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ABSTRACT

What Can Happiness Research Tell Us About Altruism? Evidence from the German Socio-Economic Panel*

Much progress has been made in recent years on developing and applying a direct measure of utility using survey questions on subjective well-being. In this paper we explore whether this new type of measurement can be fruitfully applied to the study of interdependent utility in general, and altruism between parents and children in particular. We introduce an appropriate econometric methodology and, using data from the German Socio-Economic Panel for the years 2000-2002, find that the parents' self-reported happiness depends positively, albeit not very strongly, on the happiness of adult children who moved out.

JEL Classification: D6, D64, C25, J10

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1 Introduction

In economics, altruism is commonly defined in terms of behavior. The standard definition involves a transfer: an altruist reduces his or her own wealth or consumption in order to increase the wealth or consumption of a beneficiary. Often, altruism is studied in the context of a family, where the benefactor is the parent and the beneficiary is the child.[1]. The altruism hypothesis says that parents make transfers to their children because they care for their well-being *per se*, without expecting to be "paid back" and have a direct material benefit in return. Becker (1974, 1981, 1991) formalized parental altruism within a framework of utility maximization under interdependent preferences. Past empirical studies of altruism have focussed on predictions of the model, such as the implied correlation between transfer payments and income, rather than on the preference structure *per se*.

We argue that such a direct analysis is now overdue since much progress has been made in recent years on developing and applying a direct measure of utility using survey questions on subjective well-being, or happiness. In fact, economically motivated empirical research on the determinants of individual happiness has boomed (see e.g., Frey and Stutzer, 2001, 2002, Blanchflower and Oswald, 2004). However, relatively few studies have investigated whether and how happiness between persons is interdependent. Exceptions include Winkelmann and Winkelmann (1995) who document a large negative effect of a husband's unemployment on the happiness of the spouse, and Winkelmann (2005) who models the intra-family correlation of subjective well-being using a hierarchical random-effects model. In this paper, we explore whether this new type of measurement of utility can be fruitfully applied to the study of the nature of interdependent preferences in general, and altruism between parents and children in particular.

In the spirit of Becker's seminal analysis and many papers that followed, we concentrate on

[1] Altruistic behavior can of course also be found among non-related individuals. Recent experimental research considers cases where the "benefactor" incurs costs to punish the "beneficiary", an instance of so-called altruistic punishment, which may be applied to a norm-violator or non-cooperating person in a situation that requires cooperation (see for example Fehr und Fischbacher, 2003)

altruism within the extended family. One reason for this is pragmatic, as we have access to survey data on happiness of parents and adult children. A second reason is substantive, since knowing whether transfers of income, wealth and in-kind services between family members are driven by altruism, exchange or joy of giving is crucial for efficient reforms of old age security, long-term care and social assistance. It can be shown, e.g., that attempts by governments to redistribute income between generations can be neutralized if families are altruistic, since if the income of a beneficiary of an altrustic transfer is increased, that transfer will be reduced by an equal amount (see Laferrére and Wolff, 2004, for a current survey of the literature). The majority of empirical papers estimate inter household transfer equations where the amount of transfers from parents to children is regressed on the parents' income and income of the child together with other variables. Subsequently, tests can be set up to verify predictions from the model of altruistic families. However, this approach requires specific data on transfer payments between family members, and our suggestion to test for altruism with widely available happiness responses therefore constitutes a potentially useful alternative.

Section 2 describes the data from the German Socio-Economic Panel Study (SOEP). A descriptive analysis of happiness interdependencies between parents and their children is given in Section 3. In Section 4 we consider a simple model of altruistic families as the starting point for testing altruistic preferences empirically. We find that the identification and estimation of the altruism parameter faces a number of obstacles that are subsequently addressed in the econometric analysis. In a nutshell, the correlation in happiness between parents and children is not a good measure of altruism, since it ignores omitted variables as well as the simultaneity (or reflection) problem. Panel models with individual specific effects and instrumental variable estimators can address these issues. We discuss models with and without the simplifying assumption of cardinality of the ordered happiness responses. The regression results are presented in Section 5. Finally, Section 6 concludes.

2 Data

Since the German Socio-Economic Panel (SOEP) was started in 1984, many children moved from their parents' household to live in an own household alone or together with a partner and own children.[2] An important feature of the SOEP is to trace moved persons. New households founded by persons who moved from an original panel household become a member of the SOEP sample. The SOEP also provides information to link moved children with household as well as personal information of their mother, father or both. The longer the SOEP lasts the greater the probability to find parents who can be linked to their children outside the household. Thus, the recent waves of the SOEP from 2000 to 2002 are used to construct the data set. For some of the models we want to estimate, a single cross-section would be sufficient. For others, however, the panel information is essential.

