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Income and well-being: an empirical analysis of the comparison income effect

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Abstract

This paper presents an empirical analysis of the importance of 'comparison income' for individual well-being or happiness. In other words, the influence of the income of a reference group on individual well-being is examined. The main novelty is that various hypotheses are tested: the importance of the own income, the relevance of the income of the reference group and of the distance between the own income and the income of the reference group, and most importantly the asymmetry of comparisons, i.e. the comparison income effect differing between rich and poor individuals. The analysis uses a self-reported measure of satisfaction with life as a measure of individual well-being. The data come from a large German panel known as GSOEP. The study concludes that the income of the reference group is about as important as the own income for individual happiness, that individuals are happier the larger their income is in comparison with the income of the reference group, and that for West Germany this comparison effect is asymmetric. This final result supports Dusenberry's idea that comparisons are mostly upwards.

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1. Introduction

Utility theory is based, among others, on the premise that more is better and therefore that increases in income are desirable from an individual's perspective. In technical terms, a higher income allows the insatiable consumer to reach a higher indifference curve. Despite this assumption, the relation between income and happiness or well-being[1] has been one of the most discussed and debated topics in the literature on subjective well-being since the early 1970s (for an overview, see Frey and Stutzer, 2002; Senik, in press (a)).

On the one side, various researchers claim that income correlates only weakly with individual well-being, so that continuous income growth does not lead to ever-happier individuals. Easterlin (1974, 1995, 2001) finds that while richer individuals in a country are happier than their poorer fellows, income increases do not lead to increases in well-being. In her book *The Overworked American*, Schor (1991, Chap. 5) reports that the percentage of United States population who felt "very happy" peaked in 1957 and has decreased since then, despite continuous economic growth (for similar ideas, see also Campbell et al., 1976; Frank, 1990; Scitovsky, 1976). Thus, the studies that use time-series data for one country seem to imply that income is not very relevant for well-being. Most economists have used (and are fond of) cross-section micro-empirical data, i.e. data at the individual level and for only one country. The empirical evidence based on studies employing such data is mixed, although the majority of studies find a low correlation between income and subjective well-being (see, e.g., Clark and Oswald, 1994 for the UK; and Frey and Stutzer, 2000a for Switzerland). The few micro-panel data studies, in which the same individuals are followed across time, report a positive effect of income on subjective well-being (van Praag et al., 2003 for Germany; and Ferrer-i-Carbonell and Frijters, 2004 for Germany). Finally, some studies use cross-section data on multiple countries, i.e. they base their results on country comparisons. The results thus obtained indicate a much lower correlation between income and subjective well-being within a country than between countries (Diener et al., 1999). In all, it can be concluded that richer individuals in the same country are only (if at all) slightly happier than their poor co-citizens, and economic growth in Western countries has not led to happier individuals.

On the other side, a high income allows people in modern societies to buy expensive cars, enjoy luxurious leisure activities, purchase the latest technologically advanced goods, and travel to exotic countries. Moreover, the majority of individuals express much interest in obtaining a higher income level, indicating that this is an explicit goal for most people. There are indeed studies that provide evidence that countries with higher income have higher average levels of well-being (Diener et al., 1995; Inglehart, 1990). In other words, individuals in richer countries, as well as richer individuals in one country, are slightly happier.

Several explanations have been given for what seems to be a contradiction. First, individual well-being does not only depend on income in absolute terms but also on

[1] The terms 'well-being', 'happiness', 'life satisfaction', and 'quality of life' are used interchangeably in this paper.

the subjective perception of whether one's income is adequate to satisfy one's needs. Second, individual income perception is subject to the individual's own situation in the past as well as to the individual's own income compared with the income of other people. The latter reflects the importance of the relative position of individuals in society for their satisfaction with life. This is often referred to as the "comparison income" or "relative utility" effect. According to Easterlin (1995, p. 36): "... happiness, or subjective well-being, varies directly with one's own income and inversely with the incomes of others". The "others" constitute what is known as the reference group. Third, it is often argued that individuals adapt to new situations by changing their expectations (Helson, 1947). This implies that higher incomes are accompanied by rising expectations that lead to what is known as "the hedonic treadmill" (Brickman and Campbell, 1971) or "preference drift" (van Praag, 1971). Thus, individuals strive for high incomes even if these lead only to a temporary or small increase in well-being.

This paper aims at an empirical testing of the importance for individual happiness or well-being of an individual's own income compared with the income of others: namely, the income of the reference group. This will be done through econometric regression of individual self-reported happiness, known as Subjective Well-Being (SWB). The empirical analysis is based on a large German panel data set, the German Socio-Economic Panel (GSOEP).[2] At a general level, this study contributes to the small empirical literature on interdependence of individual well-being and of individual preferences in general. The main contributions of this paper in relation to previous work are the following. First, the present study includes three different specifications to test the hypothesis of the importance of the reference group income on individual well-being. The other empirical studies only include the average income of the reference groups, and do not test for other hypotheses.

Second, the estimation of SWB includes a large set of control variables, such as family size, number of children, education, gender, age, and whether the individual works. Some of these variables are correlated with income, and thus, its inclusion is of importance for the study of the relation between income and well-being.

Third, the data set used here has a continuous measure of income. In past studies, often the income variable is only available in intervals and not on a continuous scale (for example, McBride, 2001). Additionally, SWB is measured on a 0 to 10 scale, which contrasts with other studies that only have a scale with three or four numbers. The larger the scale, the more precise is the measure of individual well-being. In short, the two most relevant variables for the analysis are of fairly good quality.

Fourth, the data is a micro-panel. The literature on the importance of income for SWB has been based on time-series or cross-sections at the macro- or micro-level. The use of time-series, which usually indicates a fairly stable SWB despite income growth, cannot capture the fact that individual expectations and standards change as everybody else is also getting richer. As a result, these studies cannot examine the comparison

[2] The data used in this publication were made available by the German Socio-Economic Panel Study (SOEP) at the German Institute for Economic Research (DIW), Berlin.

income effect. Cross-section analysis can be based on individuals in the same country (micro) or on multiple countries (macro). The latter type of analysis has been undertaken by psychologists, sociologists, and economists alike, leading to the conclusion that richer countries have higher average levels of well-being. Nevertheless, such country-comparisons suffer from the problem of cultural differences, which implies that the results are doubtful since stated SWB are not comparable among countries. Cross-section micro-empirical analysis does not suffer from this limitation. Moreover, this type of data allows us to test for the importance of the income of the reference group. The use of micro-panel data, as in the present case, has the same advantages as the cross-section micro-data and more. The use of panel data means that the individual's personal traits that largely determine SWB can be taken into account. An optimistic individual tends to have a higher SWB score than a pessimistic one, even if their objective situation is identical. The empirical analysis presented here corrects for this by including individual random effects. Thus, the error term, or unobservable variables, has a systematic part related to the individual that can be identified by means of panel data techniques.

