07
Estonia	0.79	0.93	0.76	0.74	0.86	1.72	0.97	0.92
Slovenia	0.88	0.89	0.85	0.85	1.06	0.47	1.04	1.10
Turkey	1.00	**1.34**	**1.00**	**1.04**	0.81	0.56	0.67	0.79
Lithuania	**0.68**	**0.71**	0.73	**0.60**	0.81	**0.13**	**0.46**	1.06
Poland	0.78	0.79	0.77	0.78	0.87	1.19	**1.39**	0.90
Hungary	0.72	0.89	**0.67**	0.75	1.03	0.31	1.29	1.06

Notes: Numbers denote the ratios of Wage (W) and Equivalent Wage (W^*) between women and men at the mean, 10th percentile (p_{10}), 50th percentile (p_{50}), 90th percentile (p_{90}). The results are weighted using the sampling weights.

Figure 2.4: The overall job satisfaction across countries: Proportions by gender

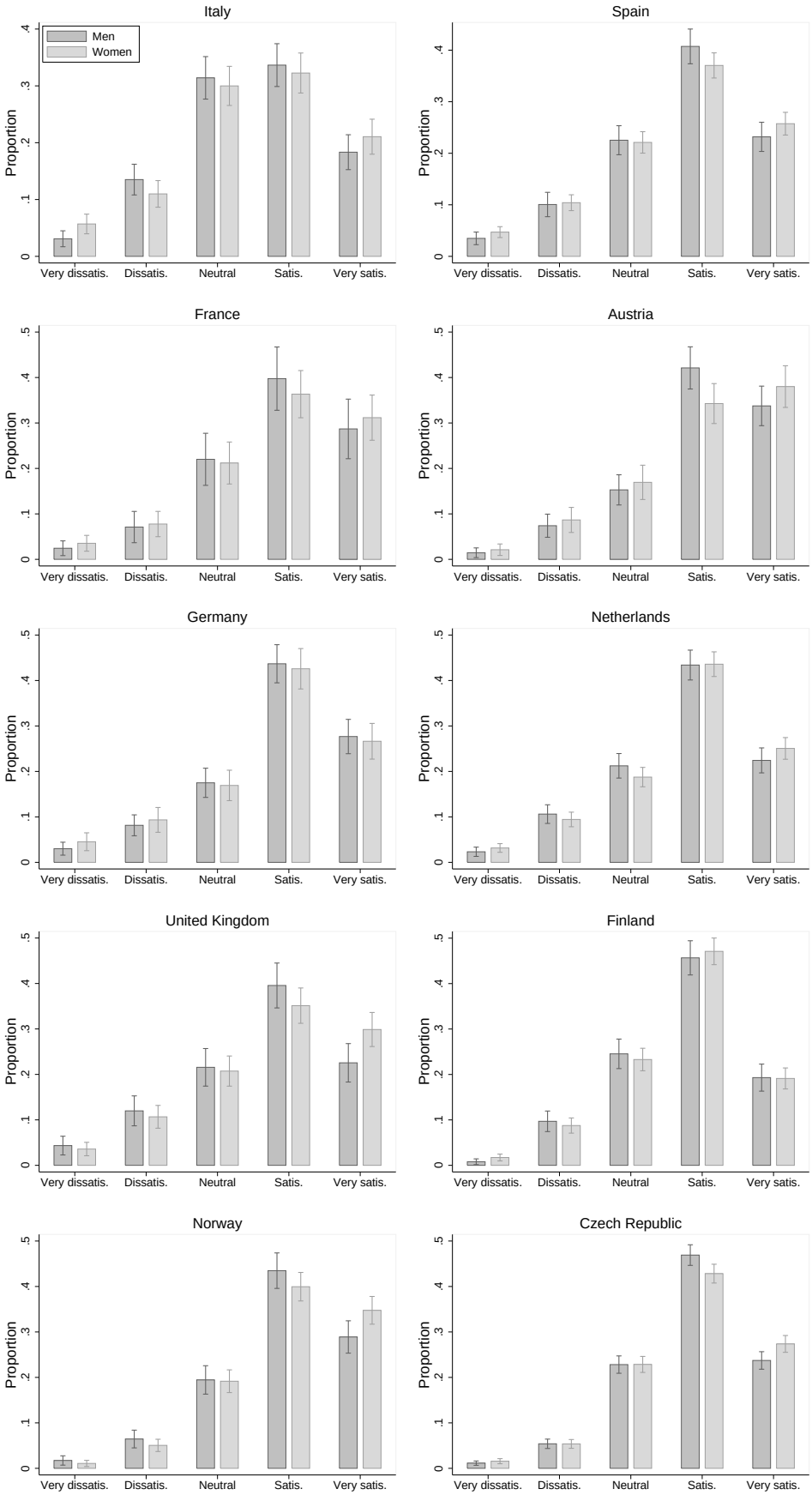


Figure 2.4: The overall job satisfaction across countries: Proportions by gender (continued)

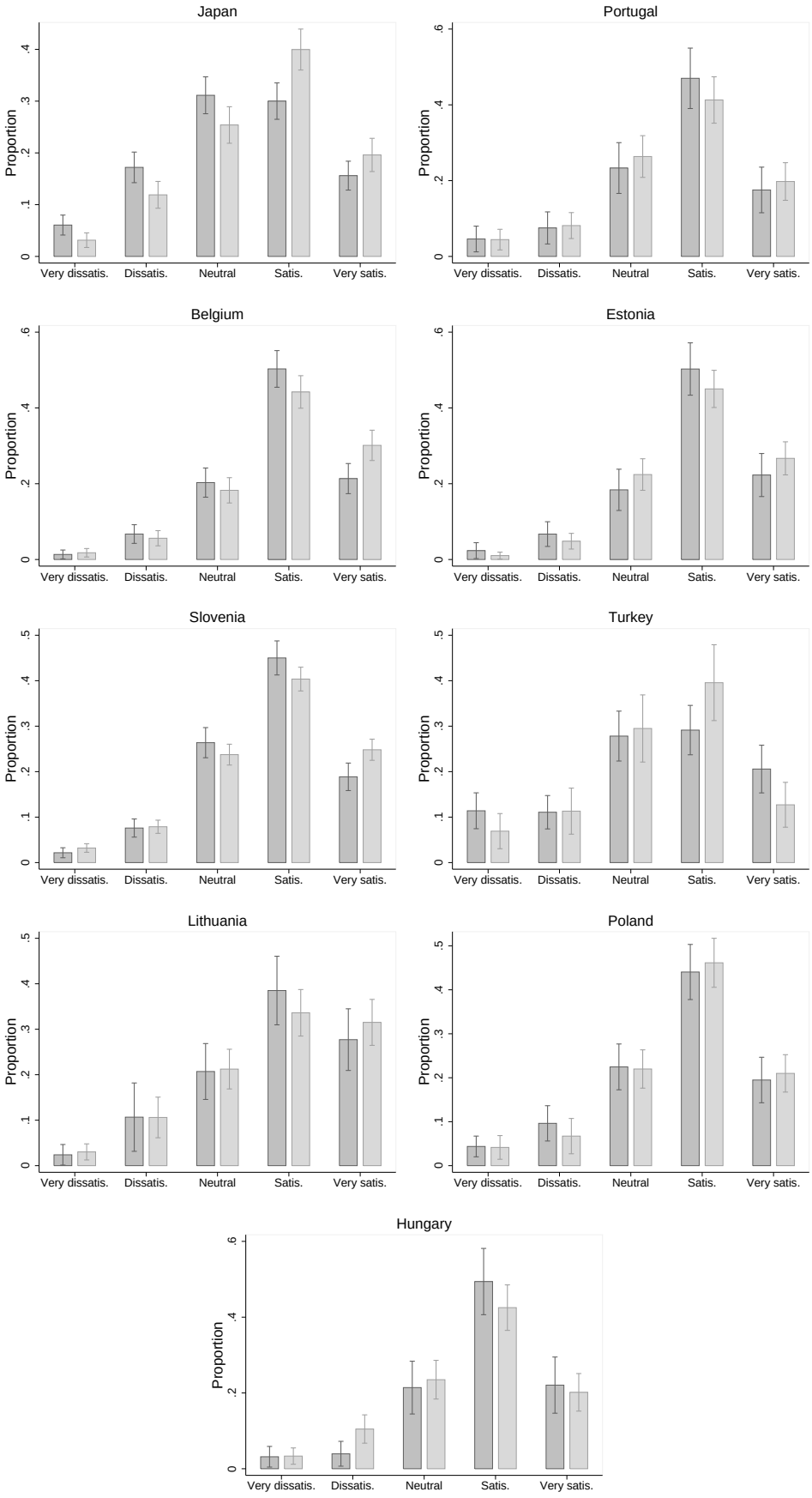


Figure 2.5: Wage and Equivalent Wage Gender Gaps

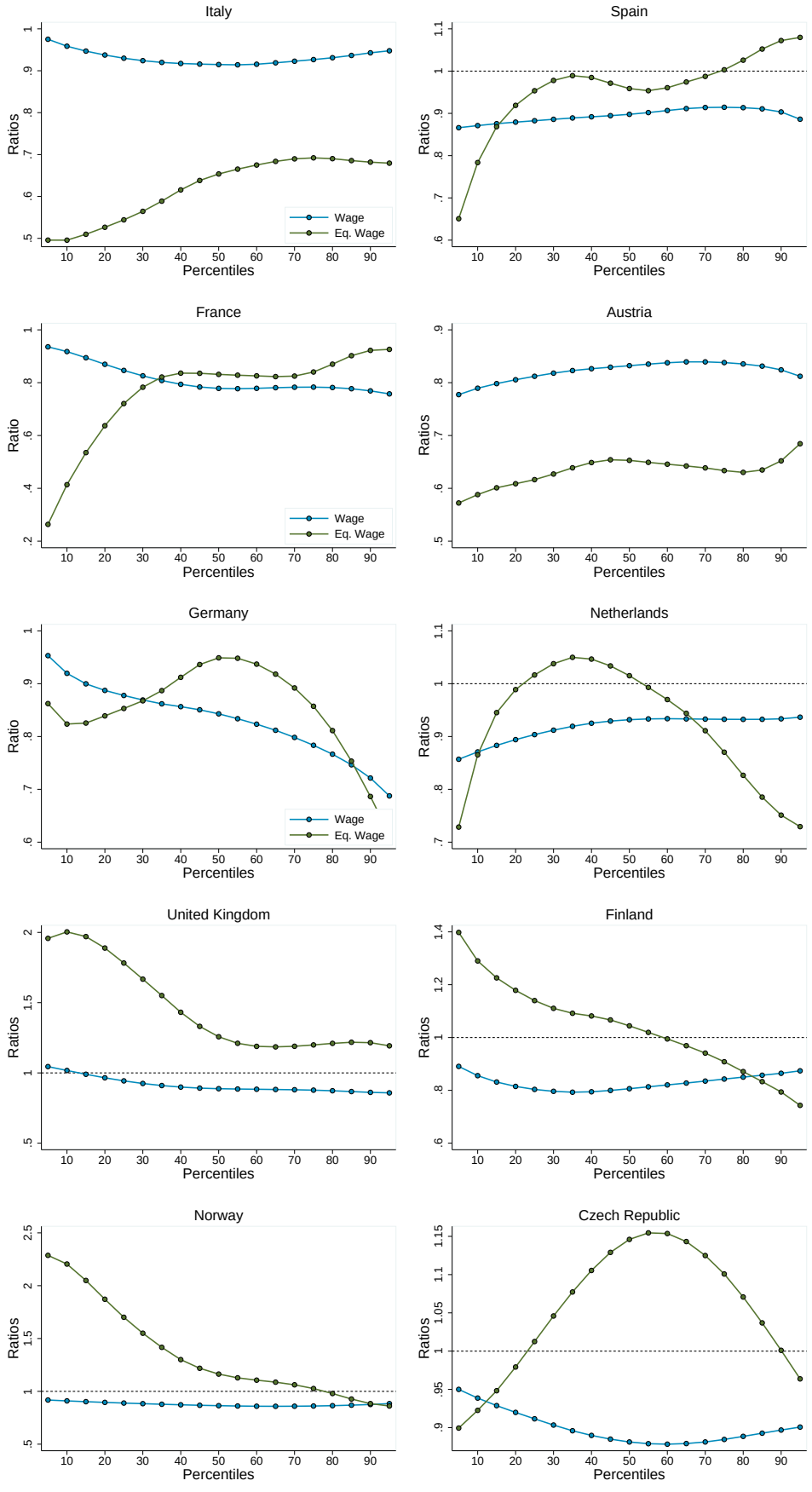


Figure 2.5: Wage and Equivalent Wage Gender Gaps (continued)

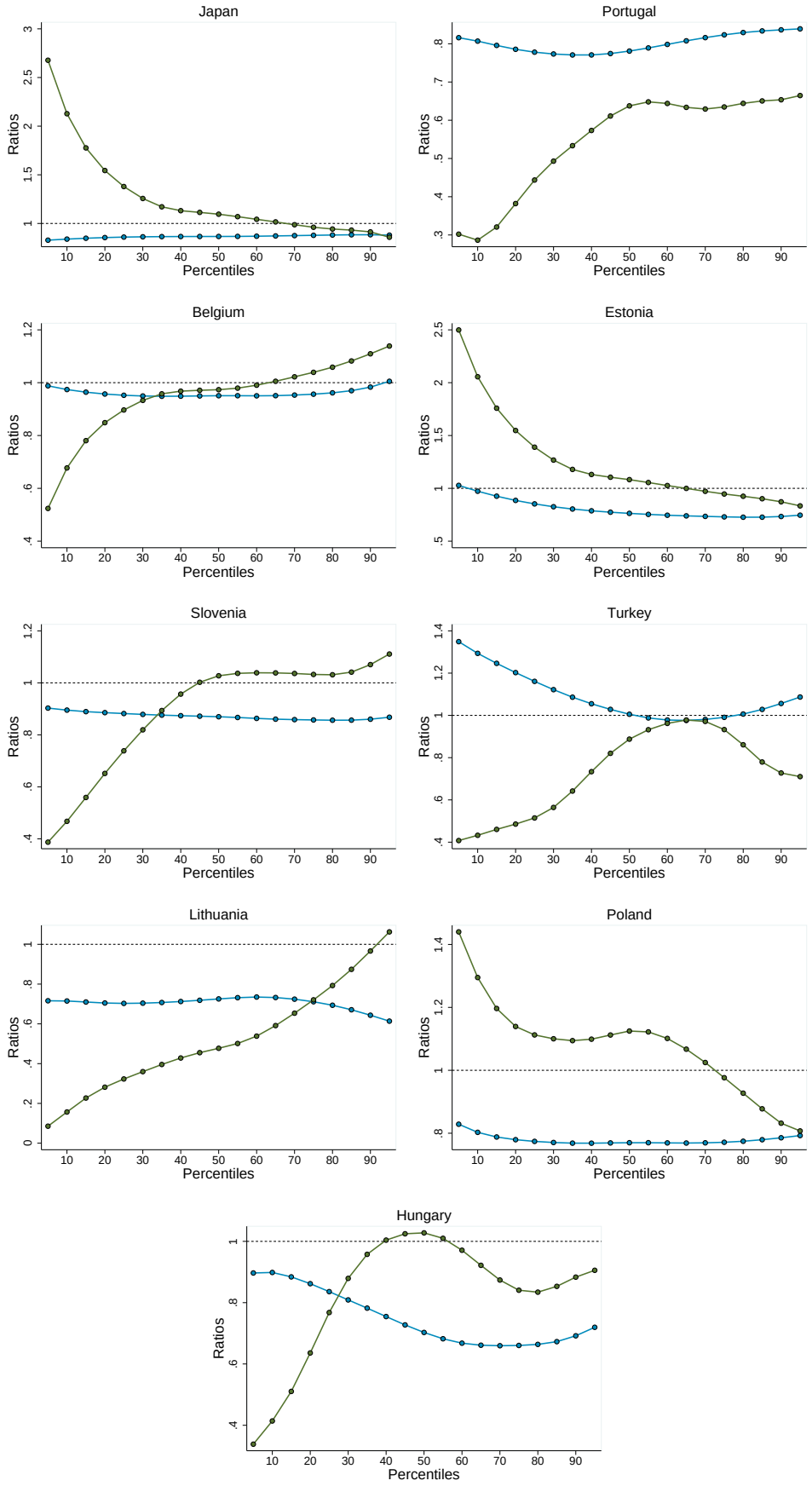
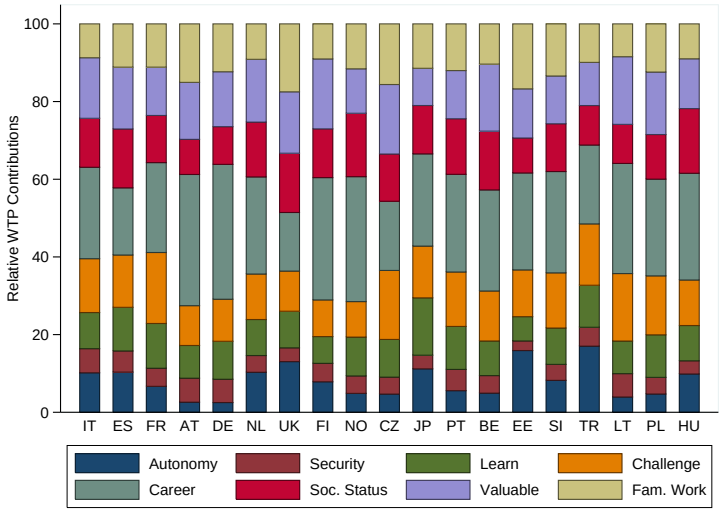
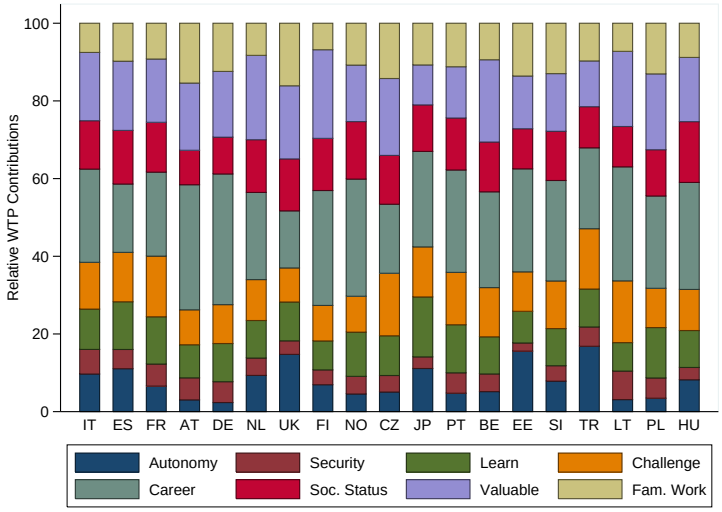