The basic unit of observation is a parent-child pair. We start by extracting from the SOEP all parents, be they fathers or mothers. If we can find for any of these fathers or mothers and any year information for at least one child that lives in a spin-off household and provides valid information in the data, this parent-child pair constitutes one observation. Each additional child for a given parent generates one additional observation. The structure of the data set from the parents point of views, for the year 2002, is depicted in Table 1. The basis are 1,750 parents for whom information on up to five children not living in the same household was found in the SOEP. For 1,317 parents information for one child not living in the same household was found. 363 parents have two children, thus they are doubled. And so on. All together the data set consists of 2,264 observations (=parent/child pairs). From the total of 1,750 parents 1,454 or 83 percent share the same household background, meaning they lived together in the same household when their children were young.

— Table 1 —

The sampling structure generates two types of interdependencies between records of parents-

[2]It has to be noted that it is not possible to distinguish between biological and non-biological children in the SOEP.

child pairs. First, in any year information on the same child can appear twice, once linked to the father and once linked to the mother. Second, information on a parent can appear repeatedly, up to five times, as the same parent is observed in different parent/child combinations. Therefore, the dataset does not really form a random sample from the universe of all parents. In the regression analysis reported below, for example, each parent is included only once per year, and the information on children is averaged if more than one child is observed for that parent. Finally, we also should point out that the data have a household structure (as both parents are observed in most cases). As to the time structure, we do not require the panel to be balanced. In fact, the total number of parents in the data with at least one entry over all three years is 2,106. 18.4 percent of parents are observed only once, 23.9 percent are included twice and the remaining fraction of 57.7 percent is observed in all three years, adding up to 5,041 independent parent-year observations. The total number of children in any year is 1,679. Again, many children are observed repeatedly over time, so that there are 3,771 child-year observations.

The SOEP provides a wide range of socio-economic variables on households and persons. Satisfaction is central for the present paper. Each respondent is asked for her life satisfaction: How satisfied are you with your life, all things considered? Please answer according to the following scale: 0 means completely dissatisfied, 10 means completely satisfied. In Table 2 we see that the arithmetic mean of the happiness response is 6.6 for parents and 7.1 for children.

— Table 2 —

In addition, we extract information on the following usual characteristics, which have been discussed in the literature as potential determinants of life satisfaction: age, age squared, health, gender, nationality, years of education, marital status, whether widowed, whether divorced, household size, number of children, place of abode, employment status, and income. Health is measured by a self rating of the respondents on a five point scale, and converted to a "good-health" indicator for the values four and five. Income is measured as disposable monthly income of the household (pre-government income). Information for children not living in the parent's household are age, gender, marital status, health, education, employment status, and household income. All these variables are computed in the same way as for parents.

From Table 2, we see that parents are on average about 27 years older than their adult children. Children report a substantially better health than parents (69 percent as opposed to 30 percent with "good health"). On the other hand, the marital rate is much lower among children than among parents (48 percent as opposed to 83 percent). Fewer children own a house, and their average income is about 12 percent below the income of parents.

In addition to those standard socio-economic variables, two measure of distance are used. The distance between a parent and her child might be important in two ways. First, the distance itself might influence a parent's well-being. Second, the distance can serve as a measure of information. The greater the distance between the households the less accurate might be the information which parents have about the living conditions of their children. We employ two measures for the geographical distance between parents and children. A first is a simple indicator whether or not the child lives in the same district as the parents – this is the case for 67 percent of all children. The second is the distance in kilometers, using the geographical coordinate of the county's midpoint (European Terrestrial Reference System, ETRS89).[3]

3 Is happiness interdependent?

What prima facie evidence is there for interdependent happiness? For example, is it the case that happier parents also have happier children? Since happiness is measured as an ordinal discrete variable, we first look at cross-tabulations rather than correlations. Table 3 shows such a simple cross-tabulation of happiness for parents and children. Observations are pooled over the three years. The original eleven point scale is collapsed into a trichotomy: 0-5, 6-7, 8-10 corresponding to the notions of below, average, and above average happiness. The table indicates a positive relationship

[3] According to data protection rules, this part of research using regional information was carried out at the DIW Berlin. We thank the staff for making the information available.

between the happiness of children and the happiness of parents. For example, only 23 percent of parents of children with below average happiness report an above average happiness themselves, compared to 43 percent of those parents with above average happy children. A formal Pearson chi-squared test rejects the independence hypothesis with p-value of 0.000.[4] A similar result is obtained, when the original eleven-point scale rather than the grouped categories is used.

— Table 3 —

If happiness between parents and children were causally related, then one would expect to find that *changes* in happiness between parents and children are related as well. In fact, such an association would be stronger evidence for a causal relation, as it eliminates any potential confounding interference of time-invariant factors that affect happiness of both parent and child. Happiness changes can be computed for parent-child pairs, where valid happiness responses are observed for at least two consecutive years. In our data, there are a total of 4401 such differences, and their joint frequencies are displayed in Table 4. For simplicity, we at first only distinguish between the three outcomes "decrease", "no change", and "increase".

— Table 4 —

An interesting pattern is the high proportion of "no change" among parents. Indeed, the "no change" fraction is almost twice as high among parents than among children, and parents' responses accordingly are much more stable than those of children. This may be due to a survey effect according to which more extreme responses on the eleven point happiness scale are less likely to be chosen the longer the individual participated in the survey. Another potential explanation is that parents tend to be older – the average age of parents in the sample is 57 years, compared to 30 years for children – and the life circumstances of older persons are more settled than those of younger ones, leading to less variation in the happiness responses.