The paper is structured as follows. Section 2 briefly discusses the interdependence among individual preferences, and surveys the literature. Section 3 introduces the subjective well-being question and formalizes the hypotheses to be tested. Section 4 presents the data and the estimation procedure. Section 5 discusses the empirical findings on the relationship between income, "comparison income", and well-being. Section 6 concludes.

2. Interdependence of preferences

The discussion about the interdependence of preferences and the importance of other individuals in one's utility and consumption decisions goes back to the inception of modern utility and consumption theory. At the beginning of the 20th century, Veblen argued that the marginal utility school failed to account for the significant importance of human interactions for individual decision making: "Then, too, the phenomena of human life occur only as phenomena of the life of a group or community" (Veblen, 1909, p. 629). In economics, the interrelation among individuals of a society is relevant at least in two respects. First, individuals are affected by the economic situation of their peers. Second, the consumption and behavior of individuals are influenced by decisions of other individuals in society (for a summary, see Hodgson, 1988). These two issues are closely related.

Already at the end of the 19th century, Fisher considered the introduction of the consumption of other individuals in individual utility. He argued that the purchase of diamonds, for example, depends not only on the good itself but also on the status given to it by society at large (Stigler, 1950). Veblen (1909, p. 632) explains this as follows: "Precious stones, it is admitted, even by hedonistic economists, are more esteemed than they would be if they were more plentiful and cheaper." Other economists of that time who highlighted the interdependent nature of wants are Knight (1922) and Clark (1918). Somewhat later, Duesenberry (1949) studied and empirically tested the impact of

interdependent preferences on individual consumption and savings behavior. Around the same time, Leibenstein (1950) reasoned that consumers get satisfaction not only from the good itself (functional demand) but also from other characteristics related to the consumption of the good (nonfunctional demand).[3] The nonfunctional demand includes the "Bandwagon effect": namely, when individuals consume a good because a large proportion of the society does so. In this case, the good serves the purpose of social belonging.

The work on interdependence of preferences was picked up by, among others, Frank (1985a), Kapteyn (1977), Kapteyn et al. (1978), and Holländer (2001). Other recent studies on the interdependence of preferences concerning consumption and savings decisions are, for example, Childers and Rao (1992), Bearden and Etzel (1982), Falk and Knell (2000), and Frank (1985b). All these studies find that individual consumption is partly driven by others' consumption. In particular, consumption decisions are, to a certain extent, a result of imitating others and following social standards. In this sense, consumption causes a negative externality by reducing the welfare of other individuals (Frank, 1989; Layard, 1980). Other studies have examined the influence of interdependent preferences on individual behavior other than consumption and savings: i.e. giving charity (see, e.g., Andreoni and Scholz, 1998); voting (see, e.g., Schram and Sonnemans, 1996); and labor market behavior (see, e.g., Aronsson et al., 1999; Charness and Grosskopf, 2001; Woittiez and Kapteyn, 1998).

Due to this interdependence of preferences, individual happiness and satisfaction will depend on what one achieves in comparison with others. If everybody were to drive a Rolls Royce, one would feel unhappy with a cheaper car. Thus, individual happiness and welfare depend not only on the material achievements and income in absolute terms but also on one's relative position income wise. Following this line of thought, it is usually assumed that individual well-being depends on the individual's own income as well as on the income of a reference group. The reference group can include all members of a society or only a subgroup, such as individuals living in the same neighborhood or having the same education level. Empirical studies that have tried to test this hypothesis are scarce. This lack of empirical work is consistent with the fact that the research on the interdependence of preferences is still marginalized in economics, even if fewer economists seem to believe in isolated individual preferences and utility.

Next, the main empirical findings using micro-data, as in the present case, on the relation between individual well-being or welfare and the income of the reference group, are summarized here. All the studies report a negative relation between an individual's own well-being or welfare and others' incomes. Kapteyn and van Herwaarden (1980), Kapteyn et al. (1978), Kapteyn et al. (1997), van Praag et al. (1979), and van de Stadt et al. (1985) present an empirical analysis of the importance for individuals' utility of their perception about where they are in the income distribution. Individual welfare is measured by means of reported answers to an income evaluation question. They find that

[3] This is also related to the distinction between intrinsic value and the subjective value made by the Greek philosophers (Georgescu-Roegen, 1968).

individual utility depends negatively on the income of the reference group. They call this phenomenon the *reference drift effect* (see, for example, Kapteyn et al., 1978, p. 177). Clark and Oswald (1996) find evidence of the negative influence of others' income on an individual's own job satisfaction, which is measured by means of self-reported questions. Thus, they analyze the comparison income effect on job-utility. On individual happiness, McBride (2001) presents an empirical analysis to test for the effect of an individual's own income, past financial situation, and cohort (reference) income on SWB. His study, as in the present case, is based on self-reported happiness. Past financial situation is subjectively defined by the respondents to as whether they were better-off or worse-off than their own parents. McBride (2001) finds a negative correlation between SWB and the average income of the individual's cohort and the financial situation of the parents. In other words, the higher the income of the peers, the less satisfied is the individual. McBride (2001) also tests for asymmetry of comparisons by regressing the SWB equation on different sub-samples according to income. He finds that the coefficient of the income of the reference group is larger for the richer sub-sample than for the poorer sample. This is in contradiction with Dusenberry's (1949) assumption that comparisons are only 'up-wards'.

3. Method of analysis

3.1. The life satisfaction question

The empirical analysis is based on a subjective, self-reported measure of well-being that was extracted from individual answers to a life satisfaction question. Life satisfaction questions have been posed into questionnaires for over three decades, starting with Bradburn (1969), Cantril (1965), and Likert (1932). In the GSOEP data set, which is used for the empirical analysis of this paper, the life satisfaction question runs as follows:

> And finally, we would like to ask you about your satisfaction with your life in general. Please answer by using the following scale, in which 0 means totally unhappy, and 10 means totally happy.
>
> How happy are you at present with your life as a whole?

The answer to this question takes discrete values from 0 to 10, and has been referred to as Subjective Well-Being (SWB), General Satisfaction, and self-reported life satisfaction. Here after, it is referred to as SWB.

Psychologists and recently economists have made ample use of subjectively evaluated measures of individual well-being, satisfaction, and welfare. See, for example, the economists Clark (1997, 1999), Clark and Oswald (1994, 1996), DiTella et al. (2001), Easterlin (1974, 1995, 2000, 2001), Ferrer-i-Carbonell and Frijters (2004), Ferrer-i-Carbonell and van Praag (2001, 2002), Frey and Stutzer (1999, 2000a, 2000b), Frijters (2000), Frijters et al. (2002), Frijters and van Praag (1998), Ng (1996, 1997), McBride (2001), Oswald (1997), van Praag and Ferrer-i-Carbonell (2004), van Praag et al. (2003), and Pradhan and Ravallion (2000).