Figure 2.6: Shapley Decomposition of WTP

Entire Sample



Men



Women

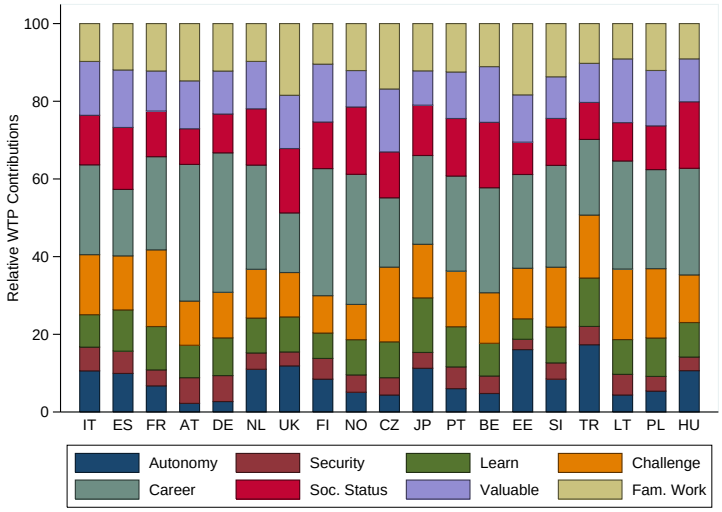


Figure 2.7: Total WTP for Men and Women

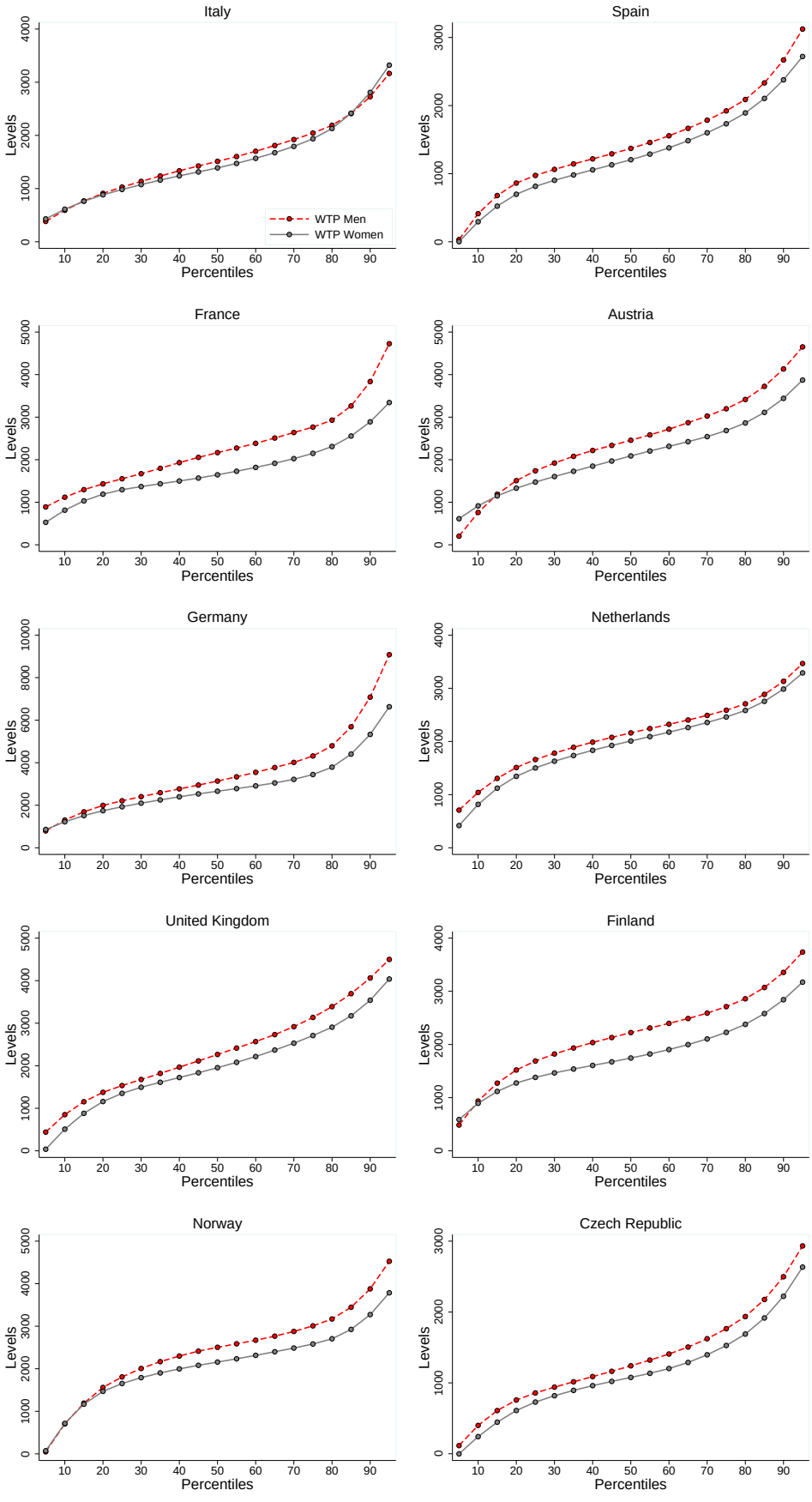
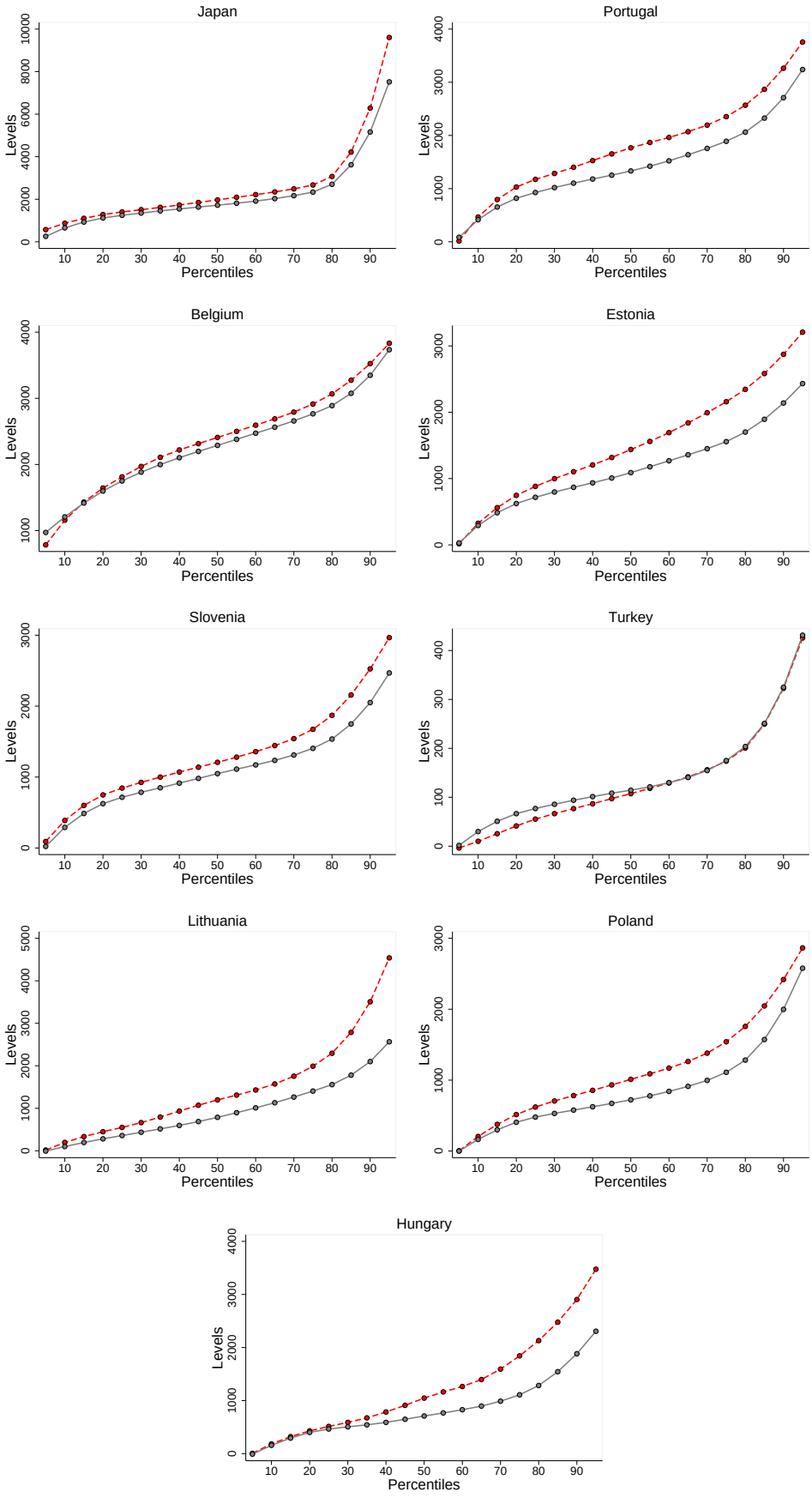


Figure 2.7: Total WTP for Men and Women (continued)



Chapter 3

Performance Pay Jobs and Job Satisfaction

3.1 Introduction

In recent years we have seen a growing interest of researches for finding the factors that affect the job satisfaction. Yet, the empirical question on what are the perspective effects of different payment schemes on the job satisfaction has received surprisingly insufficient attraction in the literature. The literature has shown that workers in the performance paying schemes exert higher effort in return for a higher earnings (see Parent (1999), Lazear (2000), Paarsch and Shearer (2000)). As a result, the productivity of workers in performance paying jobs is increased but it stays ambiguous on how this process reflects to the job satisfaction of workers. On the one hand, it is assumed that higher salaries would increase the job satisfaction but on the other hand, workers in performance pay jobs will be exposed to a higher level of effort and to a higher income variation which can lower their job satisfaction.

Brown and Sessions (2005) argue that workers choose firms that enhance productivity which as a consequence have a positive impact on workers satisfaction. Workers also report a higher level of satisfaction when they think that the payment they receive for their labour is equitable (see Brown (2001)). The literature on job satisfaction has been dealing with the effects of gender (Clark (1997a)), age (Groot and Maassen van den Brink (1999)), and occupations (Ward and Sloane (2000)). The connection between the job satisfaction and social psychology has been found as well (see Blanchflower and Oswald (2004)).

The literature on the gender differentials has shown that among equally qualified men and women, women are paid less (Blau and Kahn (1992)), women have less attractive jobs in terms of promotion opportunities, conditions of hiring, job content (see Johnson et al. (1992)) and women also report a higher level of stress (see Clark and Oswald (1994)). However, despite of the later evidence, it is found that women tend to report higher level of job satisfaction (see Blanchflower and Oswald (1992)). This is quite of a paradox[1]. Clark (1997b) proposed an answer to this paradox by arguing that women have lower expectations regarding the job opportunities they will receive in the future and that is why they are unconditionally more satisfied on their current jobs. In other words, higher job satisfaction among women reflects their lower expectation from the job opportunities which are influenced by the previous job positions they have acquired.

The literature on job satisfaction has shown that payment schemes do matter. Lazear (2000) and Oettinger (2001) have demonstrated that workers who are paid on the piece rates exert more effort and earn more than those workers paid an hourly salary. Thus, the payment schemes can influence the job satisfaction through higher earnings and by providing better working conditions (see Godard (2001)). Nevertheless, it is ambiguous what effect will different payment schemes have on the job satisfaction. Meyersson-Milgrom et al. (2002) showed that workers in the performance paying jobs may not be entirely compensated for having a higher earnings risk so that they will be experiencing a lower level of job satisfaction. Another approach that shows how the performance pay jobs can lower the job satisfaction is taken by Kennedy (1995) who has assumed that the performance pay jobs may erode the morale of the least productive workers and consequently they would exert lower effort levels. Thus, those firms who are using the performance paying schemes might end up with workers who are having a lower level of productivity than the firms who are using an hourly wage payment scheme.

Since the predictions of the microeconomic theory on the effects of performance paying jobs on the well-being on the job are mutually contrasting we have decided to tackle this issue in order to provide the empirical evidence behind these effects. It is important to bear in mind that we will use the subjective job satisfaction as our measure for the well-being on the job. In

[1]There are several reasons for observing the significant gender differences in job satisfaction. The first reason is due to different personal characteristics (age, education, health, union membership) and job characteristics (hours of work, type of performance pay scheme) between men and women. The second reason for existing gender difference in subjective well-being may be due to individual's beliefs and work values. The third reason has to do with different understanding of well-being in the sense of absolute and relative comparison levels.

addition, we break down the performance paying schemes into individual, group and company performance paying scheme and we illustrate the effects that each of these schemes have on the job satisfaction. According to the standard microeconomic theory, once we control for the level of earnings, workers in the performance pay jobs should have a lower level of job satisfaction due to the fact that they acquire a greater risk. In this chapter we examine this prediction by testing whether the workers in performance paying jobs will have a higher level of job satisfaction than the workers in non-performance paying jobs and whether this evidence will be true even after controlling for the level of earnings. We also test for the effect of risk attitudes on the job satisfaction in order to disentangle between the possible effects that the higher risk tolerance can induce a higher level of job satisfaction.

In this chapter we estimate the effects of performance pay job schemes on job satisfaction for both men and women and we consider the implications of our results for the gender job satisfaction. Although, the widespread evidence points out that women are holding less attractive jobs which is reflected in the important job characteristics like hiring, job content and earnings, we have found that despite of that women report higher level of job satisfaction in performance pay jobs. Nevertheless, after controlling for the personal and job characteristics we should expect that the identical men and women would be on the same level of job satisfaction. A solution to this puzzle can be explained with the fact that women have lower expectations from their jobs since they have formed their beliefs on the basis of their previous employment based on the jobs of lower quality.

The results we have found have confirmed the prediction that workers in the performance pay job schemes are more satisfied on their jobs than workers in the non-performance pay job schemes, even after we have controlled for the level of earnings, personal and job related characteristics. Both men and women, conditionally or unconditionally on their earnings are more satisfied in the performance paying jobs. Among all explanatory variables, we have found that health has the strongest effect on job satisfaction. After we have disaggregated the performance pay job schemes into individual, group or company performance pay job schemes, we have found that workers employed under each of these three types of schemes are more satisfied on their job than workers paid by the fixed amount. While the individual performance pay job scheme has the strongest effect on job satisfaction, the company performance pay job scheme has the smallest effect on job satisfaction.

The standard approach in modelling job satisfaction is to use the information on the subjective job satisfaction obtained on a Likert scale, which approximates the continuous latent variable of the true level of satisfaction. Unfortunately, the latent variable on the job satisfaction is unobserved to econometricians. Yet, the literature points out that the subjective well-being measure of job satisfaction can be represented as a function of income, hours of work, individual characteristics and job characteristics. It is important to emphasise that the job satisfaction is considered as the approximation of the utility on the job. We will consider the job satisfaction as the ordinal variable which implies that for instance the job satisfaction level of 4 is not as twice as high as the job satisfaction level of 2 but we know that the former level of job satisfaction is higher than the later level of job satisfaction.