[4]The Pearson test is here only an approximation, as it assumes independent sampling, whereas the data presented here exhibit some systematic interdependencies, as discussed in the previous section. Therefore, the test will somewhat underestimate the true p-value.

Although a Pearson chi-squared test rejects the null-hypothesis of independence, the direction of the effect is not so clear and, at a minimum, not very strong. For example, the Spearman rank correlation between the changes of parents and children is 0.032, with p-value of 0.035. A possible reason for the small effect might be that the evidence in Table 4 does not distinguish between small and large changes in happiness. For example, how does an increase (or decrease) of a child's happiness by a minimum of 3 points on the eleven point response scale associate with contemporaneous changes in parental happiness? Table 5 provides evidence on the effect of such substantial changes in child happiness on parents' happiness by displaying the conditional distributions of the changes in parents' happiness.[5] Indeed, we find that the effect is now somewhat larger compared to the effect of any change (repeated in the first two columns of the table). For example, the relative frequency of an increase in happiness for parents is lowered by 5 percentage points if the child's happiness decreased by a minimum of 3, compared to the case where the child's happiness increased by a minimum of 3. In the "all changes" comparison, the corresponding effect is reduced to 2.5 percentage points.

— Table 5 —

To summarize, there is some evidence for interdependent happiness responses of parents and adult children who have left home and live in their own household. However, the association is not very strong. Moreover, this descriptive analysis does not distinguish between alternative explanations for the interdependence. In particular, it cannot establish whether it is due to altruism on the part of parents and children, or whether it is due to some other factors. For a closer understanding of what these results tell us about altruism, we need a more formal modeling approach as it is provided in the next section.

[5] Such large changes are of course relatively infrequent. The table is based on 93 and 97 observations for negative / positive changes respectively.

4 Empirical models of altruism

We consider altruism in the context of a family, specifically between parents and adult children who have left home. The choice of altruism between parents and adult children who no longer live at home has both theoretical and practical advantages. A theoretical reason for this focus is that it ties in nicely with the literature on economic linkages in the extended family (for example Altonji et al, 1992). Defining the family properly has important consequences for the efficacy of family and tax policies. A practical reason is that only adult children (or at least those aged 17 or above) respond to the happiness question. Moreover, only for children living in a separate household is the independent information on consumption proxies available, which is required for an instrumental variable estimation, as detailed below. Although the focus here is on parents and adult children most of the methods discussed in this section are more general, and could be equally applied to other within-family (e.g. altruism between parents and children living at home or between spouses) or not-within family pairings (friends, colleagues, unrelated persons).

Starting point is the Becker (1991) formulation of an additive separable altruistic utility function:[6]

$$Z = U(C_p) + \eta V(C_k) \tag{1}$$

where C_p denotes consumption of the parent and C_k denotes consumption of the child. Thus, the total utility of the parent Z equals utility from own consumption plus the child's utility from consumption times η, where $0 \leq \eta < 1$.[7]

In the following we explore possibilities to estimate η directly, and to test the hypothesis $\eta = 0$

[6] The idea of such a formalisation of altruism is in fact much older. Edgeworth in his *Mathematical Psychics* of 1881, considering an economy with two agents X and Y with utility P and Π, respectively, wrote that "...we might suppose that the object which X (whose own utility is P), tends –in a calm, effective moment– to maximise, is not P but $P + \lambda\Pi$; where λ is a *coefficient of effective sympathy.*" (p. 53).

[7] The Becker altruistic utility function is a special case of general interdependent preferences where $Z = U(C_p, C_k)$.

(=selfishness) against the alternative $\eta > 0$ (=altruism).[8] In previous empirical research inspired by Becker's utility formulation, it was taken for granted that utility cannot be measured. Therefore, tests for altruistic preferences were based on behavioral implications, for example how transfer payments between parents and children adjust when income changes, that arise if the utility function (1) is maximized subject to some constraints (for a survey see Laferrére and Wolff, 2004). By contrast, it is our working assumption that proxy measures for utility Z and V are available, namely survey responses to the question on current subjective well-being, or happiness, as they are elicited in many current household surveys. Under this assumption, the selfishness hypothesis can be tested directly based on (1), without observing consumption data or transfer payments at all.

We have described the employed data before. The basic unit of observation is a parent, either father or mother. The precondition for inclusion in the data is that for a given parent year observation, at least one child in a spin-off household has been surveyed in the data. In this case, V_{it} is the reported happiness score of that child. If more than one child is included in the survey, V_{it} is the *average* over the reported happiness scores of all children. The data have also a household dimension (if observations are available for father and mother), but this dimension is inconsequential for identifying the altruism parameter, although it has implications for computating standard errors and therefore valid inference. Also, we are well aware that the happiness measure from the eleven point response scale is discrete and ordinal. However, we will disregard this aspect initially and treat the survey responses as cardinal variables. This simplifies the estimation of models with individual effects and simultaneity. Alternative methods for discrete ordinal data will be discussed later on.