In order to use answers to SWB questions in the analysis, three assumptions are needed: (1) individuals are able and willing to answer satisfaction questions; (2) there is a relation between what is measured and the concept the researcher is interested in; in particular, SWB is linked with the economic concept of welfare or well-being (W); (3) interpersonal comparability at an ordinal level is assumed; i.e. an individual with a SWB of 8 is strictly happier than one with a SWB of 6. Note that other studies sometimes assume cardinality, meaning that the satisfaction difference between a SWB equal to 8 and one equal to 6 is the same as between 6 and 4. For discussion of the underlying assumptions, see Ferrer-i-Carbonell (2002) and Ng (1996, 1997).

3.2. The hypotheses and corresponding specifications

This paper aims at testing the importance of the income of other individuals on own well-being. The following relation is assumed for each individual n at time t:

$$W = SWB(y, y_r, X), \tag{1}$$

where W is the economic concept of welfare or well-being, y stands for the family income and y_r for the family income of the reference group. The vector of variables X includes individual and household socio-economic and demographic characteristics, such as age, education, number of children living in the household, and whether the individual works. The set of variables X that influence individual SWB has been discussed in the economic and psychological literature (see, for example, Argyle, 1999). In the present paper, the decision of which variables X have to be included is based on the literature and data availability.

The empirical analysis will be based on four different specifications of Eq. (1) so as to test for various hypotheses regarding the influence of income and the income of the reference group on SWB. The most simple specification is one which includes, besides X, only own family income as a determinant of SWB. This will be the first specification presented in the empirical analysis. A common assumption in economics is that family income (y) is positively related to well-being. In cross-section analysis, the income coefficient has been always found to be positive although not very large. Often, the utility or individual welfare function is believed to be concave in income and, consequently, income is introduced in logarithmic form. This approach is followed here.

A second specification will add the income of the reference group to the first specification. The reference income, y_r, is anticipated to be negatively correlated with individual well-being. In other words, the higher the income of the reference group, the less satisfied individuals are with their own income. This paper defines the reference income of an individual as the average income of the reference group, i.e. $1/N_i \sum_i y$, where i are the individuals who belong to the same reference group. Y_r will be included in a logarithmic specification. So far, only a few other studies on satisfaction and income have included the income of the reference group in the regression (see, e.g., Clark and Oswald, 1996; Kapteyn and van Herwaarden, 1980; Kapteyn et al., 1997; McBride, 2001), and all found a negative coefficient.

A third specification assumes that SWB depends on the distance between the individual's own and the reference group income. This is done by including the difference between the logarithm of the individual's own income and the logarithm of the average income of the reference group, i.e. $\ln(y)-\ln(y_r)$. This variable is expected to have a positive impact on SWB, indicating that the richer an individual is in comparison with others, the happier she will be. Similarly, if y_r is larger than y, then the larger the difference, the unhappier the individual will be.

A fourth and last specification hypothesizes that income comparisons are not symmetric (see, e.g., Duesenberry, 1949; Holländer, 2001; Frank, 1985a,b). In this context, asymmetry means that, while the happiness of individuals is negatively affected by an income below that of their reference group, individuals with an income above that of their reference group do not experience a positive impact on happiness or well-being. This idea was introduced by Duesenberry (1949, Chap. 2), who argued that poorer individuals are negatively influenced by the income of their richer peers, while the opposite is not true, i.e. richer individuals do not get happier from knowing their income is above that of their co-citizens.

To test for asymmetry, two new variables, *richer* and *poorer*, are created as follows:

$$\begin{array}{ll} \text{If } y>y_r \text{ then} & \textit{richer} = \ln(y) - \ln(y_r) \\ & \textit{poorer} = 0 \\ \text{If } y<y_r \text{ then} & \textit{richer} = 0 \\ & \textit{poorer} = \ln(y_r) - \ln(y) \\ \text{If } y = y_r \text{ then} & \textit{richer} = 0 \\ & \textit{poorer} = 0 \end{array} \tag{2}$$

This fourth specification will include the set of explanatory variables X, own family income, and the two variables *poorer* and *richer*. According to the hypothesis, the coefficient of the variable *richer* is expected to be non-significant, or at least of a smaller magnitude than the variable *poorer*.

Some economists have argued that people perceive income increases of the poor as positive, so that income redistribution and taxation are justified from a Pareto-optimality perspective (see Hochman and Rodgers, 1969). A relevant question here is what would the structure of optimal taxation be when an individual is unhappier the higher the income of others is. Duesenberry (1949, p. 103) argues that if the asymmetry holds, then "... progressive income taxes are *necessary* to allocational efficiency". Evidently, testing for asymmetry, as is done here, is very appropriate for this policy-relevant issue. Theoretical work on how the optimal tax rate is affected by the introduction of relative income in individual's utility is scarce. All studies seem to agree that "... increase concern for relative consumption levels leads to higher income guarantees and marginal tax rates" (Boskin and Sheshinski, 1978, p. 590); or "Status-seeking offers real support for taxation and redistribution". (Ireland, 2001, p. 211) (see also Oswald, 1983; Layard, 1980). It is worth noting a statement by Boskin and Sheshinski (1978, pp. 599–600): "We hope that by demonstrating the potential policy relevance of empirical information on the "relative consumption effect", we shall encourage much additional empirical research on the subject

by economists and other social scientists". Needless to say that this has hardly been the case.

An obvious question is how to define the reference group, i.e. who belongs to the reference group of each individual. Does it include all the individuals of a country, or just those with the same education level, age, gender or region? The literature is divided on this. For example, Easterlin (1995) implicitly assumes that individuals compare themselves with all the other citizens of the same country. Persky and Tam (1990) assume that all individuals living in the same region are part of the same reference group. McBride (2001) includes in the reference group of each individual all people in USA who are in the age range of 5 years younger and 5 years older than the individual concerned. Van de Stadt et al. (1985) define the reference group according to education level, age, and employment status. In some studies, gender is also considered a relevant variable in defining a reference group.

The present study combines various criteria: the reference group contains all the individuals with a similar education level, inside the same age bracket, and living in the same region. Education is divided into five different categories according to the number of years of education: less than 10, 10, 11, 12, and 12 or more years of education. The age brackets are: younger than 25, 25–34, 35–44, 45–65, and 66 or older. The regions distinguished are West or East Germany This procedure generates 50 different reference groups. Note that the reference group is assumed to be exogenous, which is standard in empirical work.[4] Appendix A discusses the definition of the reference group in more detail and presents additional results when gender is included to define the reference group.