Another important issue in modelling job satisfaction concerns the right specification of the econometric model. One should bear in mind that the presence of unobserved heterogeneity caused by personality traits and other factors (i.e. genetics) can bias the effects of regressors on the subjective job satisfaction. Thus, we need to cautiously consider which estimation strategy to follow. The literature on the human capital has illustrated the importance of accounting for the unobserved effects of ability that can bias the returns to education (see Card (1994)). Gottfredson (2004) showed that a large fraction of variation in education and earnings is due to genetic differences in ability. Thus, for analysing the effects of performance pay schemes on job satisfaction, we have to bear in mind that the variation in choosing the performance pay jobs may be correlated with socio-economic and personality factors. For that matter, the model we will choose should properly account for the possibility that the unobserved heterogeneity might correlate with other explanatory factors[2].

Unfortunately, the econometric panel model for the categorical ordered dependent variable that allows for the unobserved heterogeneity to be correlated with the regressors is not computationally feasible due to the incidental parameter problem. To some extent a possible workaround to this problem is to use conditional maximum likelihood estimation (CML) proposed by Chamberlain (1980). However, a considerable weakness of the CML estimation is reflected in the notion that this estimation greatly reduces the sample size because the dependent

[2]The presence of unobserved ability might correlate with the performance paying scheme but also the unobserved ability can be correlated with greater job satisfaction. Our estimation strategy accounts for the unobserved ability in estimating the effect of performance paying jobs on job satisfaction by assuming that the performance paying scheme is correlated with any level of unobserved ability. This is in contrast with assuming that only workers with higher ability levels are obtaining the performance pay premium.

variable has to be collapsed into a binary variable and only those individuals whose dependent variable exceeds the threshold level will be accounted in the estimation. Another weakness of the CML estimation is that there is no meaningful procedure to calculate the marginal effects due to lack of information on the distribution of the unobserved factors. Ferrer-i-Carbonell and Frijters (2004) proposed a method that collapses the categorical ordered dependent variable into a binary variable without losing a substantial amount of observations. However, the later method suffers from the computational difficulties and the fact that the threshold value is arbitrary defined which can lead to a bias in estimation[3].

An alternative strategy for modelling the non-linear categorical ordered dependent variable model with the fixed effects (FE) is found by Baetschmann et al. (2011). The following approach uses all information contained in the ordinal dependent variable by "blowing up" the data to estimate all possible combinations of the ordered dependent variable. The authors also correct the standard errors for clustering and therefore they call their estimation procedure "Blow-Up and Custer" (BUC). Using the advantages that this estimation procedure offers for estimating the ordered non-linear dependent variable model with fixed effects, we have decided to use the BUC estimator in our work.

The reminder of this chapter is organized as follows. Section 3.2 provides an outline of the econometric model for estimating the job satisfaction in the presence of non-random unobserved heterogeneity. Section 3.3 illustrates the data and presents the distribution of the job satisfaction for the performance and non-performance paying jobs and the distribution of the job satisfaction for both men and women. In section 3.4 we illustrate our empirical strategy for estimating the job satisfaction model. In section 3.5 we present the results. Section 3.6 concludes.

[3]In order to escape this estimation problems, some researches did not tackle the problem of unobserved heterogeneity but instead they used the pooled ordered maximum likelihood estimation, generalized ordered probit models or random effects ordered models.

3.2 The Econometric Model

An important advantage from using a panel data is the possibility to purge out for the time invariant unobserved individual effects which may cause the problem of endogeneity. Nevertheless, researches are faced some serious constraints in estimating a non-linear ordered dependent variable model with fixed effects. An ordered categorical dependent variable models are applied in many econometrics settings like the estimation of the subjective job satisfaction, health, etc. A popular technique for modelling ordered dependent variable is to use the ordered probit or logit models which are estimated by the maximum likelihood estimation (MLE). The standard approach in estimating the ordered dependent panel data model is to collapse an ordered dependent variable into a binary variable and then the model is estimated by using MLE.

Winkelmann and Winkelmann (1998) and Kassenböhmer and Haisken-DeNew (2009) collapse the ordinal dependent variable into a binary variable and run the conditional maximum likelihood (CML) estimator suggested by Chamberlain (1980). While this approach has an advantage of exploring more information that is available, on the other hand this approach has a serious weakness which is reflected in the notion that a threshold value for recoding the ordered dependent variable is chosen arbitrarily. The conditional logit fixed effects panel data estimator is conditioning on the sum of the outcomes over time. The role of this estimator is to dismiss the unobserved heterogeneity that confounds the effects of independent variables. Nevertheless, in the literature there are other approaches for estimating fixed effects logit models, which have the advantage of using more information in the process of estimation (see Das and van Soest (1999) and Ferrer-i-Carbonell and Frijters (2004)).

In the following section we provide an overview of one particular estimation procedure for the fixed effects ordered logit model that has been suggested by Baetschmann et al. (2011). The reason why we have decided to use the estimator proposed by Baetschmann et al. (2011) lies in the fact that the following estimator outperforms other estimators that are currently available (see Riedl and Geishecker (2014)). The general framework for estimating a latent variable model with ordered dependent variable and unobservable characteristics can be formulated as

$$y_{it}^{*} = x_{it}'\beta + \alpha_i + \varepsilon_{it} \tag{3.1}$$

where y_{it}^* is a latent dependent variable of individual i $(i = 1, ..., N)$ in period t $(t = 1, ..., T)$, x_{it} is a vector of independent explanatory variables (i.e. observable characteristics related to job satisfaction), α_i represents a time invariant unobserved component (i.e. cognitive ability) that is assumed to be correlated with the vector of the observed explanatory variables and ε_{it} is the error term that follows logistic distribution. Since we do not observe the latent variable y_{it}^*, we relate it to the observed ordered categorical variable, y_{it}, it the following way

$$y_{it} = k \Leftrightarrow \theta_k < y_{it}^* \leqslant \theta_{k+1}, \quad k = 1, ..., K \tag{3.2}$$

where the threshold parameter θ is assumed to be strictly increasing in k, $\theta_k < \theta_{k+1}$ $\forall k$. Note that the threshold parameters can be represented as individual-specific as well, θ_{ik}, $\forall k$. Assuming that the error term, ε_{it}, is independent and identically distributed standard logistic, we can express the conditional distribution function $F(\cdot)$ of ε_{it} as

$$F(\varepsilon_{it}|x_{it}, \alpha_i) = \exp(\varepsilon_{it})/(\exp(\varepsilon_{it}) + 1) = \Lambda(\varepsilon_{it}) \tag{3.3}$$

The probability of observing outcome k for individual i at time t is given by

$$\Pr(y_{it} = k|x_{it}, \alpha_i) = \Lambda(\theta_{k+1} - x_{it}'\beta - \alpha_i) - \Lambda(\theta_k - x_{it}'\beta - \alpha_i) \tag{3.4}$$

where $\Lambda(\cdot)$ represents the link function (the logistic cdf). Baetschmann et al. (2011) point out that there are two basic problems with estimating the equation 3.4 with the MLE. First, we cannot identify α_i and θ_{ik} but only the difference between the parameters, $\alpha_{ik} = \theta_{ik} - \alpha_i$. The second weakness is attributed to the incidental parameter problem, which means that under fixed-T asymptotics, the parameter θ_{ik} cannot be consistently estimated and moreover the estimates of β will be biased as well. In the literature there are several alternative strategies in order to overcome these two problems but in general, these strategies boil down to the same approach of collapsing ordered dependent variable y_{it} into a binary variable and then proceed in the estimation with a CML estimation suggested by Chamberlain (1980). Following the approach by Baetschmann et al. (2011) we define the binary variable d_{it}^k that is transformed

from the ordered variable using the threshold level at k as

$$d_{it}^{k} = \begin{cases} 1 & \text{if } y_{it} > k \\ 0 & \text{if } y_{it} \leq k \end{cases} \tag{3.5}$$

The conditional logit statistic for α_i is then defined as the joint probability of observing a sequence of outcomes $d_i^k = (d_{i1}^k, ..., d_{iT}^k)$, conditional on the number of times the dependent variable per group exceeds the threshold k, c_i is

$$\mathcal{P}_i^k(\beta) \equiv \Pr\left(d_i^k \,\middle|\, \sum_{t=1}^{T} d_{it}^k = c_i\right) = \frac{\exp(\sum_{t=1}^{T} d_i^k x_{it}'\beta)}{\sum_{j_i \in B_i} \exp(\sum_{t=1}^{T} j_{it} x_{it}'\beta)} \tag{3.6}$$

where $j_i = (j_{i1}, ..., j_{iT})$ with $j_{it} \in \{0, 1\}$ and B_i denotes a set of all possible combinations of $y_{i1}, ..., y_{iT}$ that sum up to $c_i = \sum_{t=1}^{T} j_{it}$[4]. Chamberlain (1980) illustrates that maximizing the conditional log-likelihood gives a consistent estimate of β which can be represented as follows

$$\log \mathcal{L}^k(b) = \sum_{i=1}^{N} \log \mathcal{P}_i^k(b) \tag{3.7}$$

The underling weakness of the following estimation technique is that it discards all observations in y_{it} that are above or below the threshold level k. In other words, although it is possible to use any value for the threshold $k = (2, ..., K)$, the estimation will crucially depend on the fact that those individuals with unchanged d_{it}^k will not be taken into account when maximizing the conditional log-likelihood. An alternative estimator called "Blow-up and Cluster" (BUC) suggested by Baetschmann et al. (2011) avoids the following problem of discarding the observations. The BUC estimator transforms the dependent variable with k categories into $k-1$ dichotomizations and then it estimates the model using $k-1$ thresholds simultaneously. The procedure involves duplicating the original data $k-1$ times so that every time different threshold level is used to breakdown the dependent variable. In the next step the model is estimated on the newly created sample using a conditional logit estimator while the standard errors are adjusted for clustering since some individuals could be accounted several times in the log-likelihood function.

[4]The set B_i can be more formally represented as: $B_i = \{j_i \in \{0, 1\} \mid \sum_{t=1}^{T} j_{it} = c_i\}$

3.3 Data

The analysis is based on the Korean Labour and Income Panel Study (KLIPS). KLIPS is the longitudinal dataset conducted annually on a sample of 5,000 urban households. We have worked with the data that spans from 2003 till 2010, which are the only available years. The dataset includes a wide array of categories such as the information on the economic activity, incomes, earnings and consumption, education and vocational training, employment, working hours, life satisfaction, job-seeking activities, and labour market mobility. We constrain our analysis on employees who work at least 20 hours per week. We limit our analysis to individuals who are aged between 15 and 65 years in order to avoid any considerations that individuals have about their retirement.

The job satisfaction variable represents a categorical measure of job satisfaction measured on a five point Likert Scale. The original question on the job satisfaction asked in the questionnaire was *Overall, how satisfied or dissatisfied are you with your main job?* A scale of possible answers consists of 1 for "very dissatisfied", 2 for "dissatisfied", 3 for "neither satisfied nor dissatisfied", 4 for "satisfied" and 5 for "very satisfied". Identification of workers in the performance pay jobs comes from the following question *What kind of performance-based pay scheme does your employer apply to you?* The individuals could choose *i*) the individual level (wage is decided based on an individual's output), *ii*) the group level (wage is decided based on a team or division's output), *iii*) the company level (wage is decided based on the company's overall performance and *iv*) no performance based pay. A real hourly net wage rate is constructed using the reported weekly earnings and working hours[5].

The risk variable is constructed from the question on the willingness to participate in the lotteries. The original question on the risk attitude was formulated as follows *Suppose, for a minute, that you took over shop-keeping for a friend who had to go away for one day. As a token of thanks, she is offering you either 100,000 Won in cash or an instant lottery ticket. In this situation, how would you react to the following types of offers?* Given the winnings and probabilities of the instant lottery the individuals are offered the following choices: 1) 100,000 Won won in cash, 2) a lottery that gives 200,000 Won with the probability 0.6 and 0 Won with the probability of 0.4 and 3) whichever is fine. Based on the answers on the following question

[5]In order to construct the real wage variable a Consumer Price Index (CPI) has been applied with 2010 chosen as a base year.

we have approximated the risk attitude of individuals. This variable takes the value 0 if an individual is risk averse, 1 if an individual is risk neutral and 2 if an individual is risk lower.

In figure 3.1 we illustrate the distributions of job satisfaction over performance pay jobs (left-hand side panel) and the distribution of job satisfaction for both men and women (right-hand side panel). The vertical bars represent the estimated proportions of each job satisfaction category while capped spike lines represent 95 percent confidence intervals. The highest proportion of workers in the performance pay jobs is neither satisfied nor dissatisfied with their job (41.7 percent) while the highest proportion of workers in the non-performance pay jobs is satisfied with their jobs (59.1 percent). The gender difference in the job satisfaction is almost negligible across the distribution. The highest proportion of both men and women are found to be neither satisfied nor dissatisfied with their jobs.

The distribution of job satisfaction for both men and women in the performance pay jobs is illustrated on the left hand side panel of figure 3.2. The distribution for both men and women is skewed to the left. The highest proportion of both men and women in the performance pay jobs are satisfied with their jobs. The right hand side of figure 3.2 displays the distribution of job satisfaction form men and women in the non-performance pay jobs. The highest proportion of both men and women in the non-performance pay jobs are neither satisfied nor dissatisfied with their jobs. Figure 3.3 displays the distributions of the performance pay schemes (individual, group and company schemes) and non-performance pay scheme for men (left hand side panel) and women (right hand side panel). We have found that across different performance paying schemes, the highest proportion of satisfied men and women are found in the group scheme with 56.6 percent and 59.3 percent, respectively.

3.4 Estimating the Job Satisfaction Regression

In this section we illustrate our empirical strategy for estimating the job satisfaction model. We first consider the empirical strategy for estimating the effects of performance paying jobs on job satisfaction. The second empirical strategy is designed for estimating the effects of individual, group and company performance paying schemes on the job satisfaction. We have specified three different models for each empirical strategy. The first empirical strategy that estimates the effect of performance paying jobs on the job satisfaction is specified as follows

$$S_{it} = \alpha_0 + \alpha_1 P_{it} + \alpha_2 lnW_{it} + \alpha_3 R_{it} + \alpha_4' Z_{it} + \alpha_5' C_{it} + \alpha_6' D_{it} + \alpha_7' T_t + \alpha_8' G_i + \varepsilon_{it} \tag{3.8}$$

where S_{it} is the overall job satisfaction, P_{it} is a dummy variable that equals one if a worker belongs to performance pay job and zero otherwise, lnW_{it} denotes the natural logarithm of the real hourly wage, R_{it} denotes the risk attitude, Z_{it} is a vector of socio-demographic variables which includes age squared over 1000, marital status and number of kids, C_{it} is a vector of job characteristics which includes a dummy variable if an individual works in the medium company, a dummy variable if an individual works in a large company, a dummy variable if an individual works in shifts, dummy variable if an individual has fixed working hours and a set of dummy variables for occupation and industry, D_{it} is a vector of other controls which includes a dummy variable if an individual has finished elementary school, college, university, master studies or doctoral studies, a dummy variable for the years of experience and a dummy variable for the years of tenure an individual has, T_t is a vector of time dummies, G_i is a vector of regional dummies, ε_{it} is the error term, and α's are parameters to be estimated.

Our second empirical strategy that estimates the effects of different performance paying schemes on the job satisfaction is specified as follows

$$S_{it} = \beta_0 + \beta_1' X_{it} + \beta_2 lnW_{it} + \beta_3 R_{it} + \beta_4' Z_{it} + \beta_5' C_{it} + \beta_6' D_{it} + \beta_7' T_t + \beta_8' G_i + \varepsilon_{it} \tag{3.9}$$

where $X_{it} = [X_{it}^i, X_{it}^g, X_{it}^c]$ is a vector of dummy variables for individual performance pay scheme (X_{it}^i), group performance pay scheme (X_{it}^g) and company performance pay scheme (X_{it}^c) , β's are parameters of interested to be estimated while the remaining variables are the same as in the equation 3.8. In case of both strategies, the point estimates and standard errors are transformed from the log odds ratio to odds ratio in order to easy the interpretation of the results.

3.5 Results

3.5.1 The Effect of Performance Pay Scheme on Job Satisfaction

The first set of results illustrate the difference in job satisfaction between workers in the performance and non-performance pay jobs. Table 3.1 reports the estimation results from a pooled sample of men and women. First, we concentrate on the results of model I where we estimate the odds ratio of the performance pay jobs on job satisfaction but without controlling for the log wage and risk. Beside the regressors presented in model I we also control for a vector of socio-demographic variables, vector of job characteristics, vector of other controls which consists of education, experience and tenure, vector of time dummies and vector of regional dummies. The results confirm that the job satisfaction is significantly higher for workers in the performance pay jobs than for the workers who are paid by the fixed amount (i.e. non-performance paying jobs). For instance, if a worker switches from the fixed paid job to the performance pay job his odds ratio of being in very high job satisfaction relative to all other remaining lower categories of job satisfaction combined together is increased by 1.23. In other words the odds of being very satisfied with the job relative to all other lower categories are higher for workers in the performance paying jobs by 23 percent.