[8]We won't enter into the philosophical debate whether maximizing one's own utility is a selfish endeavor per definition, and therefore cannot possibly be labeled "altruistic". The key point is that for $\eta > 0$ such a utility function would induce an observable behavior that conforms well to the common notion of "altruistic behavior", i.e., giving up own material goods for the benefit of others.

4.1 Linear Models

To understand the possibilities for estimating the altruism parameter with data as described, we start from (1). If C_p and C_k were unrelated, we could rewrite the equation as

Model 1 $\qquad Z = \alpha + \eta V + u$

with $u = U(C_p)$ and $\eta = \text{Cov}(Z, V)/\text{Var}(V)$. Hence, a valid estimator of the altruism coefficient could be obtained from a simple linear regression of Z on V.

However, the required assumption that C_p and C_k are unrelated is not very plausible. For example, we know that intergenerational mobility in education and income is limited (for Germany, see e.g. Dustmann (2004) and Lillard (2001)). Therefore, children of parents with above average income tend to have above average income and consumption possibilities themselves. Another argument builds directly on the underlying household consumption model: If families are altruistically linked they pool their resources (incomes) to finance consumption. But if C_p and C_k are positively correlated, the least squares regression coefficient from estimating (1) directly is upward biased.

An obvious remedy to this problem is to include the parents' consumption as controls, and to estimate η based on the ceteris paribus variation of V given C_p. If a measure of individual consumption is not available, as is often the case in general purpose household survey data, we can instead proxy it by a number of socio-economic characteristics, such as income, household size and composition, education level and employment status. This leads us to

Model 2 $\qquad Z = \alpha + x_p'\beta + \eta V + u$

which can be estimated by multiple linear regression. The model can be further generalized by including individual specific intercepts

Model 3 $\qquad Z = \alpha_i + x_p'\beta + \eta V + u$

These individual specific effects can be estimated (and thus treated as fixed effects) as long as repeated observations on parents and children are available, data from the German socio-economic panel being an example.[9] The fixed effects model addresses a couple of potential problems associated with Model 2. First, endogeneity of V due to correlated consumption can remain a problem as long as unobserved variation in parental consumption (the part that is not captured by $x_p'\beta$) is correlated with the child's consumption. To the extent that this correlation is based on permanent factors, Model 3 will take care of it and allow for unbiased estimation of η. Second, one has to face the possibility that there is some inter-individual variation in the utility functions $U(C_p)$ and $V(C_k)$. For example, let $U_i(C_p) = U(C_p) + \gamma_i$ and $V_i(C_k) = V(C_k) + \xi_i$ where the terms γ_i and ξ_i symbolize different attitudes towards well-being. For example, "optimists" will report higher well-being levels (for a given consumption level) than "pessimists". Similar differences can arise if individuals anchor their responses differently on the eleven point response scale. Estimation of η based on Model 2 is affected if there is a correlation between γ_i and ξ_i, as would arise for instance if personality traits such as "optimism" or "anchoring of responses" are genetically transmitted. Model 3 with individual specific effects can identify the altruism parameter even in the presence of such effects.

Models 1 to 3 are direct empirical translations of Becker's utility function (1). In this formulation it is supposed that the child is egoistic. This assumption had its logic since altruistic preferences were first introduced by Becker in the context of parents and children, especially young children.[10] For adult children, or husbands and wives, however, such an asymmetry is questionable. If we allow that children are altruistic towards their parents as well, then we obtain, in obvious notation, a

[9] We see that household specific effects cannot be estimated as fixed effects: although in many households, two separate observations (for mother and father) are available, the main variable of interest, V, does not vary along the household dimension.

[10] Another justification follows from Becker's "rotten kid theorem", that sufficient caring by an effective altruist (a person who provides at least half the family income) "... induces even a selfish beneficiary *to act* as if she cares about the benefactor as much as she cares about herself." (Becker 1981, p. 5)

simultaneous equations system with two equations

$$\text{Model 4} \qquad \begin{aligned} Z_p &= \alpha_{i,p} + x_p'\beta_p + \eta_p Z_k + u_p \\ Z_k &= \alpha_{i,k} + x_k'\beta_k + \eta_k Z_p + u_k \end{aligned}$$

In this model, Z_k is contemporaneously correlated with u_p as long as $\eta_k \neq 0$. For example, assume that the two altruism parameters (of parents towards adult children and of children towards parents) are the same. For the simplest case ($\alpha_j = 0$, $\beta_j = 0$), we obtain after substitution a reduced form equation for Z_k:

$$Z_k = \eta(\eta Z_k + u_p) + u_k = \frac{\eta}{1-\eta^2}u_p + \frac{1}{1-\eta^2}u_k \tag{2}$$

from where we see that the correlation in the structural equation between Z_k and u_p is $\eta\sigma_p^2/(1-\eta^2)$. In this case, OLS estimation of the altruism parameter in Equation 1 has probability limit

$$\operatorname{plim}\hat{\eta} = \eta + \frac{\eta\sigma_p^2/(1-\eta^2)}{\eta^2\sigma_p^2/(1-\eta^2)^2 + \sigma_k^2/(1-\eta^2)^2} \tag{3}$$