4. Data and estimation procedure

4.1. The data

The empirical analysis uses the German Socio-Economic Panel (GSOEP).[5] The GSOEP started in the former Federal Republic of Germany (West Germany) in 1984 and includes the former Democratic Republic of Germany (East Germany) since 1990. The present analysis uses the sub-sample 1992–1997. The number of missing observations is fairly small; for example, more than 90% of the individuals answer the SWB question. The objectively measured variables are characterized by very few missing observations. The sample includes about 16,000 individuals of which about 28% are Easterners. From the total sample, about 60% are workers and 48% are males. The average SWB over the 6-year period considered is 6.883. This average is higher for Westerners than for Easterners. The family income average is also higher in the West than in the East. The family income concept used throughout the paper is that of net family income, i.e. income after tax.

[4] Falk and Knell (2000) present a theoretical model in which the reference group is endogenous.

[5] The panel is described in detail by Burkhauser et al. (2001) and Wagner et al. (1993).

Later in Section 5, estimation results will be given for the whole sample as well as for the two sub-samples, i.e. Easterners and Westerners. This is done so as to capture possible differences between both regions due to the fact that both populations lived separately and under different economic and political circumstances for a very long time. Furthermore, SWB is better comparable between individuals with the same cultural background for whom the meaning of well-being and life satisfaction is fairly similar.

Note that the reference group is defined at the individual rather than the household level, while the individual income is operationalized as family income. Individuals are regarded to have their own reference group, which is not always the same as the one of their partner, although they may be identical in the case of couples composed by individuals with similar characteristics. On the other side, the income they enjoy is equal to the family income. The paper thus assumes that individuals judge their well-being by comparing their available income (i.e. family income) with the one of individuals with similar characteristics.

4.2. The estimation procedure

Individual well-being is not exactly observed. Instead a discrete ordered categorical variable SWB is observed. Consequently, the SWB question is estimated by means of an Ordered Probit model (see Maddala, 1983). The model here describes the latent unobservable variable, SWB* in the following way:

$$\mathrm{SWB}^{*}_{nt} = \alpha + \beta y_{nt} + \gamma\, y_{\mathrm{r},\,n\,t} + \sum_{k} \delta_k x_{k,\,n\,t} + \varepsilon_{n\,t}, \tag{3}$$

where n indicates the individual, t indicates the time, x is a set of k explanatory variables, y represents income, y_{r} represents reference income, and ε_{nt} captures the unobservables.

In order to make use of the panel structure of the data set, the estimation of Eq. (3) also includes fixed time effects and individual random effects. The inclusion of fixed time effects, T, accounts for the yearly changes that are the same for all individuals. The most relevant example in this context is inflation. Thus, by including time fixed effects, it is not necessary to transform the monetary variables from nominal to real terms. The individual random effects account for the unobservable characteristics that are constant across time but different for each individual: for example, individual personal traits such as optimism and capacity to deal with adversities. In other words, the regression accounts for the fact that given personal characteristics y, y_{r}, and x_k, optimistic individuals tend to report higher SWB than pessimistic individuals. The error structure of Eq. (3) is then rewritten as:

$$\varepsilon_{nt} = \upsilon_n + \eta_{nt}, \tag{4}$$

where υ_n is the individual random effect and η_{nt} is the usual error term. As usual, the error terms are assumed to be random and not correlated with the observable explanatory variables. For the case of the individual random effects, this seems a rather strong assumption, as it implies that unobservable individual characteristics, such as optimism

and intelligence, are not correlated with observable explanatory variables, such as income and education. The most widely used solution to address this issue was proposed by Mundlak (1978). He allows for correlation between the individual random effects and some of the observable variables by assuming the following structure of this correlation (see also Chamberlain, 1980; Hsiao, 1986):

$$v_n = \sum_j \lambda_j \bar{z}_{j,n} + \omega_n. \tag{5}$$

The individual random effect v_n is thus decomposed into two terms: (1) a pure error term, ω_n, which is not correlated with the observable explanatory variables; and (2) a part that is correlated with a subset, $z_{j,nt}$, of the observable variables, $x_{k,nt}$, where $j \leq k$. The correlation between $z_{j,nt}$ and the individual random effect is assumed to be of the form $\lambda\, \bar{z}_{j,n}$, where $\bar{z}_j$ is the average of z_j across time. The sub-set, $z_{j,nt}$, includes variables such as income and years of education. Other variables, such as age and gender, are not assumed to be correlated with the unobservable individual random effect. The coefficient λ can be read as a correlation corrector factor without any further meaning for SWB, or alternatively an economic interpretation can be given to λ. Here, λ is assumed to only represent a statistical correction.

Rewriting Eq. (3) by incorporating the individual random and the time fixed effects:

$$\mathrm{SWB}^*_{nt} = \alpha + \tau T + \beta y_{nt} + \gamma\, y_{r,\,nt} + \sum_k \delta_k\, x_{k,\,nt} + \sum_j \lambda_j \bar{z}_{j,\,n} + \omega_n + \eta_{nt} \tag{6}$$

The model uses the common assumption that $E(\omega)=E(\eta)=0$ and errors are normally distributed. Additionally, the model could have been estimated by means of a Logit model with individual fixed effects. Ferrer-i-Carbonell and Frijters (2004) show that such an approach yields similar results as the approach used in this paper, i.e. Ordered Probit with individual random effects and incorporating the Mundlak transformation. This is only true if the comparison does not use the coefficients λ (see Eq. (6)). In other words, if λ is interpreted only as picking up the correlation between individual unobservable random effects and some of the explanatory variables, the fixed and the random effect models give rise to similar results.

5. Estimation results

This section presents estimation results of the form of Eq. (6), which accommodates for the four different specifications presented in Section 3.2.[6] The discussion hereafter focuses on the income coefficients. The coefficients of the other variables do not present surprises

[6] The estimation procedure, Ordered Probit with individual random effects, was done with LIMDEP 7.0. Convergence was reached with the default convergence criterion and initial parameters, so that no further modifications were needed (Greene, 1998). As routine in Ordered Probit, the variance of the error term is standardized so that $\sigma^2_\eta=1$. Thus, the total error variance is equal to $1+\sigma^2_\omega$.

for the connoisseur of the SWB literature (e.g., age has a u-shape with a minimum subjective well-being at about 40 years old, individuals are more satisfied when working, or when living together with a beloved one). The interested reader is referred to Clark and Oswald (1994), Ferrer-i-Carbonell (2003), Frey and Stutzer (2002), and van Praag et al. (2003). The pseudo-R^2's for all four regressions are at about 0.07 to 0.08. This is in accordance with the general finding in the literature that only about 8% to 20% of individual SWB depends on objective variables and thus can be explained (Kahneman et al., 1999).