An interesting evidence is coming from the effects on the demographic variables. If an unmarried worker becomes married, then his odds ratios of being in the highest job satisfaction category will decrease. The evidence that marriage increases the likelihood of being more satisfied with life in general is found with a cross-section data (see Blanchflower and Oswald (2004)) and in the panel data that used fixed effects (Winkelmann and Winkelmann (1998)). One reason for finding the positive effect of marriage on job satisfaction comes from the fact that married individuals suffer less from a mental illness (see Cochrane (1996)). Notice that the odds ratio greater than one relates to workers in the medium and large companies, which implies that the odds of being very satisfied with job is increasing for those workers. An increase in the subjective health status[6] by one category increases the odds ratio of being very satisfied with the job relative to other job satisfaction categories taken together. For instance, if the health of individuals improve from good to excellent, then the odds ratio of being very satisfied with the job increases by 1.53. We can notice that the magnitude of this effect is

[6]The subjective health status variable takes on value 1 for poor health, 2 for fair health, 3 for good health and 4 for excellent health.

quite strong. Working in the fixed hours regime increases the odds ratio of being in the highest job satisfaction category. It should not be unreasonable to expect this since an unanticipated working hours could lead to a lower level of job satisfaction.

We turn to the model II where in addition to the previously introduced variables we control for the log hourly real wage. In other words, in model II we test whether the job satisfaction of workers in the performance pay jobs would be higher than the job satisfaction of workers in the fixed paid jobs, once we control for the earnings. It should be emphasised that our previous findings about a significantly positive effect of performance pay jobs on the job satisfaction may be confounded with the notion that we have not controlled for the wage compensation that the workers in performance pay jobs receive for undertaking higher risks. According to the standard microeconomic theory, once we control for the level of earnings, the positive effect of performance pay jobs on workers' utility should disappear (see Gazioglu and Tansel (2006)).

We have found that a unit increase in the log wage increases the log odds ratio of being very satisfied with the job relative to other lower job satisfaction categories by 1.13[7]. The odds of being very satisfied with the job relative to combined set of other lower categories are higher for workers in performance pay jobs by 15 percent. This effect is by 8 percentage points lower than in model I where we did not control for wage. The following evidence goes clearly in contrast with the standard principal-agent model which predicts that the job satisfaction should be lower for workers in the performance paying jobs once we control for their earnings due to the fact that these workers face a greater risk. The results we have found are also in line with the evidence found by Clark (1997a) and Blanchflower and Oswald (2004) who argued that various job characteristics have a significant effect on the job satisfaction. Working in the medium and large companies increases the odds of being very satisfied with job. An increase in the health status by one category increases the odds ratio of being very satisfied with the job. Working in shifts and working in the fixed hours regimes increase the odds ratio of being in the highest job satisfaction category by 1.18 and 1.23, respectively.

In model III we have add the variable risk in order to test whether the job satisfaction would be lower among workers in the performance pay jobs after we control for the risk attitude. Although, we have found that workers who are ready to accept higher risks tend to report a higher odds ratio of being more satisfied with the job, still the odds ratio on risk attitude is not

[7]This effect is calculated as follows $\ln(\exp(\hat{\alpha_2})) = \ln(3.107)$.

significant. We can also notice that once we have controlled for the risk attitude of individuals, the odds ratios for all other variables remain almost unchanged relative to the specification in model II. Thus, even after controlling for the log wage and risk attitudes the odds of being very satisfied with the job are higher for workers in the performance pay jobs.

3.5.1.1 Sub-samples of Men and Women

Since the effects of performance pay jobs on job satisfaction could possibly differ between gender, we have estimated the job satisfaction regression separately for men and women. These results are presented in table 3.2 and table 3.3 for men and women, respectively. For easier comparison of the results across gender we have plotted the odds ratios and confidence intervals for model I (figure 3.4), model II (figure 3.5) and model III (figure 3.6).

Let us first take a look at the model I which illustrates the odds ratios of the performance pay jobs on job satisfaction after controlling for a vector of socio-demographic and job related characteristics, time and regional dummies. We have found that for both men and women the odds ratio of being very satisfied with the job relative to all lower categories taken together is higher among workers in the performance pay jobs. The odds of being very satisfied with job are higher by 22 percent for men in the performance pay jobs and by 28 percent for women in performance pay jobs. This evidence indicates that the effect of performance pay jobs on job satisfaction is stronger for women than for men.

It is important to note that it is not possible to evaluate the effect of gender on job satisfaction by including an indicator variable for gender in the job satisfaction regression since we cannot separately identify the effects on time-invariant variables. Yet, we can compare the estimates from the job satisfaction regression across gender. Clark (1997a) has found that the job satisfaction greatly differ across gender since men and women are having quite different expectations form the job. Women are having lower expectation from their jobs than men do and therefore the job satisfaction for women will be higher. Crosby (1982) and Ross and Reskin (1992) argue that individuals construct their expectations in the early phase of life during nurturing and education, so one way of testing whether the gender difference in expectations have an effect on job satisfaction would be to estimate the effects of age and education on the job satisfaction across gender and then to see whether these effects differ between gender. Unfortunately, the later approach is not feasible in our setting since it is not possible to identify

the linear effect of age and time trend independently and therefore we are not keeping the former variable in our model (see Ferrer-i-Carbonell and Frijters (2004)).

We have found no significant effect of being married or having an additional child in the household on job satisfaction for both men and women. We can notice that the odds ratio greater than one applies only for male workers in a medium and large companies while the odds ratio for women is not significant. For instance, males employed in a medium (large) companies, compared with males employed in small companies are 15 (22) percent more likely to be in the highest job satisfaction category. The odds ratio on subjective health status is greater than one for both men and women, which implies that an increase in the subjective health by one category will increase the odds of being in the highest category of job satisfaction by more than one. The odds ratios on health variable is almost the same between men and women which means that both men and women evaluate the health with the same importance. Working fixed hours contribute to the odds of being very satisfied with the job, although this effect is only significant for men. In other words, an unanticipated working hours will not affect the level of satisfaction for women but it brings men more dissatisfied.

We are now turning to the model II where in addition to all variables in the previous model we control for the log hourly wage. Again we test the prediction from the classical principal-agent model that workers in the performance pay jobs should be on the lower level of indifference curve once we control for the level of earnings. We can see that after we have controlled for the log wage, the odds ratio on the performance pay jobs remained higher than one for both men and women which implies that workers in the performance pay jobs have a greater odds ratios of being on the higher level of job satisfaction than the workers in the non-performance pay jobs. The following evidence clearly contrasts the predictions from the standard principal- agent model. The odds of being very satisfied with the job are higher for male (female) workers in performance pay jobs by 13 (20) percent which leads to a 7 percentage points gender difference in favour of women.

Comparing the odds ratios for the performance pay jobs between models I and II, we can notice that the odds ratios for being the most satisfied with the job have decreased after we have controlled for wage by 9 and 8 percentage points for men and women, respectively. However, even after we have controlled for wage, for both men and women there is a positive and significant difference in the level of satisfaction between workers in performance pay jobs

and workers paid by fixed amount. For a one unit increase in the log hourly wage, the log odds of being very satisfied with the job increase by 1.16 for men and by 1.10 for women[8]. Both men and women that work in the medium or large companies are having a higher odds ratio of being very satisfied with job than men and women employed in small companies (although the effect is not significant for women). Working in shifts has the positive effect on job satisfaction for men but not for women. A higher self reported health status increases job satisfaction for both men and women while working in shifts contributes to higher job satisfaction only for men.

In model III we have introduced a variable that measures the attitude towards risk in order to test whether the differences in preferences for undertaking risks have an effect on job satisfaction for men and women (see figure 3.6). We have fount that the odds ratios on the risk attitude are almost equal to one for both men and women which implies that the risk attitude does not increase the likelihood of becoming very satisfied with the job and moreover these effects are not significant for both men and women.

3.5.2 The Effects of Individual, Group and Company Performance Pay Schemes on Job Satisfaction

In order to analyse whether a different performance pay schemes have different effects on job satisfaction, we have used the information on the particular type of performance paying scheme that applies to a worker. We could determine for each worker who has been using the performance pay scheme, whether she or he is using an individual, group or company performance pay scheme at their job. In the individual scheme wage is decided according to individual's output, in group scheme wage is decided according to team or division's output and in company scheme wage is decided according to the company's overall performance.

The results are illustrated in table 3.4. We first illustrate the results for model I. We observe that an odds ratio greater than one applies to every type of performance paying scheme which indicates that workers employed in such schemes are having a higher odds of being in the highest job satisfaction category compared to the workers who are paid by the fixed amount. Workers in the individual performance pay jobs are having the highest likelihood to be very satisfied with their jobs in contrast to workers in fixed paid jobs. For instance, if a worker switches from a non-performance pay job to the individual performance pay jobs, group performance

[8] Alternatively, the effect of wage on job satisfaction can be interpreted as a one percent increase in wage (or 0.001 increase in log wage) increases the log odds by 0.0116 for men and by 0.0111 for women.

pay jobs or company performance pay jobs, then her odds of being very satisfied with the job is by 25, 24 or 19 percent higher, respectively. The latter effects indicate that the cooperation reduces the odds ratios relative to those workers who are using the individual performance paying schemes. In fact, this evidence goes in line with the findings of Drago and Garvey (1998) who argue that the performance paying schemes increase the competition among co-workers which directly leads to a lower job satisfaction for these workers.

In model II we control for the log wage so that the effect of the performance paying scheme on job satisfaction is independent of earnings. Again, it is important to note that the effects of performance paying schemes on job satisfaction that we have found in model I could be confounded since workers in the performance paying jobs could receive a wage premium for undertaking a higher risks and thus we expect the job satisfaction of these workers to increase. We can see that after controlling for wages, all performance paying schemes have the odds ratios that are higher than one, with a slight drop in the odds ratios for performance paying jobs relative to the odds ratios in model I. The odds ratio of being very satisfied with the job is by 19 (16) percent higher for workers in the individual (group) performance paying jobs than for workers in non-performance paying jobs. Again, this evidence goes clearly in contrast with the assumption of the standard principal-agent model which says that on-the-job utility or job satisfaction is lower for workers in the performance paying jobs once we control for their earnings since these workers will be exposed to a greater risk.

Comparing the results between models I and II, we can see that the odds ratios on all types of performance paying jobs decreased for the later model. The odds ratio for the individual performance pay jobs decreased by 6 percentage points while for the group performance it has decreased by 8 percentage points. These reductions in odds ratios approximate the wage premium that workers in individual and group performance pay jobs receive. It is important to note that the wage premiums that the firms are paying to workers in the performance pay jobs are lower than the optimal wage premiums predicted by the microeconomic theory since workers employed in the performance pay job still enjoy a higher level of job satisfaction than workers in non-performance paid jobs. According to the microeconomic theory, the wage premium would need to be set at the point where the job satisfaction between workers in performance and non-performance pay jobs equates. Interestingly, after we have controlled for the log wage the effect of the company performance pay scheme on job satisfaction disappeared. One reason

that can explain the following evidence comes from the fact that the determination of wage for the company performance pay scheme depends on the level of performance exerted from all employees together and thus the wage premium paid for the company performance job scheme may not be high enough to compensate workers for their higher risks.

Although we have found a positive effect of wage on job satisfaction, nevertheless the magnitude of the odds ratio does not indicate that money buys job satisfaction as it was found for the overall life satisfaction by Blanchflower and Oswald (2004). We have found that a one unit increase in the log hourly wage increases the log odds ratio of being very satisfied with the job by 1.14[9] or alternatively a one percent increase in wage[10] increases the log odds by 0.0114. Working in a medium or large company increases the odds of being very satisfied with the job relative to those working in a small companies. We can notice that if the subjective health increases by one category then the odds of being very satisfied with the job increases by 1.53 (or 53 percent). The results show that working in shifts or having a fixed working hour contract significantly increases the odds of being very satisfied with the job.

3.5.2.1 Sub-samples of Men and Women

Since are we are interested to see how different performance paying schemes effect job satisfaction between gender, we have estimated the job satisfaction regression separately for men and women. Let us first discuss the results obtained in model I (see table 3.5 for men and table 3.6 for women). In case of men, the job satisfaction is higher for all types of the performance paying jobs, while women are more satisfied only in the individual performance paying jobs. This evidence goes in line with the findings that women feel a higher peer pressure when operating in the groups (i.e. group and company performance pay schemes) and as a consequence they acquire a lower level of job satisfaction while working in such environments (see Heywood et al. (2005)).

If a male worker switches from a non-performance pay jobs into the individual performance pay jobs, group performance pay jobs or company performance pay jobs then her odds of being very satisfied with the job are higher by 21, 23 or 21 percent, respectively. Women in the individual performance paying job have a 35 percent higher odds ratio of being very satisfied with the job relative to the same women being employed in a fixed pay job. This indicates that for workers in the individual performance pay jobs, the odds of being in the highest job

[9] This effect is calculated as follows $\ln(\exp(\hat{\beta}_2)) = \ln(3.115)$.
[10] Which is equivalent to an increase in log wage of 0.01.

satisfaction category is by 14 percentage points higher for women than for men. There are no significant effects of being married or having an additional child on the job satisfaction either for men or women. Both men and women are more satisfied in the medium and large companies than in the small companies, although the odds ratio is not significant for women (see figure 3.7).

Let us now illustrate the results obtained from the model II where in addition to the variables in the previous model, we have controlled for the level of earnings. The odds ratios on all types of performance paying schemes are greater than one for both men and women which implies that all performance paying schemes increase the job satisfaction more than the non-performance paying schemes, although the only significant effect applies to women in the individual performance paying jobs. Wage has a positive and significant effect on job satisfaction for both men and women. A one unit increase in the log hourly wage increases the log odds of being very satisfied with the job by 1.16 for men and by 1.11 for women[11]. Whether someone find it surprising or not, both men and women care the most about their health. An improvement in health by one category will increase the odds ratio of being very satisfied with the job by 53 (55) percent for men (women). Based on these findings we can conclude that it is not money that buys job satisfaction but health.

[11]The effect for men is calculated as $\ln(\exp(\hat{\beta_2^m})) = \ln(3.193)$ while the effect for women is calculated as $\ln(\exp(\hat{\beta_2^w})) = \ln(3.020)$.

3.6 Conclusion

In this chapter we have estimated the effects of the performance pay job schemes on job satisfaction. According to the microeconomic theory, the performance pay job schemes take into account the additional productivity, effort and risk that workers would exert in such schemes and as a way of compensation, the employers allow these workers to make the best effective use of such schemes. On the other hand, this possibility would not be allowed to workers which are not in the performance pay job schemes but instead they are paid by the the fixed amount (i.e. an hourly salary). Thus, we would expect that workers in the performance pay job schemes have a higher job satisfaction than workers in the non-performance pay job schemes, even after we control for the level of earnings.

Since we have confirmed the later prediction in our analysis, this evidence goes clearly in contrast with the standard principal-agent model which implies that once we control for the level of earnings, the well-being on the job should be lower for the workers who are employed under the non-performance pay schemes since the workers in the performance pay jobs need to be compensated for being exposed to the higher risk. Nevertheless, it turns out that the prediction from the standard principal-agent model is not well grounded.

An important and challenging issue in estimating the effects of performance pay job schemes on job satisfaction concerns the choice of the econometric model. Due to the fact that unobserved factors could have an important role in affecting the choice of payment schemes, we cannot rely on the orthogonality of independent variables. For that matter, we have applied a conditional fixed effects ordered logit model which allowed us to purge out the time-invariant heterogeneity from the regressors.

The results have shown that whether we condition for the level of earnings or not, workers in performance pay jobs have a higher job satisfaction. Nevertheless, once we have controlled for the level of earnings, the odds ratio on performance pay jobs was slightly reduced in size but still the effect was significant and large in magnitude. In addition, even after we have controlled for the attitude toward risk, the effect of performance pay job schemes on job satisfaction remained positive and statistically significant.

Estimating the job satisfaction for men and women separately, we have confirmed that both men and women, conditionally or unconditionally on their earnings, are more satisfied on

the job if they are working in the performance pay jobs. Despite of the evidence that women are holding less attractive jobs and that they are paid less than men, our results indicate that women in the performance paying jobs are more satisfied on their jobs. When it comes down to the effect of wage on job satisfaction, we have found that the effect is not apparent as someone might expect. We observe that among all explanatory variables, health has the strongest effect on the job satisfaction. The later evidence goes in line with the results of Easterlin (1974) and other studies who have found that focusing on income as the only source of individual utility is wrong since other non-monetary variables do matter.

Finally, we have exploited the information on the individual, group and company performance pay job schemes in order to test whether these schemes have different effects on job satisfaction. We have found that workers who are employed in each type of performance pay job schemes are more satisfied on their jobs than workers who are paid by the fixed amount. Among those workers who are paid by performance, we have found that the strongest effect on job satisfaction has the individual performance pay job scheme while the smallest effect has the company performance pay job scheme.