An interesting consequence is that under $H_0 : \eta = 0$, there is no bias whatsoever, so that the null hypothesis of selfishness can be tested directly from Model 3 without accounting for simultaneity.[11] If the null is rejected (or if one wants to consider more general forms of simultaneity where $\eta_p \neq \eta_k$), we will need to consider methods for consistently estimating the first structural equation of Model 4. The fixed effects estimator only accounts for the fact that Z_k might be correlated with *time invariant* individual characteristics that also affect Z_p. Hence, fixed effects estimation alone is inconsistent, and we need to use instrumental variables. Both structural equations are (over)identified since within this model, the consumption proxies of one person (x_p or x_k) affect the other person only through their effect on Z. Hence, they can be used as instruments.

To get an estimable model, we must first deal with the presence of $\alpha_{i,p}$. Wooldridge (2002, p. 310) recommends to estimate pooled two-stage least squares using within-transformed data and

[11] Unfortunately, the result does not carry over to more general models (where $\beta \neq 0$) but it still provides useful guidance for the bias that is to be expected.

instruments. Thus Z_k is replaced by its predicted value from a regression of the time-demeaned Z_k on all time-demeaned exogenous variables, i.e. x_p and x_k.

4.2 Extensions

So far, our modelling followed strictly the simple Becker utility function (1). Under the maintained assumption of the model, a positive partial effect of the child's utility unambiguously identifies altruistic preferences. However, if one broadens the model somewhat and considers other aspects of the parent-child relationship, alternative interpretations for a positive interdependence in happiness become possible. In other words, a positive η does not need to signify altruism at all.

A first such alternative explanation is *joy of giving*. If parents derive direct happiness from making a transfer to their child, regardless of the consequences of the transfer for the child's utility, then such joy of giving will erroneously be interpreted as altruism. In the above Models 1-4, this situation can be interpreted as omitted variable bias. The transfer enters the error term u_p with positive sign and at the same time increases, on average, the utility of the child, thereby leading to an upward bias in η_p. The simple solution, then, is to include transfers directly among the regressors. In doing so, the joy of giving motive and the altruism motive can be estimated and tested separately.

A second potential problem with the simple Becker model are paternalistic preferences. These arise if parents derive happiness from x_k directly, regardless of their effect on the children's utility. Obviously, Models 1-4 are then misspecified, as the variables x_k are excluded from the parents happiness equation. We doubt, however, that this is a serious problem in practice. True, parents may have paternalistic preferences and value for example the child's education *per se*. But the child's education is largely time invariant. It is likely, therefore, that such paternalistic preferences are implicitly controlled for in the person specific intercept and do not lead to a bias in η.

We mention two further generalizations of the Becker model. The first relates to activities that children may undertake in order to help and support their parents. If these services enter the child utility negatively and the parents utility positively, not controlling for this unobserved variable would tend to reduce the estimated altruism parameter. Similarly, if parents observe the child's utility only with error, the altruism parameter would be, under the assumptions of the classical measurement error model, biased towards zero. Although we cannot explicitly address these issues in our analysis we are not overly concerned, as the direction of the bias means that it becomes harder to find evidence for altruism but if we do, the weight of the evidence is strengthened.

4.3 Ordered Probit Modeling

So far, we have ignored for simplicity that the data are ordinal and cast all models in terms of linear regressions. A possible refinement of the model takes Model 3,

$$Z_p^* = \alpha_i + x_p'\beta + \eta V_k^* + u_p$$

as the underlying latent model, and use a threshold mechanism to derive a model for the discrete ordered happiness responses. For example, under the additional assumption that u_p has a standard normal distribution, and with

$$Z_p = \begin{cases} 0 \text{ if } Z_p^* \leq \kappa_1 \\ 1 \text{ if } \kappa_1 < Z_p^* \leq \kappa_2 \\ \dots \\ J \text{ if } Z_p^* > \kappa_J \end{cases}$$

where $\kappa_1, \dots, \kappa_J$ are cut points that need to be estimated jointly with the β's and η, the conditional probabilities of the ordered responses are given by

$$P(Z_p = j | x_p, V_k^*) = \Phi(\kappa_{j+1} - \alpha_i - x_p'\beta - \eta V_k^*) - \Phi(\kappa_j - \alpha_i - x_p'\beta - \eta V_k^*) \ , j = 0, \dots, J \quad (4)$$

where Φ denotes the distribution function of the standard normal distribution.