First, the results for the first, most simple, specification, in which only family income and the control variables are included, is given in Table 1. It is shown that the income coefficient is significant and positively related to SWB for all three sub-samples, i.e. all Germans, Easterners, and Westerners. This result is in accordance with the usual findings: namely, that richer individuals are, ceteris paribus, happier than their poorer co-citizens. The income coefficient is clearly larger for Easterners than for Westerners. The difference between both coefficients is statistically significant, i.e. the t-statistic $\frac{\beta_1-\beta_2}{\sqrt{\sigma^2_{\beta_1}+\sigma^2_{\beta_2}}}$ equals 4.8. This is in agreement with the literature, which suggests that (absolute) income is relatively more important for poorer individuals than for richer ones. Note that Easterners have a lower average income than the Westerners.

It is often argued that the relation between income and well-being is not very strong. To understand the importance of income for individual well-being, the family income coefficient has to be put into perspective. To do that, the income effect on SWB is compared with the effect of other variables. First, the impact of income on the SWB of two *representative individuals* is calculated. Hereafter, the *East (West) representative individual* is someone who lives in East (West) Germany in 1996 and has all the characteristics of the East (West) sample average. The expected SWB of the East and West representative individuals are equal to 3.643 and 3.760, respectively. These both fall between the intercept terms 6 and 7, which corresponds to the category 7 on the original 0 to 10 scale. This calculation shows that income is, after 'age', the individual characteristic that contributes most to the expected SWB of 3.643 and 3.760. For the East representative individual, education plays also an important role in determining well-being.

Second, the impact of income on SWB is compared with the impact of a change on other variables. For example, imagine that the West representative individual is identical to the one above, except that he/she lives alone. If this individual were to start living with a partner, he/she would then increase individual expected SWB in the same quantity as if he/she were to experience an income increase of almost 200%. For the East representative individual, this percentage equals 61%. Thus, for the East representative individual who lives alone, an income increase of 61% brings about the same happiness as starting to live with a partner. These two examples indicate that (a) for both samples the level of income is very important for individual SWB, (b) for the East, the effect of income on SWB is large compared to the effect of other variables; this is less so for the West.

Even if the level of income is very important for individual SWB, income increases lead to a small increase of SWB (and even a smaller one for Westerners). For example, the

Table 1
General Satisfaction, first specification

Ordered Probit Individual Random Effect, GSOEP 1992–1997						
	Total		Westerners		Easterners	
	Coefficient	*t*-Ratio	Coefficient	*t*-Ratio	Coefficient	*t*-Ratio
Constant	13.039	21.064	10.666	14.670	18.941	14.875
Dummy for 1992	0.223	15.527	0.350	20.516	−0.065	−2.289
Dummy for 1993	0.177	11.978	0.265	14.978	−0.033	−1.184
Dummy for 1994	0.115	7.605	0.182	10.096	−0.049	−1.700
Dummy for 1995	0.129	8.633	0.161	9.128	0.046	1.611
Dummy for 1996	0.096	6.110	0.113	6.076	0.038	1.306
ln(age)	−7.822	−22.526	−6.422	−15.728	−11.727	−16.562
ln(age)^2	1.039	21.763	0.840	14.954	1.593	16.356
Age reaches a minimum at	43.072		45.747		39.709	
ln(family income)	0.248	16.672	0.163	9.415	0.334	10.726
ln(years of education)	0.078	0.675	0.058	0.437	0.477	1.969
ln(number of children at home+1)	−0.046	−2.530	−0.029	−1.387	−0.018	−0.468
ln(number of adults at home)	−0.116	−6.354	−0.092	−4.432	−0.108	−2.758
Male	−0.068	−3.989	−0.065	−3.260	−0.058	−1.696
Living together	0.146	10.954	0.176	11.754	0.158	4.714
Worker	0.194	15.538	0.147	9.861	0.331	14.133
Easterner	−0.545	−23.808				
Mean (ln(family income))	0.449	15.690	0.485	14.653	0.517	8.461
Mean (ln(years of education))	−0.180	−1.459	−0.123	−0.863	−0.710	−2.790
Mean (ln(children at home+1))	−0.079	−2.585	−0.133	−3.764	−0.014	−0.230
Mean (ln(adults at home))	−0.184	−5.565	−0.115	−3.045	−0.538	−7.317
Intercept term 1	0.334	19.856	0.325	16.264	0.358	11.333
Intercept term 2	0.815	40.522	0.779	31.990	0.896	24.390
Intercept term 3	1.341	63.620	1.268	49.956	1.486	38.178
Intercept term 4	1.768	83.795	1.681	65.814	1.938	50.118
Intercept term 5	2.655	123.235	2.504	96.138	2.936	74.241
Intercept term 6	3.209	148.728	3.040	116.618	3.530	88.921
Intercept term 7	4.060	187.790	3.884	149.081	4.413	110.000
Intercept term 8	5.372	244.027	5.204	197.750	5.728	135.968
Intercept term 9	6.231	276.453	6.087	227.358	6.493	145.730
Std. Dev. of individual random effect	1.019	136.823	1.045	116.029	0.948	68.638
Number observations	71,911		51,472		20,439	
Number of individuals	15,881		11,527		4354	
Log likelihood	−124,201		−87,986.2		−35,823.4	
Pseudo-R^2	0.080		0.084		0.072	

West representative individual needs an income increase of about 46,000% in order to increase his or her expected SWB from 3.760 to 4.760. The income increase necessary to bring the East representative individual from 3.643 to 4.643 is of about 2000%. Remember that both representative individuals' expected SWB (3.643 and 3.760) correspond to 7 on a 0 to 10 scale. For West, the income increase needs to be about 220% in order to obtain an expected SBW of just above 3.884, which corresponds to category 8 of the original 0 to 10 scale. For East, this percentage is about 110%.

Table 2 presents the results for the second specification, in which, besides family income, the average income of the reference group is included.[7] The inclusion of the average income of the reference group does not change the family income coefficient significantly. The expected SWB for the East representative individual is now 3.660 and for the West representative individual 3.782, virtually the same as with the first specification and again corresponding to category 7 on the original 0 to 10 scale. As expected, the average income of the reference group has a negative impact on SWB (McBride, 2001). Actually, both income coefficients are very similar. For Westerners, the coefficient of the average income of the reference group is higher than the coefficient of the individual's own family income. For Easterners and for the total sample, this is the opposite. The results imply that if all individuals of the same reference group enjoy an income increase of the same magnitude, their expected SWB remains fairly constant.