Table 3.1: Job Satisfaction Regression: Performance Pay Jobs, Entire Sample

	Model I		Model II		Model III	
	e^{β}	s.e	e^{β}	s.e.	e^{β}	s.e.
Performance Pay Jobs	1.233***	(0.067)	1.149**	(0.063)	1.148**	(0.063)
Log Hourly Real Wage			3.107***	(0.214)	3.093***	(0.215)
Risk					1.027	(0.042)
Age squared/1000	1.553	(0.837)	5.102***	(2.811)	4.751***	(2.649)
Married	0.916	(0.083)	0.933	(0.084)	0.938	(0.086)
Number of kids	0.981	(0.057)	0.984	(0.058)	0.980	(0.058)
Medium Company	1.141**	(0.071)	1.131**	(0.071)	1.145**	(0.072)
Large Company	1.192***	(0.076)	1.124*	(0.071)	1.153**	(0.074)
Working in shifts	1.096	(0.093)	1.181**	(0.100)	1.177*	(0.101)
Health	1.531***	(0.045)	1.525***	(0.045)	1.526***	(0.046)
Fixed hours	1.263***	(0.075)	1.229***	(0.074)	1.223***	(0.074)
Time Dummies	Yes		Yes		Yes	
Regional Dummies	Yes		Yes		Yes	
Occupation	Yes		Yes		Yes	
Industry	Yes		Yes		Yes	
Other Controls	Yes		Yes		Yes	
Pseudo-R^2	0.0509		0.0697		0.0693	
Log-likelihood	-9562.5		-9461.6		-9312.4	
Observations	26817		26817		26366	

Notes: In all columns the omitted (base) variables are: dummy for upper secondary school, experience 15-20, tenure 15-20, legislators (occupation), business activity (industry), Seoul, small company and year 2003. Other controls consist of dummy variables for the acquired level of education, dummies for the experience level in five years brackets and dummies for the level of tenure in five years brackets. Robust standard errors in parentheses with clustering at individual level. *, ** and *** indicate statistical significance at the 10% level, 5% level, and 1% level, respectively.

Table 3.2: Performance Pay Jobs, Men

	Model I		Model II		Model III	
	e^{β}	s.e	e^{β}	s.e.	e^{β}	s.e.
Performance Pay Jobs	1.216***	(0.079)	1.132*	(0.074)	1.128*	(0.075)
Log Hourly Real Wage			3.189***	(0.265)	3.181***	(0.266)
Risk					1.007	(0.046)
Age squared/1000	1.816	(1.266)	8.044***	(5.777)	7.344***	(5.330)
Married	0.871	(0.102)	0.863	(0.100)	0.878	(0.103)
Number of kids	0.973	(0.074)	0.966	(0.074)	0.961	(0.074)
Medium Company	1.148*	(0.087)	1.145*	(0.087)	1.153*	(0.089)
Large Company	1.217**	(0.095)	1.142*	(0.090)	1.171**	(0.093)
Working in shifts	1.055	(0.102)	1.198*	(0.117)	1.201*	(0.119)
Health	1.532***	(0.056)	1.525***	(0.056)	1.521***	(0.057)
Fixed hours	1.353***	(0.096)	1.322***	(0.095)	1.310***	(0.095)
Time Dummies	Yes		Yes		Yes	
Regional Dummies	Yes		Yes		Yes	
Occupation	Yes		Yes		Yes	
Industry	Yes		Yes		Yes	
Other Controls	Yes		Yes		Yes	
Pseudo-R^2	0.0568		0.0769		0.0761	
Log-likelihood	-6353.1		-6217.3		-6113.8	
Observations	17648		17648		17326	

Notes: In all columns the omitted (base) variables are: dummy for upper secondary school, experience 15-20, tenure 15-20, legislators (occupation), business activity (industry), Seoul, small company and year 2003. Other controls consist of dummy variables for the acquired level of education, dummies for the experience level in five years brackets and dummies for the level of tenure in five years brackets. Robust standard errors in parentheses with clustering at individual level. *, ** and *** indicate statistical significance at the 10% level, 5% level, and 1% level, respectively.

Table 3.3: Performance Pay Jobs, Women

	Model I		Model II		Model III	
	e^{β}	s.e	e^{β}	s.e.	e^{β}	s.e.
Performance Pay Jobs	1.280**	(0.128)	1.200*	(0.121)	1.205*	(0.123)
Log Hourly Real Wage			3.012***	(0.383)	3.000***	(0.384)
Risk					1.107	(0.098)
Age squared/1000	1.129	(0.982)	2.595	(2.294)	2.502	(2.239)
Married	0.993	(0.145)	1.057	(0.155)	1.045	(0.154)
Number of kids	0.995	(0.092)	1.011	(0.095)	1.010	(0.096)
Medium Company	1.164	(0.129)	1.132	(0.126)	1.156	(0.129)
Large Company	1.176	(0.129)	1.119	(0.121)	1.149	(0.126)
Working in shifts	1.212	(0.208)	1.148	(0.195)	1.131	(0.195)
Health	1.554***	(0.078)	1.550***	(0.079)	1.562***	(0.080)
Fixed hours	1.080	(0.118)	1.042	(0.116)	1.044	(0.117)
Time Dummies	Yes		Yes		Yes	
Regional Dummies	Yes		Yes		Yes	
Occupation	Yes		Yes		Yes	
Industry	Yes		Yes		Yes	
Other Controls	Yes		Yes		Yes	
Pseudo-R^2	0.0501		0.0658		0.0671	
Log-likelihood	-3261.2		-3207.5		-3159.5	
Observations	9164		9164		9035	

Notes: In all columns the omitted (base) variables are: dummy for upper secondary school, experience 15-20, tenure 15-20, legislators (occupation), business activity (industry), Seoul, small company and year 2003. Other controls consist of dummy variables for the acquired level of education, dummies for the experience level in five years brackets and dummies for the level of tenure in five years brackets. Robust standard errors in parentheses with clustering at individual level. *, ** and *** indicate statistical significance at the 10% level, 5% level, and 1% level, respectively.

Table 3.4: Individual, Group and Company Performance Pay Jobs, Entire Sample

	Model I		Model II		Model III	
	e^{β}	s.e	e^{β}	s.e.	e^{β}	s.e.
Individual Performance Pay Jobs	1.251***	(0.087)	1.185**	(0.084)	1.184**	(0.085)
Group Performance Pay Jobs	1.240**	(0.108)	1.160*	(0.103)	1.149	(0.103)
Company Performance Pay Jobs	1.190**	(0.103)	1.066	(0.092)	1.079	(0.094)
Log Hourly Real Wage			3.115***	(0.215)	3.099***	(0.216)
Risk					1.027	(0.042)
Age squared/1000	1.557	(0.839)	5.142***	(2.834)	4.788***	(2.669)
Married	0.917	(0.084)	0.934	(0.084)	0.939	(0.086)
Number of kids	0.981	(0.057)	0.984	(0.058)	0.980	(0.058)
Medium Company	1.141**	(0.071)	1.132**	(0.071)	1.145**	(0.072)
Large Company	1.193***	(0.076)	1.127*	(0.071)	1.155**	(0.074)
Working in shifts	1.097	(0.093)	1.183**	(0.100)	1.178*	(0.101)
Health	1.531***	(0.045)	1.525***	(0.045)	1.527***	(0.046)
Fixed hours	1.263***	(0.075)	1.230***	(0.074)	1.223***	(0.074)
Time Dummies	Yes		Yes		Yes	
Regional Dummies	Yes		Yes		Yes	
Occupation	Yes		Yes		Yes	
Industry	Yes		Yes		Yes	
Other Controls	Yes		Yes		Yes	
Pseudo-R^2	0.0509		0.0698		0.0694	
Log-likelihood	-9652.4		-9460.9		-9311.9	
Observations	26817		26817		26366	

Notes: In all columns the omitted (base) variables are: dummy for upper secondary school, experience 15-20, tenure 15-20, legislators (occupation), business activity (industry), Seoul, small company and year 2003. Other controls consist of dummy variables for the acquired level of education, dummies for the experience level in five years brackets and dummies for the level of tenure in five years brackets. Robust standard errors in parentheses with clustering at individual level. *, ** and *** indicate statistical significance at the 10% level, 5% level, and 1% level, respectively.

Table 3.5: Individual, Group and Company Performance Pay Jobs, Men

	Model I		Model II		Model III	
	e^{β}	s.e	e^{β}	s.e.	e^{β}	s.e.
Individual Performance Pay Jobs	1.213**	(0.105)	1.152	(0.101)	1.140	(0.102)
Group Performance Pay Jobs	1.226**	(0.126)	1.143	(0.120)	1.137	(0.121)
Company Performance Pay Jobs	1.213**	(0.119)	1.086	(0.106)	1.100	(0.108)
Log Hourly Real Wage			3.193***	(0.265)	3.184***	(0.266)
Risk					1.007	(0.046)
Age squared/1000	1.815	(1.266)	8.074***	(5.799)	7.361***	(5.343)
Married	0.871	(0.102)	0.864	(0.100)	0.878	(0.103)
Number of kids	0.973	(0.074)	0.965	(0.074)	0.961	(0.074)
Medium Company	1.148*	(0.087)	1.145*	(0.087)	1.153*	(0.089)
Large Company	1.217**	(0.095)	1.143*	(0.090)	1.172**	(0.093)
Working in shifts	1.055	(0.103)	1.199*	(0.117)	1.202*	(0.119)
Health	1.532***	(0.056)	1.525***	(0.056)	1.521***	(0.057)
Fixed hours	1.353***	(0.096)	1.322***	(0.095)	1.310***	(0.095)
Time Dummies	Yes		Yes		Yes	
Regional Dummies	Yes		Yes		Yes	
Occupation	Yes		Yes		Yes	
Industry	Yes		Yes		Yes	
Other Controls	Yes		Yes		Yes	
Pseudo-R^2	0.0568		0.0770		0.0761	
Log-likelihood	-6353.1		-6217.2		-6113.7	
Observations	17646		17646		17326	

Notes: In all columns the omitted (base) variables are: dummy for upper secondary school, experience 15-20, tenure 15-20, legislators (occupation), business activity (industry), Seoul, small company and year 2003. Other controls consist of dummy variables for the acquired level of education, dummies for the experience level in five years brackets and dummies for the level of tenure in five years brackets. Robust standard errors in parentheses with clustering at individual level. *, ** and *** indicate statistical significance at the 10% level, 5% level, and 1% level, respectively.

Table 3.6: Individual, Group and Company Performance Pay Jobs, Women

	Model I		Model II		Model III	
	e^{β}	s.e	e^{β}	s.e.	e^{β}	s.e.
Individual Performance Pay Jobs	1.345**	(0.158)	1.267**	(0.150)	1.287**	(0.154)
Group Performance Pay Jobs	1.285	(0.213)	1.217	(0.205)	1.181	(0.199)
Company Performance Pay Jobs	1.104	(0.213)	1.007	(0.194)	1.017	(0.199)
Log Hourly Real Wage			3.020***	(0.384)	3.008***	(0.385)
Risk					1.107	(0.098)
Age squared/1000	1.145	(0.996)	2.647	(2.339)	2.554	(2.285)
Married	0.994	(0.145)	1.058	(0.155)	1.047	(0.154)
Number of kids	0.996	(0.092)	1.012	(0.095)	1.011	(0.096)
Medium Company	1.166	(0.130)	1.133	(0.126)	1.157	(0.129)
Large Company	1.180	(0.129)	1.124	(0.122)	1.154	(0.126)
Working in shifts	1.215	(0.208)	1.151	(0.195)	1.136	(0.196)
Health	1.554***	(0.078)	1.550***	(0.079)	1.561***	(0.080)
Fixed hours	1.083	(0.119)	1.045	(0.116)	1.047	(0.117)
Time Dummies	Yes		Yes		Yes	
Regional Dummies	Yes		Yes		Yes	
Occupation	Yes		Yes		Yes	
Industry	Yes		Yes		Yes	
Other Controls	Yes		Yes		Yes	
Pseudo-R^2	0.0503		0.0660		0.0674	
Log-likelihood	-3260.7		-3206.7		-3158.7	
Observations						

Notes: In all columns the omitted (base) variables are: dummy for upper secondary school, experience 15-20, tenure 15-20, legislators (occupation), business activity (industry), Seoul, small company and year 2003. Other controls consist of dummy variables for the acquired level of education, dummies for the experience level in five years brackets and dummies for the level of tenure in five years brackets. Robust standard errors in parentheses with clustering at individual level. *, ** and *** indicate statistical significance at the 10% level, 5% level, and 1% level, respectively.

Figure 3.1: Proportion of Job Satisfaction over Performance Pay Jobs and Gender

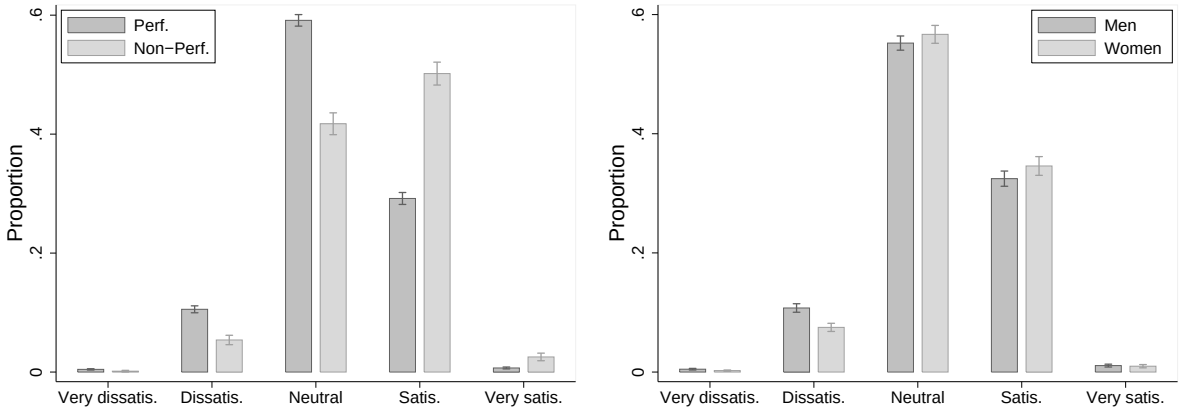


Figure 3.2: Proportion of Job Satisfaction over Gender within Performance Pay Jobs

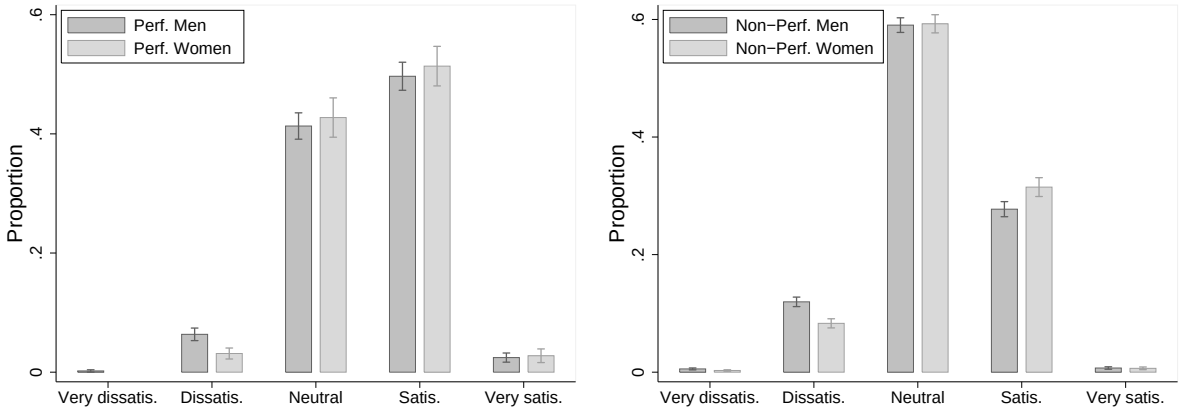


Figure 3.3: Proportion of Job Satisfaction within Gender over various Payment Schemes