It would be normal procedure to estimate the parameters of the model by maximum likelihood. This begs the question how to deal with the individual specific fixed effects, the fact that V_k^*

is unobserved, and with the simultaneity of V_k^*. One might be tempted to copy linear model strategies, for instance include $n-1$ individual dummies and replace V_k^* by a predicted value. However, such a strategy would be misguided in the current context. First, as to the dummy variable formulation, there is an incidental parameter problem that leads to inconsistency of the ML estimate for η. Also, differencing or the within transformation are not an option for removing the individual specific effect in non-linear models such as this one. Therefore, we suggest to follow the Mundlak (1978) approach and model the correlation between the fixed effects and the regressors directly by including the individual averages of the explanatory variables among the regressors (see also Wooldridge, 2002). Under the additional assumption

$$\alpha_{i,p}|x_p, V_k \sim Normal(\bar{x}_p'\delta_1 + \delta_2\bar{V}_k^*, \sigma_\alpha^2)$$

where $\bar{x}_p$ and $\bar{V}_k^*$ are time averages, it follows that

$$Z_p^*|x_p, V_k^* \sim Normal(x_p'\beta + \eta V_k^* + \bar{x}_p'\delta_1 + \delta_2\bar{V}_k^*, 1 + \sigma_\alpha^2)$$

The probabilities for the observed responses are then obtained in the standard way. Under conditional independence of $Z_{p,i1}, \ldots, Z_{p,iT}$ conditional on x_p, V_k^* and α_i (which implies the absence of autocorrelation in the error terms), the model can be estimated as a simple pooled ordered probit. All coefficients are scaled by the factor $(1+\sigma_\alpha^2)^{-1/2}$. Alternatively, and more efficiently, one can estimate a random effects ordered probit model (with time averages included), obtain an estimate of σ_α^2 and thereby recover the original parameters β and η.

A further problem is that the regressor of main interest, V_k^*, is unobserved. Terza (1987) suggested to replace it by its marginal expected value given by

$$E(V_k^*|V_k = j) = E(V_k^*|\mu_j < V_k^* < \mu_{j+1}) = \frac{\phi(\mu_j) - \phi(\mu_{j+1})}{\Phi(\mu_{j+1}) - \Phi(\mu_j)}, \ \ j = 0, ..., 10 \tag{5}$$

where the μ_j's are the quantiles of a standard normal distribution for sample cumulative relative frequencies of the 11 response categories.

With regard to the simultaneity issue, it is inadmissible to use a two-stage least squares in non-linear models such as this one (Wooldridge, 2002). There is no simple way to deal with simultaneity in ordered probit models, and we will need to rely on results from the linear model in order to assess the magnitude of simultaneity bias.

5 Regression Results

The results for the four linear specifications are shown in Table 6. The standard errors in parentheses have been adjusted for clustering at the household level. In the linear model the estimated altruism parameter $\hat{\eta}$ indicates by how much the predicted happiness of parents changes when the happiness of the child (or the average happiness of the children if there are several of them) increases by one.[12]

— Table 6 —

A comparison of the estimated values across the models shows that the altruism parameter is largest in the simple linear regression Model 1. The point estimate is 0.25; thus the happiness of parents increases by one for each four point increase in happiness of the child. The effect is highly significant. Moving to the other models 2-4, the magnitude of $\hat{\eta}$ is steadily reduced. This is to be expected, as the discussion of the potential biases of the simple least squares coefficients in the previous section has shown. First, controlling for other socio-economic factors – and thereby accounting for the correlation in consumption between parents and children, $\hat{\eta}$ drops to 0.17. If individual specific effects are included, $\hat{\eta}$ is further reduced to 0.06. It remains statistically significant at conventional levels. F-tests show that Model 1 is rejected against Model 2, which in turn is rejected against the fixed effects Model 3.

The fourth column of Table 6 shows the results from the instrumented fixed effects model, where the children's socio-economic characteristics (the exclusion restrictions) serve as instruments. In the first stage regression, which is not shown here, health, employment and income have strong

[12]The standard deviation of the children's happiness is 1.5 – hence such an increase corresponds to an increase by about 0.7 standard deviations.

explanatory power. The instruments are highly significant with an F-statistic of 5 and a p-value of 0.000. Since there are more instruments (12) than endogenous variables (1), we can test for the overidentifying restrictions. The F-statistic has a p-value of 0.25. Thus, we fail to reject the null hypothesis of no correlation between errors and instruments, and we can have some confidence in the set of instruments. This statistical test therefore supports the substantive argument that children's consumption should affect parents' happiness only through its effect on happiness.

In Model 4, the estimate of η drops to 0.02 and it is no longer statistically different from zero. Having established the validity of the instruments, we can now test for the endogeneity of the children's happiness in the parental happiness equation. We find that the Hausman test cannot reject the null hypothesis of exogeneity (p-value of 0.70). Although not rejecting H_0 can also be due to the low power of the test, we interpret this as evidence that Model 3, rather than Model 4, gives us our preferred estimate of the altruism parameter. This result seems to be counterintuitive at first, since there are *a-priori* reasons to assume that altruism is reciprocical. A simple explanation for this result might be that the bias is not very large. For example, we can take the bias formula (3) as starting point for a back-of-the envelope calculation. The bias depends on the unknown σ_p^2 and σ_k^2. For example, with $\sigma_k^2 = 2\sigma_p^2$, a structural parameter of 0.4 will lead to an OLS estimate of 0.6. The difference between the two is well within the margin of error and thus unlikely to appear statistically significant in a test. On the other hand, the IV estimator in Model 4 lacks precision and may be subject to the well-known small sample biases of instrumental variable estimators that have been documented in other contexts.