Table 3 presents the results for the third specification, in which the average income of the reference group is substituted by the difference between the individual's own family income and reference income. As expected, the coefficient of the difference is positive, indicating that the larger an individual's own income is in comparison to the reference group income, the happier the individual is. Nevertheless, the coefficient of the difference between an individual's own income and reference groups income is only significant for the sub-sample of all Germans. Additionally, the income coefficient now becomes non-significant for all sub-samples.

For this specification, the East and West representative individuals have an expected SWB of 3.654 and 3.754, respectively. If the West representative individual experiences an income increase from about 3600 to 15,000 DM per month, while the income of the reference group is kept identical (3600 DM), his or her expected SWB increases to almost 12%, i.e. 3.988. This falls between the intercept terms 7 and 8, which corresponds to level 8 of the original 0 to 10 ranking. Imagine that this individual with an income of 15,000 DM now changes his or her reference group and starts comparing him or herself with a reference group with an average income of 15,000 DM. In these circumstances, the expected SWB would decrease to 3.802, corresponding to 7 in the original ranking. For the East representative individual, an increase in income from 3000 to 15,000 DM per month (with the income of the reference group kept identical, i.e. 3000 DM) increases SWB by almost 15%, i.e. to 4.193. This, however, still corresponds to level 7 of the original 0 to 10 ranking. If the East representative individual changes his or her reference group and starts comparing him or herself to a person with the average income of 15,000 DM, the expected SWB would decrease to 3.939.

[7] The three variables used to construct the reference income (age, education, and region) are also included in the regressions of general satisfaction that incorporate the reference income. The reason is that it is assumed that these three explanatory variables have two effects, namely a pure effect (for example, higher educated individuals have more resources to generate income and solutions to any problems), and through creating the individual reference group. One needs to show that there are no problems of multicollinearity. Various empirical tests have been done, all of which lead to conclude that multicollinearity is not a problem here. The most conclusive test is regressing subjective well-being with reference income but without age and education. This leads to similar conclusions as the ones presented in Table 2. This is: income is more important for Easterners than for Westerners (and significantly so); and all income coefficients are significant and have the right signs (own income is positively significant and reference income is negatively significant).

Table 2
General Satisfaction, second specification

Ordered Probit Individual Random Effect, GSOEP 1992–1997						
	Total		Westerners		Easterners	
	Coefficient	*t*-Ratio	Coefficient	*t*-Ratio	Coefficient	*t*-Ratio
Constant	14.470	20.615	11.983	14.796	20.452	13.759
Dummy for 1992	0.220	15.367	0.348	20.427	−0.071	−2.479
Dummy for 1993	0.177	11.974	0.266	15.053	−0.037	−1.329
Dummy for 1994	0.115	7.559	0.181	10.051	−0.052	−1.799
Dummy for 1995	0.129	8.614	0.160	9.091	0.044	1.549
Dummy for 1996	0.096	6.160	0.114	6.119	0.038	1.289
ln(age)	−7.693	−21.543	−6.303	−14.860	−11.635	−16.446
ln(age)^2	1.017	20.603	0.819	13.996	1.572	16.045
Age reaches a minimum at	43.995		46.781		40.508	
ln(family income)	0.248	16.801	0.167	9.698	0.333	10.727
ln(years of education)	0.112	0.971	0.081	0.605	0.503	2.082
ln(number of children at home+1)	−0.046	−2.542	−0.028	−1.372	−0.016	−0.433
ln(number of adults at home)	−0.114	−6.299	−0.093	−4.516	−0.104	−2.652
Male	−0.064	−3.678	−0.064	−3.191	−0.055	−1.639
Living together	0.144	10.808	0.175	11.718	0.156	4.679
ln[average Income Reference Group][a]	−0.226	−3.469	−0.206	−2.682	−0.244	−1.845
Worker	0.197	15.771	0.150	10.067	0.331	14.162
Easterner	−0.598	−21.615				
Mean (ln(family income))	0.456	16.065	0.486	14.813	0.535	8.753
Mean (ln(years of education))	−0.126	−1.012	−0.063	−0.435	−0.626	−2.404
Mean (ln(children at home+1))	−0.084	−2.751	−0.143	−4.045	−0.019	−0.304
Mean (ln(adults at home))	−0.185	−5.580	−0.113	−2.986	−0.544	−7.420
Intercept term 1	0.333	19.859	0.325	16.270	0.358	11.335
Intercept term 2	0.815	40.519	0.779	32.024	0.896	24.391
Intercept term 3	1.341	63.604	1.268	49.954	1.485	38.182
Intercept term 4	1.768	83.739	1.679	65.731	1.937	50.118
Intercept term 5	2.655	123.200	2.503	96.096	2.936	74.239
Intercept term 6	3.208	148.708	3.038	116.572	3.529	88.913
Intercept term 7	4.060	187.781	3.883	149.038	4.411	109.992
Intercept term 8	5.372	244.190	5.203	197.872	5.726	135.961
Intercept term 9	6.232	276.681	6.085	227.560	6.492	145.683
Std. Dev. of individual random effect	1.018	136.815	1.044	116.065	0.947	68.581
Number of observations	71,911		51,472		20,439	
Num. of individuals	15,881		11,527		4354	
Log likelihood	−124,252		−88,048.9		−35,829.9	
Pseudo-R^2	0.0800		0.0834		0.0714	

[a] The reference income is defined as the average income of all individuals in the same reference group. The reference group is defined by education, age, and region (i.e. West or East Germany).

Table 4 presents the results for the fourth specification, which includes the variables *richer* and *poorer*. The family income coefficient is, as for the third specification, non-significant for all three sub-samples. Table 4 indicates that for Easterners the comparison income effect is symmetric, i.e. the variables *richer* and *poorer* have approximately the