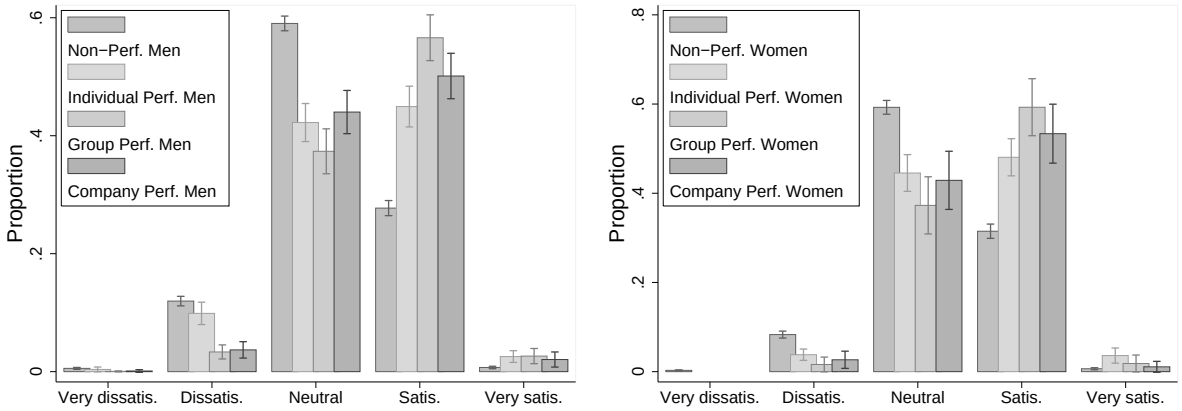


Figure 3.4: Effects of Performance Pay Jobs: Model I

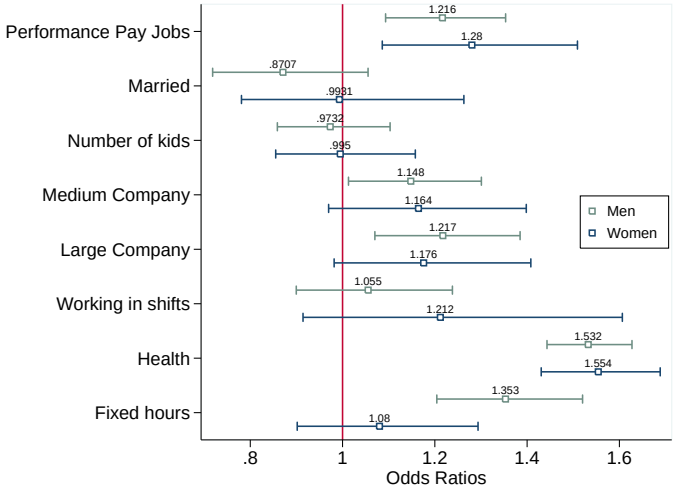


Figure 3.5: Effects of Performance Pay Jobs: Model II

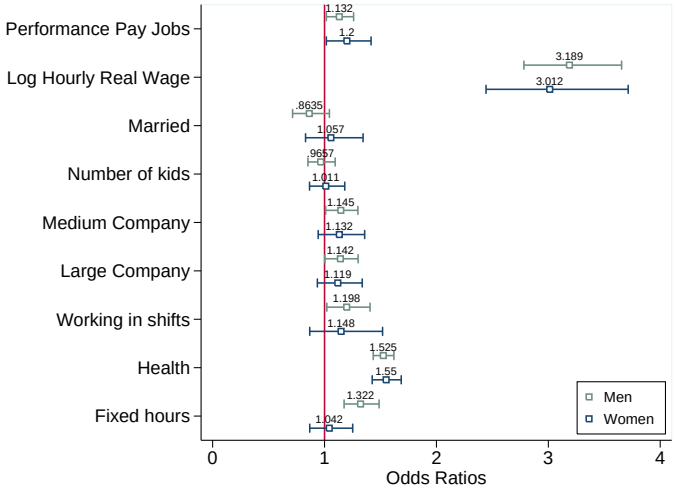


Figure 3.6: Effects of Performance Pay Jobs: Model III

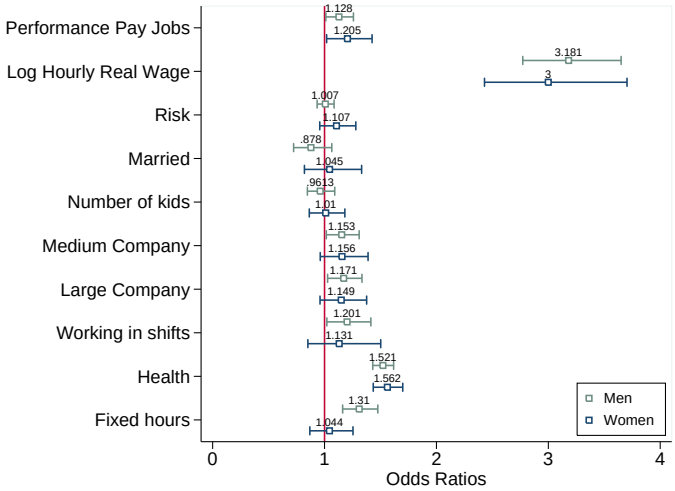


Figure 3.7: Effects of Various Performance Pay Jobs: Model I

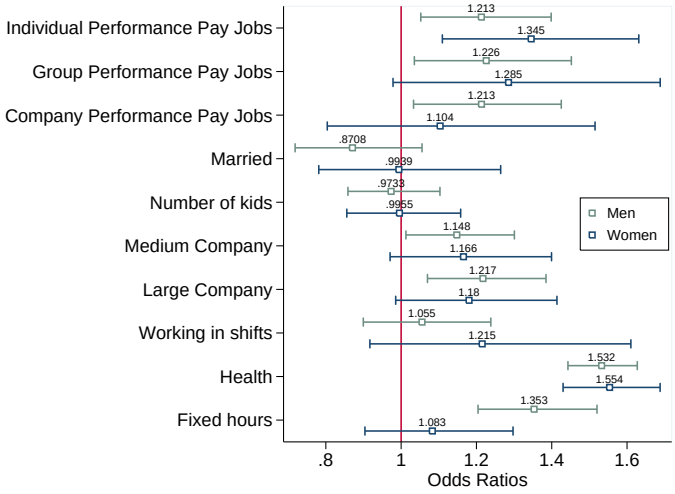


Figure 3.8: Effects of Various Performance Pay Jobs: Model II

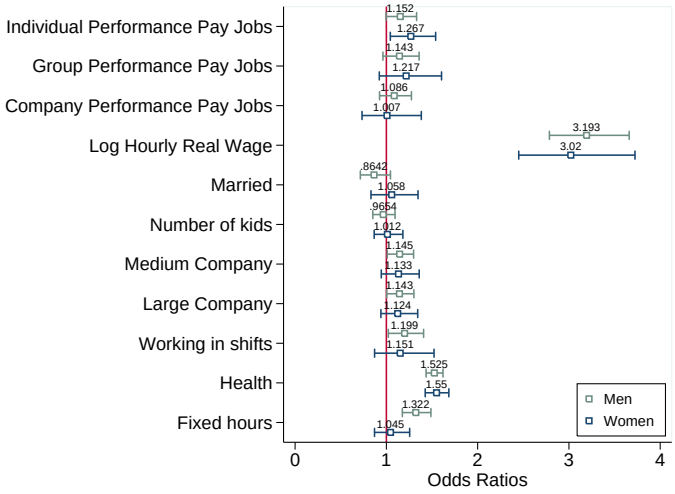
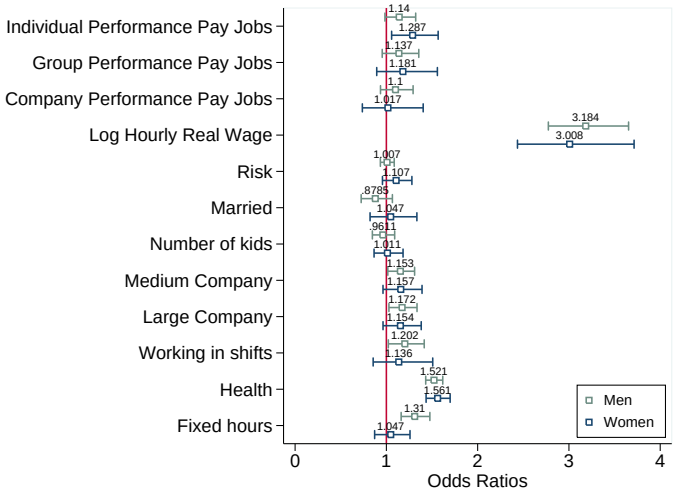


Figure 3.9: Effects of Various Performance Pay Jobs: Model III



Bibliography

Adler, Matthew D. Happiness Surveys and Public Policy: What's the Use? *Duke Law Journal*, 62, 2013.

Baetschmann, Gregori and Staub, Kevin E. and Winkelmann, Rainer. Consistent Estimation of the Fixed Effects Ordered Logit Model. IZA Discussion Papers 5443, Institute for the Study of Labor (IZA), Jan 2011.

Bernheim, B. Douglas and Rangel, Antonio. Beyond revealed preference: Choice-theoretic foundations for behavioral welfare economics. 124(1):51–104, 2009.

Blanchflower, David and Oswald, Andrew. Entrepreneurship, Happiness and Super-normal Returns: Evidence from Britain and the US. NBER Working Papers 4228, National Bureau of Economic Research, Inc, December 1992.

Blanchflower, David G. and Oswald, Andrew J. Well-being over time in Britain and the USA. *Journal of Public Economics*, 88(7-8):1359–1386, July 2004.

Blau, Francine D. and Kahn, Lawrence M. The Gender Earnings Gap: Learning from International Comparisons. *American Economic Review*, 82(2):533–38, May 1992.

Blau, Francine D. and Kahn, Lawrence M. *The gender pay gap:going, going, going,... but not gone.*, chapter 2, pages 37–66. Russell Sage Foundation, New York, NY, 2006a.

Blau, Francine D. and Kahn, Lawrence M. The u.s. gender pay gap in the 1990s: Slowing convergence. *Industrial and Labor Relations Review*, 60(1):45–66, 2006b.

Booth, Alison L. and Van Ours, Jan C. Job satisfaction and family happiness: The part-time work puzzle*. *The Economic Journal*, 118(526):F77–F99, 2008.

Booth, Alison L. and van Ours, Jan C. Part-time jobs: what women want? *Journal of Population Economics*, 26(1):263–283, 2013.

Borghans, Lex and Duckworth, Angela L. and Heckman, James J. and Weel, Bas T. The Economics and Psychology of Personality Traits. *Journal of Human Resources*, 43 (4):972–1059, September 2008.

Boyce, Christopher J. Understanding fixed effects in human well-being. *Journal of Economic Psychology*, 31(1):1–16, 2010.

Brickman, Philip and Campbell, Donald T. Hedonic relativism and planning the good society. In Apley, M. H., editor, *Adaptation-level theory: A symposium*, pages 287–305. Academic Press, Michigan, 1971.

Brown, Michelle. Unequal Pay, Unequal Responses? Pay referents and their implications for pay level satisfaction. *Journal of Management Studies*, 38:879–896, 2001.

Brown, Sarah and Sessions, John G. Employee Attitudes, Earnings and Fixed-Term Contracts: International Evidence. *Review of World Economics (Weltwirtschaftliches Archiv)*, 141(2):296–317, July 2005.

Brun, Bernt Christian and Tungodden, Bertil. Non-welfaristic theories of justice: Is "the intersection approach" a solution to the indexing impasse? *Social Choice and Welfare*, 22(1):49–60, 02 2004.

Cameron, Adrian C. and Trivedi, Pravin K. *Microeconometrics : Methods and Applications*. Cambridge University Press, May 2005.

Card, David. Earnings, Schooling, and Ability Revisited. NBER Working Papers 4832, National Bureau of Economic Research, Inc, August 1994.

Chamberlain, Gary. Analysis of Covariance with Qualitative Data. *Review of Economic Studies*, 47(1):225–38, January 1980.

Clark, Andrew. What really matters in a job? hedonic measurement using quit data. *Labour Economics*, 8(2):223–242, 2001.

Clark, Andrew. Inequality-Aversion and Income Mobility: A Direct Test. DELTA Working Papers 2003-11, DELTA (Ecole normale supérieure), 2003.

Clark, Andrew and Etilé, Fabrice and Postel-Vinay, Fabien and Senik, Claudia and van der Straeten, Karine. Heterogeneity in Reported Well-Being: Evidence from Twelve European Countries. *Economic Journal*, 115(502):C118–C132, 03 2005.

Clark, Andrew E. Job satisfaction and gender: Why are women so happy at work? *Labour Economics*, 4(4):341–372, December 1997a.

Clark, Andrew E. Job satisfaction and gender: Why are women so happy at work? *Labour Economics*, 4(4):341–372, December 1997b.

Clark, Andrew E. Your money or your life: Changing job quality in oecd countries. *British Journal of Industrial Relations*, 43(3):377–400, 2005.

Clark, Andrew E. and Oswald, Andrew J. Unhappiness and Unemployment. *Economic Journal*, 104(424):648–59, May 1994.

Clark, Andrew E. and Oswald, Andrew J. Satisfaction and comparison income. *Journal of Public Economics*, 61(3):359 – 381, 1996.

Cochrane, Raymond. Marriage and Madness. *Psychology Review*, 3:2–5, 1996.

Crosby, Faye J. *Relative deprivation and working women*. Oxford University Press, New York, 1982.

D'Addio, A. Cristina and Eriksson, Tor and Frijters, Paul. An analysis of the determinants of job satisfaction when individuals' baseline satisfaction levels may differ. *Applied Economics*, 39(19):2413–2423, November 2007.

Danna, Karen and Griffin, Ricky W. Health and well-being in the workplace: A review and synthesis of the literature. *Journal of Management*, 25(3):357–384, 1999.

Das, Marcel and van Soest, Arthur. A panel data model for subjective information on household income growth. *Journal of Economic Behavior & Organization*, 40(4):409–426, December 1999.

Davoine, Lucie and Erhel, Christine and Guerogat-Lariviere, Mathilde. Monitoring quality in work: European employment strategy indicators and beyond. *International Labour Review*, 147(2-3):163–198, 2008.

De Witte, Hans and Näswall, Katharina. 'objective' vs 'subjective' job insecurity: Consequences of temporary work for job satisfaction and organizational commitment in four european countries. *Economic and Industrial Democracy*, 24(2):149–188, 2003.

Decancq, Koen and Schokkaert, Erik. Beyond gdp: Using equivalent incomes to measure well-being in europe. *Social Indicators Research*, 126(1):21–55, 2016.

Decancq, Koen and Fleurbaey, Marc and Schokkaert, Erik. Inequality, income, and well-being. CORE Discussion Papers 2014018, Université catholique de Louvain, Center for Operations Research and Econometrics (CORE), June 2014.

Decancq, Koen and Fleurbaey, Marc and Schokkaert, Erik. Chapter 2 - inequality, income, and well-being. In Atkinson, A. B. and Bourguignon, F., editors, *Handbook of Income Distribution*, volume 2 of *Handbook of Income Distribution*, pages 67 – 140. Elsevier, 2015.

Di Tella, Rafael and Haisken-De New, John and MacCulloch, Robert. Happiness adaptation to income and to status in an individual panel. *Journal of Economic Behavior & Organization*, 76(3):834–852, December 2010.

Donaldson, David and Weymark, John. A single-parameter generalization of the gini indices of inequality. *Journal of Economic Theory*, 22(1):67–86, 1980.

Drago, Robert and Garvey, Gerald T. Incentives for Helping on the Job: Theory and Evidence. *Journal of Labor Economics*, 16(1):1–25, 1998.

Easterlin, Richard A. Does economic growth improve the human lot? Some empirical evidence. *Nations and households in economic growth: Essays in honor of Moses Abramovitz*, pages 89–125, 1974.

Easterlin, Richard A. Will raising the incomes of all increase the happiness of all? *Journal of Economic Behavior & Organization*, 27(1):35–47, 1995.

Easterlin, Richard A. Income and happiness: Towards a unified theory. *Economic journal*, pages 465–484, 2001.

Eurofound. Trends in job quality in europe. 2012.

European Commission. Employment and social policies: A framework for investing in quality. 2001.

European Statistical System. Sponsorshop Group on Measuring Progress, Well-being and Sustainable Development. Final report, 2011.

Ferrer-i-Carbonell, Ada. Income and well-being: an empirical analysis of the comparison income effect. *Journal of Public Economics*, 89(5-6):997–1019, June 2005.

Ferrer-i-Carbonell, Ada and Frijters, Paul. How Important is Methodology for the estimates of the determinants of Happiness? *Economic Journal*, 114(497):641–659, 07 2004.

Fleurbaey, Marc. Social choice and the indexing dilemma. *Social Choice and Welfare*, 29 (4):633–648, 2007.

Fleurbaey, Marc. Beyond gdp: The quest for a measure of social welfare. *Journal of Economic Literature*, 47(4):pp. 1029–1075, 2009.

Fleurbaey, Marc. Willingness-to-pay and the equivalence approach. *Revue d'économie politique*, 121(1):35–58, 2011.

Fleurbaey, Marc and Blanchet, Didier. *Beyond GDP : Measuring welfare and assessing sustainability*. Oxford University Press New York, 2013.

Fleurbaey, Marc and Schokkaert, Erik and Decancq, Koen. What good is happiness? CORE Discussion Papers 2009017, Universitè catholique de Louvain, Center for Operations Research and Econometrics (CORE), 2009.

Freeman, Richard B. Job satisfaction as an economic variable. *The American Economic Review*, 68(2):135–141, 1978.

Frey, Bruno S. and Stutzer, Alois. *How the Economy and Institutions Affect Human Well-Being*. Princeton: Princeton University Press, 2002a.

Frey, Bruno S. and Stutzer, Alois. What can economists learn from happiness research? *Journal of Economic Literature*, 40(2):402–435, 2002b.

Frijters, Paul and Haisken-DeNew, John P. and Shields, Michael A. Money does matter! evidence from increasing real income and life satisfaction in east germany following reunification. *American Economic Review*, 94(3):730–740, 2004.