While the estimated altruism effect in our preferred Model 3 is rather small, it is, apart from health, income and unemployment, the only statistically significant regressor in the fixed effects model. Other factors such as schooling or marital status but also the spatial distance between parents and children are not statistally signifificant. Also, transfers do not affect the parent's happiness significantly, as shown in the last column of Table 6. Hence, we find no evidence in favor of the joy of giving hypothesis, and the interpretation of the parameter η in Model 3 as altruism is not invalidated.

From an economic point of view, it does not matter how large η is, as long as it is positive. Any positive η will induce a behavior of the utility maximizing agent that will conform to the common notion of altruism (i.e., giving up consumption in order to increase the utility of the beneficiary). Also, if compared to the effect of income there is a sense that the altruism parameter is not so small after all, since an increase of the child's happiness by one standard deviation has approximately the same effect as an increase of household income by 20 percent.[13] However, this result should not be overinterpreted, since other factors, including health and unemployment, have much larger income equivalents.

The linear specification we have worked with so far assumes a cardinal scale of measurement and ignores that the underlying random variable is discrete and ordinal. Therefore, in Table 7, we also show the corresponding results from ordered probit models. We estimated three versions. As in the linear case, Model 1 does not include any covariates apart from the happiness index of the child. Model 2 includes a number of socio-economic controls and Model 3 is a fixed effects model in the Mundlak (1978) formulation, where individual means of all time-varying regressors are included in addition to the original regressors from Model 2. The three models are nested and likelihood ratio tests can be used to discriminate amongst them. Model 1 is rejected against Model 2 with controls for observed heterogeneity, and Model 2 is rejected against Model 3 that accounts for correlation between individual time-invariant unobserved heterogeneity (the fixed effects) and the regressors. Hence, as in the linear case, statistical criteria speak for Model 3.

— Table 7 —

It is reassuring that the central conclusions remain essentially unaffected. The estimated altruism parameter is positive and statistically significant. The implied child well-being / income tradeoff is about the same as in the linear model once we account for the fact the the child-variable

[13] The one standard deviation change refers to the transformed measurement scale – see (5). In the orignal responses, this corresponds to about 1.5 points on the eleven point scale.

has been rescaled in the ordered response model so that the standard deviation is now two-thirds of the original variable. We can use the estimated ordered probit coefficients to predict the changes in the response probabilities for a one standard deviation increase in the children's happiness indicator ($\approx$ 1.5 standard deviations on the untransformed scale). In a nonlinear model such as this one, the effect will depend on the values of the explanatory variables. For an average person (where all regressors are set to the sample means) the probability of being happy (8 or above on the 0-10 scale) increases by 2.2 percentage points from 33 to 35.2 percent. For a rather unhappy person – represented by a predicted outcome distribution shifted to the left such that $\hat{Z}_p^* = \hat{\kappa}_3$ – such an increase does not make much of a difference, as the already small probability of being happy would only change from 0.4 to 0.5 percent.

6 Conclusions

"What can happiness research tell us about altruism?", was the question that motivated the research in this paper. Quite a lot, we think. Modeling interdependencies in happiness responses among respondents is a promising new area of research that allows for quantification and direct tests of the altruism hypothesis. Of course, the potential reasons for interdependent happiness responses are manifold, altruism being only one of them, and establishing causal relationships is not trivial. But even in the absence of experimental data, good identification strategies are available for household panel surveys.

Using data from the German Socio-Economic Panel for the years 2000-2002, we find that the happiness of adult children who have left their parental home has a statistically significant effect on the parents' self-reported happiness. Hence, in following Becker's definition of altruism, there is evidence that parents have altruistic preferences. The altruism effect appears sizeable when converted to money equivalents. However, the small marginal effects in the linear model (or marginal probability effects in the ordered probit model) mean that altruism contributes little to the overall variation in happiness among parents. From an economic point of view, however, it does not matter how large η is, since any positive η will induce a behavior of the utility maximizing agent that will conform to the common notion of altruism.

One explanation for the relatively small overall effect might be that the altruism parameter estimated by our models is a population average. In reality, substantial parameter heterogeneity is likely. For example, Phelps (2001) reports on psychological research aimed at distinguishing between altruists and selfish individuals. If we keep the simple distinction between altruists ($\eta > 0$) and selfish persons ($\eta = 0$), rather than allowing for a continuum of degrees of altruism, and if we take the psychological benchmark that about 20 percent of the population are altruists (Phelps, 2001), we find that a weighted average altruism parameter from the linear model with fixed effects of 0.06, say, would imply a much larger effect of 0.30 (since $0.06 = 0.8 \times 0 + 0.2 \times 0.30$) among altruists. In future work, we plan to estimate the share of altruists endogenously using finite mixture models. Eventually, such models may yield a classification of individuals into altruists and egoists based on information from standard household surveys only.

References

Altonji, J.G., F. Hayashi and L.J. Kotlikoff (1992) Is the Extended Family Altruistically Linked? Direct Tests Using Micro Data, *American Economic Review* 82, 1777-1198.