Table 3
General Satisfaction, third specification

Ordered Probit Individual Random Effect, GSOEP 1992–1997						
	Total		Westerners		Easterners	
	Coefficient	*t*-Ratio	Coefficient	*t*-Ratio	Coefficient	*t*-Ratio
Constant	13.646	20.239	11.184	14.330	19.746	13.643
Dummy for 1992	0.222	15.434	0.350	20.492	−0.069	−2.398
Dummy for 1993	0.176	11.901	0.265	14.948	−0.036	−1.273
Dummy for 1994	0.114	7.542	0.182	10.063	−0.051	−1.765
Dummy for 1995	0.129	8.575	0.161	9.091	0.045	1.561
Dummy for 1996	0.095	6.088	0.113	6.060	0.038	1.285
ln(age)	−7.619	−20.941	−6.196	−14.235	−11.582	−16.147
$\ln(age)^2$	1.009	20.038	0.807	13.404	1.569	15.791
Age reaches a minimum at	43.554		46.378		40.120	
ln(family income)	0.109	1.644	0.033	0.413	0.176	1.325
ln(years of education)	0.090	0.780	0.074	0.557	0.476	1.963
ln(children+1)	−0.045	−2.475	−0.028	−1.340	−0.017	−0.442
ln(adults)	−0.114	−6.276	−0.091	−4.373	−0.106	−2.706
Male	−0.067	−3.899	−0.063	−3.170	−0.057	−1.685
Living together	0.144	10.858	0.175	11.701	0.155	4.643
ln(Fam.inc.)− ln(Avg(IncRefGroup))[a]	0.138	2.130	0.131	1.682	0.158	1.229
Worker	0.195	15.629	0.148	9.940	0.332	14.165
Easterner	−0.574	−21.376				
Mean (ln(f.inc))	0.455	15.868	0.489	14.756	0.527	8.591
Mean (ln(years edu))	−0.136	−1.086	−0.088	−0.606	−0.636	−2.421
Mean (ln(ch+1))	−0.078	−2.559	−0.133	−3.758	−0.014	−0.215
Mean (ln(adults))	−0.180	−5.448	−0.111	−2.943	−0.535	−7.270
Intercept term 1	0.334	19.856	0.325	16.263	0.358	11.333
Intercept term 2	0.815	40.514	0.779	31.979	0.896	24.393
Intercept term 3	1.341	63.595	1.268	49.921	1.485	38.181
Intercept term 4	1.768	83.748	1.680	65.757	1.937	50.120
Intercept term 5	2.655	123.172	2.504	96.068	2.936	74.249
Intercept term 6	3.209	148.640	3.039	116.521	3.530	88.926
Intercept term 7	4.060	187.661	3.884	148.935	4.413	110.007
Intercept term 8	5.371	243.906	5.204	197.577	5.728	136.000
Intercept term 9	6.231	276.344	6.086	227.211	6.493	145.762
Std. Dev. of individual random effect	1.018	136.771	1.045	115.967	0.947	68.615
Number of observations	71,911		51,472		20,439	
Number of individuals	15,881		11,527		4354	
Log likelihood	−124,199		−87,984.9		−35,822.6	
Pseudo-R^2	0.080		0.083		0.072	

[a] The reference income is defined as the average income of all individuals in the same reference group. The reference group is defined by education, age, and region (i.e. West or East Germany).

same magnitude. Nevertheless, these two variables are non-significant. The equality of coefficients was tested using the *t*-statistic $\frac{\beta_1-\beta_2}{\sqrt{\sigma^2_{\beta_1}+\sigma^2_{\beta_2}}}$, which equals 1.67. On the other hand, for Westerners and for the whole sample, the comparisons are asymmetric. In concrete terms, the coefficient for *richer* is non-significant and smaller than the coefficient

Table 4
General Satisfaction, fourth specification

Ordered Probit Individual Random Effect, GSOEP 1992–1997						
	Total		Westerners		Easterners	
	Coefficient	*t*-Ratio	Coefficient	*t*-Ratio	Coefficient	*t*-Ratio
Constant	13.679	20.283	11.253	14.415	19.738	13.637
Dummy for 1992	0.219	15.199	0.346	20.264	−0.069	−2.388
Dummy for 1993	0.174	11.792	0.264	14.880	−0.036	−1.273
Dummy for 1994	0.114	7.487	0.181	10.020	−0.051	−1.765
Dummy for 1995	0.128	8.548	0.160	9.079	0.045	1.557
Dummy for 1996	0.096	6.136	0.114	6.152	0.038	1.284
ln(age)	−7.617	−20.947	−6.210	−14.278	−11.577	−16.137
ln(age)^2	1.009	20.044	0.809	13.447	1.568	15.780
Age reaches a minimum at	43.548		46.346		40.119	
ln(family income)	0.100	1.496	0.019	0.234	0.175	1.319
ln(years of education)	0.090	0.778	0.069	0.519	0.476	1.964
ln(children+1)	−0.045	−2.518	−0.029	−1.390	−0.017	−0.443
ln(adults)	−0.112	−6.149	−0.087	−4.160	−0.106	−2.702
Male	−0.067	−3.946	−0.065	−3.249	−0.057	−1.684
Living together	0.139	10.418	0.168	11.165	0.155	4.602
Richer than average ($\ln(Y)-\ln(Y_r)>0$)[a]	0.079	1.173	0.037	0.456	0.153	1.156
Poorer than average ($\ln(Y_r)-\ln(Y)>0$)[a]	−0.189	−2.826	−0.208	−2.602	−0.161	−1.216
Worker	0.195	15.594	0.147	9.892	0.332	14.161
Easterner	−0.575	−21.435				
Mean (ln(family income))	0.463	16.074	0.503	15.078	0.527	8.561
Mean (ln(years of education))	−0.134	−1.073	−0.082	−0.564	−0.637	−2.423
Mean (ln(children at home+1))	−0.080	−2.626	−0.137	−3.862	−0.014	−0.216
Mean (ln(adults at home))	−0.183	−5.522	−0.116	−3.061	−0.535	−7.266
			0.263			
Intercept term 1	0.334	19.854	0.325	16.259	0.358	11.332
Intercept term 2	0.815	40.499	0.779	31.959	0.896	24.390
Intercept term 3	1.342	63.561	1.268	49.875	1.485	38.179
Intercept term 4	1.769	83.696	1.681	65.687	1.937	50.120
Intercept term 5	2.656	123.112	2.504	96.007	2.936	74.247
Intercept term 6	3.209	148.563	3.040	116.443	3.530	88.925
Intercept term 7	4.061	187.562	3.884	148.831	4.413	110.002
Intercept term 8	5.372	243.763	5.204	197.444	5.728	135.992
Intercept term 9	6.231	276.163	6.087	227.068	6.493	145.744
Std. Dev. of individual random effect	1.018	136.698	1.044	115.908	0.947	68.583
Number of observations	71,911		51,472		20,439	
Number of individuals	15,881		11,527		4354	
Log likelihood	−124,194		−87,977.3		−35,822.6	
Pseudo-R^2	0.080		0.083		0.072	

[a] The reference income is defined as the average income of all individuals in the same reference group. The reference group is defined by education, age, and region (i.e. West or East Germany).

for *poorer*. The coefficient of the variable *poorer* is significant for both sub-samples. Again this was tested using the above mentioned *t*-statistics. For West Germans, the difference between the coefficients richer and poorer is 2.15 and for the total sample it is 2.82. This result yields the conclusion that for West Germans comparisons are, as postulated by Duesenberry (1949), asymmetric and upwards. This is in contradiction with the findings of McBride's (2001), who regresses SWB on a US data set. For Easterners, comparisons are symmetric.