Gazioglu, Saziye and Tansel, Aysit. Job satisfaction in Britain: individual and job related factors. *Applied Economics*, 38(10):1163–1171, 2006.

Godard, John. High performance and the transformation of work? the implications of alternative work practices for the experience and outcomes of work. *Industrial and Labor Relations Review*, 54(4):pp. 776–805, 2001.

Gottfredson, Linda S. Intelligence: is it the epidemiologists' elusive fundamental cause of social class inequalities in health? *Journal of Personality and Social Psychology*, 86:174–199, 2004.

Grimshaw, Damian. What do we know about low wage work and low wage workers? : Analysing the definitions, patterns, causes and consequences in international perspective. ILO Working Papers 464858, International Labour Organization, 2011.

Groot, Wim and Maassen van den Brink, Henriëtte. Job satisfaction and preference drift. *Economics letters*, 63(3):363–367, 1999.

Groot, Wim and Maassen van den Brink, Henriëtte. Job satisfaction and gender: Why are women so happy at work? *International Journal of Manpower MCB UP Ltd*, 20 (6):343–360, 1999.

Grund, Christian and Sliwka, Dirk. Reference Dependent Preferences and the Impact of Wage Increases on Job Satisfaction: Theory and Evidence. IZA Discussion Papers 1879, Institute for the Study of Labor (IZA), Dec 2005.

Hagenaars, A. J. M. and de Vos, K. and Zaidi, M. A. and Statistical Office of the European Communities. *Poverty Statistics in the Late 1980s: Research Based on Micro-data*. Eurostat: Series C, Accounts, surveys and statistics. Office for Official Publications of the European Communities, 1994.

Hall, Richard, H. and Buttram, Robert, T. *The Sociology of Work: Perspectives, Analyses, and Issues*. The Pine Forge Press Social Science Library. Pine Forge Press, 1994.

Hamermesh, S. Daniel. Economic aspects of job satisfaction. *Essays in Labor Market Analysis. New York: John Wiley*, pages 53–72, 1977.

Hamermesh, S. Daniel. The changing distribution of job satisfaction. *The Journal of Human Resources*, 36(1):1–30, 2001.

Herzberg, Frederick and Mausner, Bernard and Snyderman, B. Barbara. *The Motivation to Work*. Organization and Business. Transaction Publishers, 2011.

Heywood, John S. and Bender, Keith A. and Donohue, Susan M. Job satisfaction and gender segregation. *Oxford Economic Papers*, 57(3):479–496, July 2005.

Holman, David. Job types and job quality in europe. *Human Relations*, 66(4):475–502, 2013.

ILO. Decent work indicators: Concepts and definitons. 2012.

Jencks, Christopher and Perman, Lauri and Rainwater, Lee. What is a good job? a new measure of labor-market success. *American Journal of Sociology*, 93(6):1322–1357, 1988.

John, Oliver P. and Srivastava, Sanjay. The Big Five trait taxonomy: History, measurement, and theoretical perspectives. In Pervin, L. A. and John, O. P., editors, *Handbook of Personality: Theory and Research*, pages 102–138. Guilford Press, New York, second edition, 1999.

Johnson, Nancy Brown and Bobko, Philip and Hartenian, Linda S. Union influence on local union leaders' perceptions of job insecurity: An empirical test. *British Journal of Industrial Relations*, 30(1):45–60, 1992. ISSN 1467-8543.

Kahneman, Daniel and Krueger, Alan B. Developments in the measurement of subjective well-being. *Journal of Economic Perspectives*, 20(1):3–24, 2006.

Kahneman, Daniel and Wakker, Peter P. and Sarin, Rakesh. Back to bentham? explorations of experienced utility. *The Quarterly Journal of Economics*, 112(2):375–406, 1997.

Kahneman, Daniel and Krueger, Alan B. and Schkade, David and Schwarz, Norbert and Stone, Arthur. Toward National Well-Being Accounts. *American Economic Review*, 94(2):429–434, May 2004.

Kalleberg, Arne L. and Vaisey, Stephen. Pathways to a good job: Perceived work quality among the machinists in north america. *British Journal of Industrial Relations*, 43 (3):431–454, 2005. ISSN 1467-8543.

Kassenböhmer, C. Sonja and Haisken-DeNew, P. John. You're fired! the causal negative effect of entry unemployment on life satisfaction. *Economic Journal*, 119(536):448–462, 2009.

Kennedy, Peter W. Performance Pay, Productivity and Morale. *The Economic Record*, 71 (214):240–47, September 1995.

Kolenikov, Stanislav and Shorrocks, Anthony. A Decomposition Analysis of Regional Poverty in Russia. *Review of Development Economics*, 9(1):25–46, 02 2005.

Layard, Richard. *Happiness: Lessons from a New Science*. Penguin Books, London, 2005.

Layard, Richard and Mayraz, Guy and Nickell, Stephen J. The marginal utility of income. *Journal of Public Economics*, 92(8–9):1846 – 1857, 2008.

Lazear, Edward P. Performance Pay and Productivity. *American Economic Review*, 90(5): 1346–1361, December 2000.

Leschke, Janine and Watt, Andrew and Finn, Mairéad Finn. Putting a number on job quality?: Constructing a european job quality index. Technical report, European Trade Union Institute, Belgium, 2008.

Levy-Garboua, Louis and Montmarquette, Claude. Reported job satisfaction: what does it mean? *Journal of Behavioral and Experimental Economics (formerly The Journal of Socio-Economics)*, 33(2):135–151, April 2004.

Locke, Edwin A. The nature and causes of job satisfaction. In Dunnette, M. D. and Hough, L. M., editors, *Handbook of industrial and organizational psychology*, pages 1297–1349. Rand McNally, Chicago, 1976.

Loewenstein, George and Ubel, Peter A. Hedonic adaptation and the role of decision and experience utility in public policy. *Journal of Public Economics*, 92(8-9):1795–1810, August 2008.

Lucifora, Claudio and McKnight, Abigail and Salverda, Wiemer. Low-wage employment in europe: a review of the evidence. *Socio-Economic Review*, 3(2):259–292, 2005.

McBride, Michael. Relative-income effects on subjective well-being in the cross-section. *Journal of Economic Behavior & Organization*, 45(3):251–278, 2001.

Meyersson-Milgrom, Eva M. and Petersen, Trond and Asplund, Rita. Pay,Risk,and Productivity. The Case of Finland,1980 -1996. *Finnish Economic Papers*, 15(1):3–23, Spring 2002.

Muñoz de Bustillo, Rafael and Fernández-Macías, Enrique and Antón, José-Ignacio and Esteve, Fernando. *Measuring More than Money.* Number 14072 in Books. Edward Elgar Publishing, 2011a.

Muñoz de Bustillo, Rafael and Fernández-Macías, Enrique and Esteve, Fernando and Antón, José-Ignacio. E pluribus unum? a critical survey of job quality indicators. *Socio-Economic Review*, 9(3):447–475, 2011b.

Ng, Eddy and Schweitzer, Linda and Lyons, Sean T. New generation, great expectations: A field study of the millennial generation. *Journal of Business and Psychology*, 25(2): 281–292, 2010.

Nussbaum, Martha,. *Frontiers of justice : disability, nationality, species membership.* Belknap Press of Harvard University Press Cambridge, MA, 2006. ISBN 0674019172.

Nussbaum, Martha. *Creating Capabilities: The Human Development Approach.* Harvard University Press, 2011. ISBN 9780674050549.

OECD. *How's Life? Measuring Well-being.* OECD Publishing, Paris, 2011.

OECD. Closing the gender gap-act now. 2012.

OECD. How's Life? 2015. 2015a.

OECD. All on board: Making inclusive growth happen. 2015b.

Oettinger, Gerald S. Do piece rates influence effort choices? Evidence from stadium vendors. *Economics Letters*, 73(1):117–123, October 2001.

Olsen, Karen M. and Kalleberg, Arne L. and Nesheim, Torstein. Perceived job quality in the united states, great britain, norway and west germany, 1989-2005. *European Journal of Industrial Relations*, 16(3):221–240, 2010.

Oswald, Andrew. Happiness and Economic Performance. The Warwick Economics Research Paper Series (TWERPS) 478, University of Warwick, Department of Economics, 1997.

Paarsch, Harry J and Shearer, Bruce. Piece Rates, Fixed Wages, and Incentive Effects: Statistical Evidence from Payroll Records. *International Economic Review*, 41(1): 59–92, February 2000.

Parent, Daniel. Methods of pay and earnings: A longitudinal analysis. *Industrial and Labor Relations Review*, 53(1):71–86, October 1999.

Ponthieux, Sophie and Meurns, Dominique. Chapter 12 - gender inequality. In Atkinson, B., Anthony and Bourguignon, F., editors, *Handbook of Income Distribution*, volume 2 of *Handbook of Income Distribution*, pages 981 – 1146. Elsevier, 2015.

Riedl, Maximilian and Geishecker, Ingo. Keep it simple: estimation strategies for ordered response models with fixed effects. *Journal of Applied Statistics*, 41(11):2358–2374, November 2014.

Ritter, Joseph A. and Anker, Richard. Good jobs, bad jobs: Workers' evaluations in five countries. *International Labour Review*, 141(4):331–358, 2002.

Ross, Catherine E. and Reskin, Barbara F. Education, control at work, and job satisfaction. *Social Science Research*, 21(2):134–148, 1992.

Sastre, Mercedes and Trannoy, Alain. Shapley inequality decomposition by factor components: Some methodological issues. *Journal of Economics*, 9(1):51–89, 2002.

Schokkaert, Erik and Decancq, Koen. Beyond gdp: Measuring social progress in europe. Technical report, Euroforum KU Leuven Working Paper, 2013.

Schokkaert, Erik and Van Ootegem, Luc and Verhofstadt, Elsy. Preferences and subjective satisfaction: Measuring well-being on the job for policy evaluation. *CESifo Economic Studies*, 57(4):683–714, 2011.

Schwarz, Norbert and Strack, Fritz. *Evaluating one's life: a judgment model of subjective well-being*, volume 05. 1988.

Sen, Amartya. *Commodities and capabilities*. North-Holland, Amsterdam [u.a.], 1985.

Sen, Amartya. *Choice, Welfare and Measurement*. Harvard University Press, 1997.

Sen, Amartya. Capabilities, lists, and public reason: Continuing the conversation. *Feminist Economics*, 10(3):77–80, 2004.

Shapley, Lloyd S. A value for n-person games. In Roth, A. E., editor, *The Shapley value*, pages 31–40. Cambridge University Press, 1988.

Shorrocks, Anthony. Decomposition procedures for distributional analysis: a unified framework based on the Shapley value. *Journal of Economic Inequality*, 11(1):99–126, 2013.

Sousa-Poza, Alfonso and Sousa-Poza, Andres A. Well-being at work: a cross-national analysis of the levels and determinants of job satisfaction. *The journal of socio-economics*, 29(6):517–538, 2000.

Spector, E. Paul. *Job Satisfaction: Application, Assessment, Causes and Consequences.* Books. London: Sage., 1997.

Stadt, Huib van de and Kapteyn, Arie and van de Geer, Sara. The relativity of utility: Evidence from panel data. *The Review of Economics and Statistics*, 67(2):pp. 179–187, 1985.

Stiglitz, Joseph E. and Sen, Amartya and Fitoussi, Jean-Paul. The measurement of economic performance and social progress revisited. Documents de Travail de l'OFCE 2009-33, Observatoire Francais des Conjonctures Economiques (OFCE), December 2009a.

Stiglitz, Joseph E. and Sen, Amartya and Fitoussi, Jean-Paul. Report by the commission on the measurement of econpomic performance and social progress. 2009b.

Stiglitz, Joseph E. and Sen, Amartya and Fitoussi, Jean-Paul. *Mismeasuring Our Lives: Why GDP Doesn't Add Up.* New Press, The, May 2010.

Stutzer, Alois. The role of income aspirations in individual happiness. *Journal of Economic Behavior & Organization*, 54:89–109, 2002.

Train, Kenneth E. *Discrete Choice Methods with Simulation.* Cambridge Books. Cambridge University Press, 2nd edition, December 2009.

UNECE. Handbook of measuring quality of employment: A statistical framework. 2015.

van Praag, Bernard and Ferrer-i-Carbonell, Ada. *Happiness Quantified: A Satisfaction Calculus Approach.* Oxford University Press, 2007.

Vendrik, Maarten C. M. and Woltjer, Geert B. Happiness and loss aversion: Is utility concave or convex in relative income? *Journal of Public Economics*, 91(7-8):1423–1448, August 2007.

Verhofstadt, Elsy and De Witte, Hans and Omey, Eddy. Higher educated workers: better jobs but less satisfied? *International Journal of Manpower*, 28(2):135–151, 2007.

Ward, Melanie E. and Sloane, Peter J. Non-pecuniary Advantages versus Pecuniary Disadvantages; Job Satisfaction among Male and Female Academics in Scottish Universities. *Scottish Journal of Political Economy*, 47(3):273–303, August 2000.

Winkelmann, Liliana and Winkelmann, Rainer. Why are the unemployed so unhappy? evidence from panel data. *Economica*, 65(257):1–15, February 1998.

Appendix A

A.1 Rescaling and uprating procedures

Since our analysis is dealing with the population means and inequality measures, it is important that these statistics, calculated from the EQLS income data, match as closely as possible those calculated from other sources, such as national accounts in the case of population mean and Eurostat's figures on income inequality derived from EU-SILC. To ensure that, we had to do rescaling of the EQLS incomes for the purpose of achieving the following steps.

First, the decile shares of equivalised household disposable income from the EQLS must be equal to the decile shares from the EU-SILC. Under the assumption that most inequality in income distribution is due to differences between the mean incomes of decile groups, by getting the decile income shares in line with those based on the EU-SILC income data we try to get Gini indices of income inequality computed from the EQLS incomes to be as close as possible, if not equal to, the Ginis computed from the EU-SILC incomes (available from Eurostat). Second, the mean disposable income per household member must be equal to the closest concept from the national accounts in per capita terms. Following Decancq and Schokkaert (2016), we take that national accounts income concept to be the net national income per capita in Purchasing Poverty Standards (PPS) (available from Eurostat).

The rescaling procedure proceeds in four steps. In the first step, using the EU-SILC data on the shares of decile groups in total equivalised disposable household income, we calculate, for each country-year, what the mean for each decile group must be for the decile shares in the EQLS data be equal to those from the EU-SILC. Here we use the fact that the overall mean, $\overline{Y}$, and the mean of decile group d, $\overline{Y}_d$, are related as $\overline{Y}_d = s_d \cdot \overline{Y}$, where s_d is the decile share of group d. In the second step, we divide the decile means calculated in the first step by the decile means calculated from the EQLS. This gives us decile-specific rescaling factors for each country-year. Then we multiply all incomes in each of the decile groups for each country-year by the rescaling factor corresponding to these decile groups and country-years. This ensures that for each country-year the decile shares from the EQLS data be equal to those from the EU-SILC data. In the third step, from the rescaled equivalised household disposable incomes obtained in the second step, we recover the rescaled total household disposable incomes. From these we calculate rescaled disposable household incomes per household member (rather than per adult equivalent). These incomes are then further rescaled by multiplying them by country-year-specific rescaling factors obtained as the ratio of the net national income per capita PPS

to the mean disposable household income per household member. This ensures equality, for each country-year, between the net national income per capita PPS and the mean disposable household income per household member. In the final, fourth step, from the disposable household incomes per household member and the number of household members we recover total disposable household incomes and divide them by the number of adult equivalents (according to the OECD equivalent scale) to obtain the disposable household income per adult equivalent. And, finally, to convert nominal to real incomes, we divide them all by country-year specific consumer price indices (with 2005 as the base year). The income variable so obtained is the one we use in the analysis.

Upon applying the rescaling procedure, we have checked if the Ginis calculated from the rescaled EQLS incomes do indeed match those calculated from the EU-SILC incomes and found that almost all of the initial differences vanish. Yet there is a reasonable a priori concern that by rescaling incomes to get the EQLS Ginis close to the EU-SILC Ginis, one distorts the original incomes to the extent that they become unreliable. To check that, we asked whether getting the Ginis right comes at the price of substantial re-ranking of individuals by income, in the sense that person i's income, which before rescaling was higher than person j's income, after rescaling is lower rather than higher. This can well happen, particularly for people close to the bounds of two decile groups, but also for those farther to a group's interior in case of substantial rescaling. By computing the portion of the difference between Ginis computed from the original incomes and those computed from the rescaled incomes, we found that only a very small part of this difference can be attributed to re-ranking. We consider that result a good enough indication that the rescaled incomes are reliable. The more so given the fact that not all respondents report the exact net household income, but rather choose from the number of intervals that are offered.

Table A1: Total WTP and Absolute WTP Contributions in WTP

	WTP and Absolute Contributions to WTP (€/mnth) in 2007					WTP and Absolute Contributions to WTP (€/mnth) in 2011				
	WTP	WTP^a	WTP^h	WTP^n	WTP^u	WTP	WTP^a	WTP^h	WTP^n	WTP^u
AT	929.76	108.67	610.90	186.60	23.59	779.60	77.58	525.74	150.67	25.60
BE	1131.84	143.52	642.24	284.43	61.65	888.94	138.39	575.81	133.12	41.62
BG	403.37	76.98	174.50	135.12	16.76	370.13	81.72	178.25	77.01	33.15
CY	748.49	155.95	332.62	238.60	21.32	744.43	148.16	346.46	205.64	44.16
CZ	722.62	86.58	456.06	170.72	9.27	600.83	73.55	401.71	109.73	15.84
DE	936.03	82.29	667.98	145.68	40.07	957.94	97.13	668.09	145.32	47.39
DK	921.61	171.91	622.16	112.00	15.54	790.58	99.71	597.13	54.54	39.20
EE	759.22	191.37	405.75	150.12	11.97	566.05	118.49	365.34	60.48	21.74
EL	862.38	152.29	287.99	374.34	47.76	505.79	104.17	213.33	144.80	43.48
ES	925.14	100.15	511.66	260.23	53.11	733.75	70.34	429.40	100.03	133.97
FI	945.09	143.81	673.11	114.78	13.39	828.01	117.76	636.91	49.67	23.66
FR	1056.34	159.21	568.91	282.22	45.99	814.85	130.49	514.83	115.32	54.21
HU	682.76	113.41	361.98	187.50	19.87	533.04	82.31	347.95	74.06	28.72
IT	1254.94	166.26	608.11	457.12	23.44	859.53	98.55	554.19	181.00	25.79
LT	742.49	173.12	364.79	188.32	16.26	585.14	94.87	367.45	76.57	46.25
LU	2053.43	292.47	1124.43	594.27	42.27	1286.16	180.28	937.71	130.86	37.32
LV	699.74	183.57	346.82	154.35	15.00	529.80	138.47	319.30	43.98	28.05
NL	1001.83	138.98	676.88	165.49	20.49	969.93	133.36	726.81	81.70	28.06
PL	704.16	123.90	323.53	214.76	41.98	586.19	93.31	365.17	90.85	36.86
PT	861.44	98.43	474.35	238.99	49.67	642.35	100.92	421.19	55.84	64.41
RO	472.78	114.26	247.94	105.52	5.06	397.62	76.23	245.91	68.35	7.13
SE	927.10	116.08	642.68	132.63	35.71	884.03	136.34	606.28	92.82	48.59
SI	988.24	125.51	659.30	166.56	36.87	681.18	74.08	470.87	73.05	63.18
SK	701.63	104.51	427.64	158.93	10.54	583.18	70.74	409.36	77.05	26.03
UK	1110.10	194.32	641.93	233.50	40.34	813.10	139.74	516.16	113.10	44.10

Notes: Numbers denote the mean values of (total) WTP and the absolute contributions of non-income dimensions to total WTP (WTP^d). The results are weighted using the sampling weights.

Table A2: Shares of WTP and WTP Contributions, 2007

	Shares of WTP and WTP Contributions in Income					Shares of WTP Contributions in WTP			
	$\frac{WTP}{y}$	$\frac{WTP^a}{y}$	$\frac{WTP^h}{y}$	$\frac{WTP^n}{y}$	$\frac{WTP^u}{y}$	$\frac{WTP^a}{\sum WTP}$	$\frac{WTP^h}{\sum WTP}$	$\frac{WTP^n}{\sum WTP}$	$\frac{WTP^u}{\sum WTP}$
AT	34.47	4.63	22.53	6.01	1.29	11.43	63.82	22.48	2.27
BE	44.03	5.75	23.98	10.99	3.31	11.87	52.65	30.69	4.78
BG	54.30	11.44	24.97	15.22	2.66	18.69	44.49	33.33	3.49
CY	34.82	7.89	16.62	9.10	1.22	20.32	43.12	34.60	1.96
CZ	44.14	5.42	28.32	9.41	0.99	10.90	61.76	26.02	1.32
DE	37.41	3.60	25.29	5.68	2.84	8.44	66.91	20.17	4.48
DK	34.14	6.89	22.38	4.13	0.74	17.14	61.75	19.79	1.33
EE	54.67	14.09	30.06	9.45	1.07	23.35	54.72	20.58	1.35
EL	41.68	7.81	15.51	15.42	2.94	15.69	35.61	44.58	4.12
ES	39.69	4.73	21.32	11.04	2.60	10.16	52.69	33.40	3.75
FI	37.04	5.63	26.17	4.36	0.88	14.07	67.73	16.76	1.43
FR	42.03	6.87	22.30	10.74	2.12	14.45	52.07	30.47	3.01
HU	55.72	10.14	28.93	14.13	2.52	16.75	50.56	29.63	3.06
IT	53.51	7.19	26.21	18.87	1.23	11.52	49.47	37.63	1.38
LT	56.13	14.31	28.48	11.50	1.84	22.59	50.92	24.20	2.29
LU	42.19	6.07	22.80	12.06	1.26	11.67	53.32	33.36	1.64
LV	59.56	16.47	30.33	11.25	1.51	24.95	53.06	20.23	1.76
NL	33.72	5.14	22.12	5.51	0.96	14.38	61.48	22.61	1.53
PL	54.57	10.26	26.55	14.52	3.24	16.70	47.92	31.06	4.32
PT	50.09	6.65	28.23	12.54	2.67	11.88	56.73	27.53	3.85
RO	54.00	15.86	26.95	10.37	0.83	25.13	50.98	22.88	1.00
SE	31.75	4.08	21.95	4.35	1.37	10.95	62.72	24.31	2.01
SI	49.02	6.53	32.85	7.58	2.06	11.25	67.26	18.79	2.70
SK	49.19	7.64	29.27	10.86	1.41	12.79	59.53	25.95	1.73
UK	40.88	7.43	23.03	7.97	2.45	16.44	52.70	27.13	3.73

Notes: Numbers denote the relative shares of WTP in income (WTP/y), the relative shares of WTP contributions in income (WTP^d/y) and the relative shares of WTP contributions in total WTP ($WTP^d/\sum WTP$). The results are weighted using the sampling weights.

Table A3: Shares of WTP and WTP Contributions, 2011

	Shares of WTP and WTP Contributions in Income					Shares of WTP Contributions in WTP			
	$\frac{WTP}{y}$	$\frac{WTP^a}{y}$	$\frac{WTP^h}{y}$	$\frac{WTP^n}{y}$	$\frac{WTP^u}{y}$	$\frac{WTP^a}{\sum WTP}$	$\frac{WTP^h}{\sum WTP}$	$\frac{WTP^n}{\sum WTP}$	$\frac{WTP^u}{\sum WTP}$
AT	34.99	3.77	23.83	5.66	1.72	8.87	61.45	27.11	2.57
BE	42.55	6.86	26.76	5.95	2.97	14.73	62.29	18.82	4.16
BG	52.83	13.18	24.82	8.92	5.90	22.03	47.51	22.04	8.43
CY	38.64	7.95	17.40	10.06	3.23	18.69	41.36	34.67	5.29
CZ	45.24	5.78	30.42	7.45	1.60	11.16	63.67	22.99	2.18
DE	42.62	4.67	28.55	5.98	3.41	8.70	67.64	18.80	4.85
DK	34.71	5.02	25.09	2.41	2.18	14.42	66.13	16.14	3.31
EE	56.88	11.99	35.97	5.60	3.33	17.91	65.33	12.74	4.02
EL	39.79	8.93	16.55	9.62	4.70	19.24	40.79	32.74	7.23
ES	41.10	4.12	24.06	5.00	7.92	8.76	60.01	18.45	12.78
FI	40.73	5.89	30.95	2.45	1.44	13.01	76.68	8.16	2.16
FR	39.49	6.75	24.16	5.14	3.45	15.02	60.48	19.51	4.99
HU	53.18	9.13	33.65	6.38	4.01	14.28	63.69	16.96	5.08
IT	46.11	5.97	28.61	9.19	2.34	11.09	60.79	25.32	2.80
LT	54.39	10.27	33.65	6.30	4.17	15.97	64.38	14.16	5.48
LU	38.29	5.95	26.86	3.90	1.58	14.30	65.48	18.01	2.21
LV	59.95	16.39	34.36	4.39	4.80	25.23	60.28	8.72	5.78
NL	38.40	5.65	28.18	3.09	1.48	13.03	71.42	13.42	2.14
PL	48.98	8.66	29.76	6.26	4.30	15.66	61.24	17.26	5.83
PT	45.97	7.50	29.69	3.78	5.00	14.36	67.33	11.01	7.31
RO	54.13	13.05	32.04	7.82	1.22	19.40	60.92	18.25	1.43
SE	37.12	5.58	25.14	3.86	2.55	13.96	65.58	16.80	3.66
SI	45.55	5.43	30.53	4.22	5.36	10.18	69.05	12.97	7.80
SK	45.47	5.83	31.31	5.32	3.01	9.97	66.90	19.07	4.06
UK	42.11	7.41	26.46	5.49	2.76	16.41	59.66	20.01	3.92

Notes: Numbers denote the relative shares of WTP in income (WTP/y), the relative shares of WTP contributions in income (WTP^d/y) and the relative shares of WTP contributions in total WTP ($WTP^d/\sum WTP$). The results are weighted using the sampling weights.

Appendix B

Figure B.1: Rank Changes in Job Quality

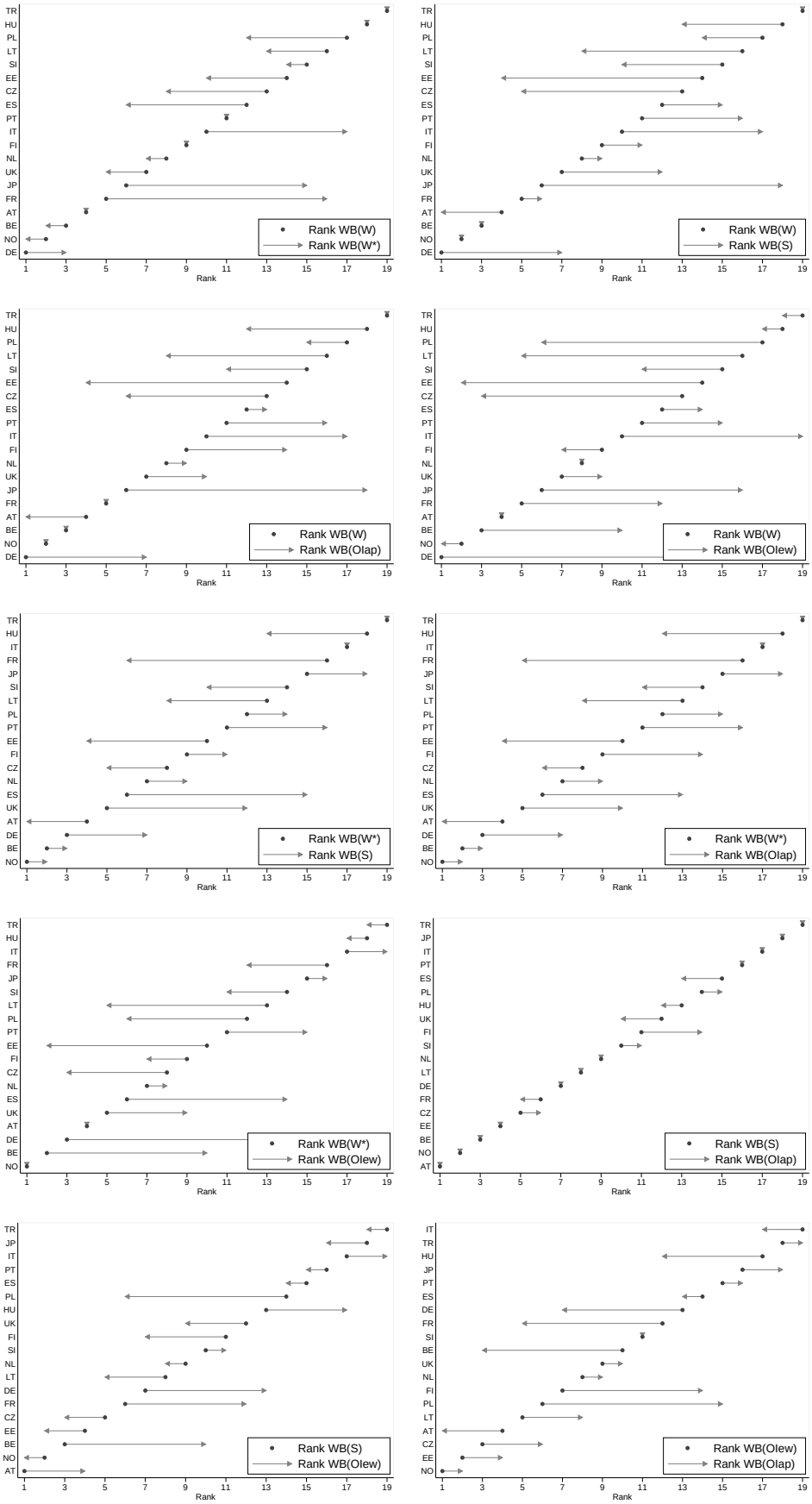


Figure B.2: Relative WTP for Men and Women

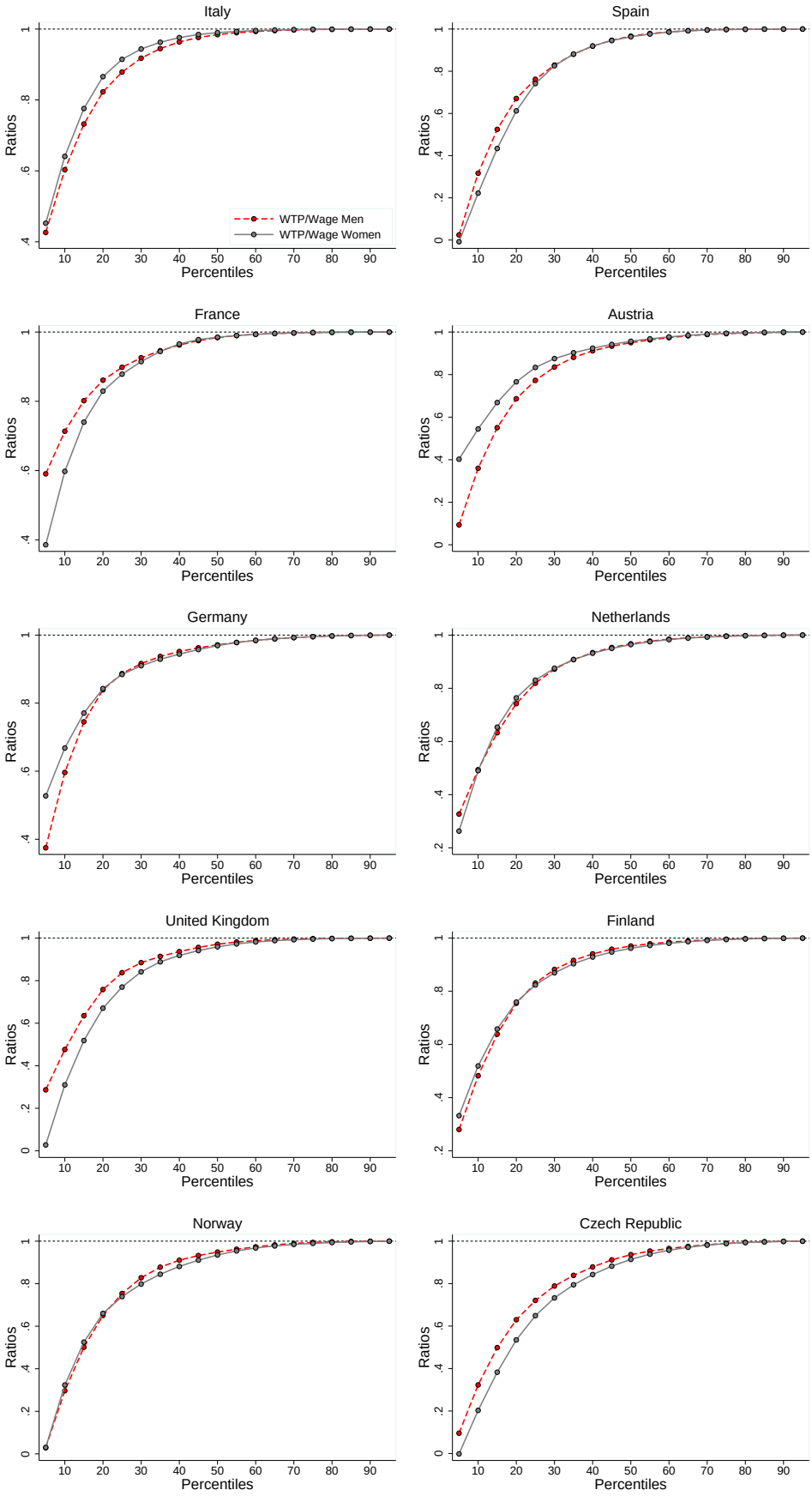


Figure B.2: Relative WTP for Men and Women (continued)