The estimated effect of the reference income on SWB in East Germany is not very stable. This is somewhat puzzling. Senik (2004b) finds that the income of the reference group has a positive effect on the subjective well-being of Russian individuals. She justifies her results by arguing that in an unstable economy like Russia's, individuals take the reference income not as a comparison but as an information measure to create future expectations. In other words, Senik argues that individuals who see richer people around them take this as a sign that their own income may soon increase, which contributes to their happiness. Evidently, the East Germany economy cannot be compared with Russia's. Nevertheless, East Germans still face an uncertain economy with high unemployment. In 2000, unemployment in East Germany was about 16%, which was twice as much as in West Germany. Thus, the reference income effect in East Germany may capture both a comparison and an information effect. These two effects may cancel out, which can explain the ambiguous results found for East Germany, namely that the reference income effect is small, even if it is never positive. Although the income results for East Germany are not always stable, they do lead to a number of insights: income is more important for SWB in East than in West; and the reference income is negative at 10% level. Nevertheless, the difference between the own and the reference income and the coefficients of "poor" and "rich" are not significant.

6. Conclusions

This paper presented an empirical test of four hypotheses about the importance of income and "comparison income" for individual well-being. The empirical analysis has taken the responses to a life satisfaction question as a measure for individual well-being or happiness. The data used is a sub-sample of a large German micro-panel data set (GSOEP). The estimation results distinguish between (former) East and West Germans.

The relevance of the present study lies in two features. First, it contributes to the small empirical literature on the impact of interdependent preferences on individual well-being. This is especially true when looking at the studies that, like this one, use micro-data and measure well-being by means of self-reported answers to a life satisfaction question. Second, it differs from other studies, as it tests four different hypotheses of the relation between income and individual well-being. The four specifications are based on the following hypotheses: (1) only an individual's own family income is important; (2) individual well-being depends on the income of the reference group; or, (3) on the difference between an individual's own income and the

average income of the reference group; and (4) income comparisons are 'upwards'. The empirical analysis estimates individual subjective well-being by means of an Ordered Probit model with individual random effects. The regression includes a large set of variables, such as education and working status.

The main conclusions can be summarized as follows: (1) even if income has a small effect on individual well-being, the effect is not insignificant when compared with other objective variables; (2) the impact of income on individual well-being is larger for East than for West Germans, which makes sense, given that Easterners are poorer than Westerners; (3) increases in family income accompanied by identical increases in the income of the reference group do not lead to significant changes in well-being; (4) the larger an individual's own income is in comparison with the income of the reference group, the happier the individual is; and (5) for Westerners and for the total German sample, the comparison effects are asymmetric; this means that poorer individuals' well-being is negatively influenced by the fact that their income is lower than that of their reference group, while richer individuals do not get happier from having an income above the average. In other words, comparisons are mostly 'up-wards'.

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Appendix A. Including gender to define the reference group

The individual's reference group has been exogenously defined as all the individuals who belong to the same age group, have similar education and live in the same region, i.e. East or West. Admittedly, one could also think of other variables defining the reference group. Gender seems an obvious one.[8] Other possibilities are job characteristics of the individual, such as the sector working in and the sort of position. For example, Clark and Oswald (1996) use a large set of work related variables to define the reference group. In their scenario that made sense, since they tried to explain individual job satisfaction and were using only a sub-set of working individuals. In the present case, however, the sample includes also non-working individuals for whom there are no work related variables.

Here, statistical regression results are presented for specification two[9] when the reference group of an individual is also defined by gender. This assumes that women (men) evaluate their economic situation in comparison with other women (men) instead of with all other individuals who have similar education and age, and live in the same region.

[8] The two referees of this paper asked to include gender in the reference group definition.

[9] Specification two is the one that includes family income and income of the reference group.

Making a reference group using gender allows testing of the hypothesis that in Germany equally qualified individuals earn different wages when they are men than when they are women.

Table 5 compares the results for the total sample when the reference group is defined with or without gender. The first two columns are the same as those in Table 2. The last two columns present the same specification with the reference group also defined with

Table 5
General Satisfaction, second specification

Ordered Probit Individual Random Effect, GSOEP 1992–1997				
	Total		Total	
	Coefficient	*t*-Ratio	Coefficient	*t*-Ratio
	Reference group=Education, age, region		Reference group=Education, age, region and gender	
Constant	14.470	20.615	14.211	20.440
Dummy for 1992	0.220	15.367	0.221	15.399
Dummy for 1993	0.177	11.974	0.177	12.001
Dummy for 1994	0.115	7.559	0.115	7.583
Dummy for 1995	0.129	8.614	0.129	8.633
Dummy for 1996	0.096	6.160	0.096	6.168
ln(age)	−7.693	−21.543	−7.731	−21.627
$\ln(age)^2$	1.017	20.603	1.022	20.704
Age reaches a minimum at	43.995		43.844	
ln(family income)	0.248	16.801	0.249	16.812
ln(years of education)	0.112	0.971	0.107	0.924
ln(number children at home+1)	−0.046	−2.542	−0.046	−2.557
ln(number adults at home)	−0.114	−6.299	−0.115	−6.318
Male	−0.064	−3.678	−0.057	−3.243
Living together	0.144	10.808	0.145	10.873
ln[average Income Reference Group]	−0.226	−3.469	−0.181	−2.843
Worker	0.197	15.771	0.196	15.709
Easterner	−0.598	−21.615	−0.587	−21.356
Mean (ln(family income))	0.456	16.065	0.455	15.999
Mean (ln(years of education))	−0.126	−1.012	−0.141	−1.133
Mean (ln(children at home+1))	−0.084	−2.751	−0.085	−2.777
Mean (ln(adults at home))	−0.185	−5.580	−0.185	−5.583
Intercept term 1	0.333	19.859	0.333	19.860
Intercept term 2	0.815	40.519	0.815	40.518
Intercept term 3	1.341	63.604	1.341	63.606
Intercept term 4	1.768	83.739	1.768	83.743
Intercept term 5	2.655	123.200	2.655	123.198
Intercept term 6	3.208	148.708	3.209	148.706
Intercept term 7	4.060	187.781	4.060	187.776
Intercept term 8	5.372	244.190	5.372	244.182
Intercept term 9	6.232	276.681	6.232	276.665
Std. Dev. of individual random effect	1.018	136.815	1.019	136.797
Number of observations	71,911		71,953	
Number of individuals	15,881		15,881	
Log likelihood	−124,252		−124,254	

gender.[10] The coefficient of the importance of the reference group for an individual's well-being when the reference group does not include gender is −0.226, and when it includes gender is −0.181. Using the t-statistic $\frac{\beta_1-\beta_2}{\sqrt{\sigma^2_{\beta_1}+\sigma^2_{\beta_2}}}$, this difference turns out to be statistically not significant.

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[10] When gender is included, the analysis includes 100 instead of 50 different reference groups.

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