Becker, G.S. (1974) A Theory of Social Interactions, *Journal of Political Economy* 82, 1063-1093.

Becker, G.S. (1981) Altruism in the Family and Selfishness in the Market Place, *Economica* 48, 1-15.

Becker, G.S. (1991)*A Treatise on the Family.* 2nd ed., Cambridge, Mass.: Harvard University Press.

Blanchflower, D.G. and A.J. Owald (2004) Well-being over time in Britain and the USA, *Journal of Public Economics* 88, 1359-1386.

Dustmann, C. (2004) Parental background, secondary school track, and wages, *Oxford Economic Papers* 56, 209-230.

Edgeworth, F.Y. (1881), *Mathematical Physics*, Reprinted in: Peter Newman (ed.) (2003) F.Y. Edgeworth: *Mathematical Physics and Further Papers on Political Economy*, Oxford University Press.

Fehr, E. and U. Fischbacher (2003) The nature of human altruism, *Nature* 425, 785-791.

Frey, B.S. and A. Stutzer (2001) *Happiness and Economics*, Princeton University Press.

Frey, B. S. and A. Stutzer (2002) What can Economists Learn from Happiness Research? *Journal of Economic Literature*, 40, 402-435.

Laferrére, A. and F.Ch. Wolff (2004): Microeconomic models of family transfers. In: Gerard-Varett, L.-A., S-C. Kolm, and J. Mercier Ythier (eds.): *Handbook on the Economics of Giving,* *Reciprocity and Altruism*, North-Holland: Elsevier, forthcoming. Version 2.3 for chapter 12, http://www.crest.fr/pageperso/dr/laferrere/Chapt12.pdf

Lillard, D.R. (2001) Earnings and income mobility, *Vierteljahreshefte zur Wirtschaftsforschung* 70 (1), 51-58.

Mundlak, Y. (1978) On the Pooling of Time Series and Cross Section Data, *Econometrica* 46, 69-85.

Phelps, C.D. (2001) A clue to the paradox of happiness, *Journal of Economic Behavior and Organization* 45, 293-300.

Terza, J. (1987) Estimating Linear Models with Ordinal Qualitative Regressors, *Journal of Econometrics* 34, 275-291.

Winkelmann, L. and R. Winkelmann (1995) Happiness and Unemployment: a Panel Data Analysis for Germany, *Konjunkturpolitik*, 41(4), 293-307.

Winkelmann, R. (2005) Subjective Well-Being and the Family: Results from an Ordered Probit Model with Multiple Random Effects, forthcoming in: *Empirical Economics*.

Wooldridge, J. (2002) *Econometric Analysis of Cross Section and Panel Data*, MIT Press.

Table 1: *Structure of the data set 2002*

Children not living in parents household	Number of parents		Mothers	Fathers	Number of observations	
	Frequency	Percent	Frequency	Frequency	Frequency	Percent
One	1,317	75.3	708	609	1,317	58.0
Two	363	20.7	199	164	726	32.2
Three	61	3.5	33	28	183	8.1
Four	7	0.4	4	3	28	1.2
Five	2	0.1	1	1	10	0.4
Total	1,750	100	945	805	2,264	100
Parents in two-parent households	1,454	83.1	-	-	-	-

Source: SOEP 2002.

Table 2: *Descriptive Statistics*

	Parents		*Children*	
Variable	mean	std.dev.	mean	std.dev.
Happiness	6.610	1.787	7.122	1.546
Female	0.538	0.499	0.508	0.500
Age	57.05	8.63	30.41	5.88
Good health	0.301	0.459	0.692	0.462
Married	0.827	0.378	0.480	0.500
Widowed	0.077	0.266		
Years of schooling	11.09	2.36	12.26	2.49
Unemployed	0.086	0.281	0.066	0.248
Retired	0.321	0.467		
House ownership	0.543	0.498	0.246	0.431
Log household income	8.261	0.503	8.144	0.547
Log household size	0.809	0.387	0.767	0.539
Distance	46.33	109.83		
Same district	0.667	0.471		
Number of children	1.969	1.182		
Children yes			0.459	0.498
Year=2000	0.321	0.467	0.323	0.468
Year=2001	0.332	0.471	0.328	0.470
Year=2002	0.347	0.476	0.349	0.477
Observations	5041[a]		3771[b]	

Source: SOEP 2000-2002

[a] Excludes multiple person-year observations for parents with several children.

[b] Excludes multiple person-year observations for children with two parents.

Table 3: *Happiness responses of parents and children (in percent, n = 6507)*

	Happiness of child			
Happiness of parent	0-5	6-7	8-10	total
0-5	41.86	27.32	19.18	25.60
6-7	34.69	41.41	37.53	38.64
8-10	23.45	31.27	43.29	35.76
total	100.00	100.00	100.00	100.00

Table 4: *Year-to-year changes in happiness responses of parents and children (in percent, n = 4401)*

	Change in happiness of child			
Change in happiness of parent	decrease	no change	increase	total
decrease	7.18	7.75	5.77	20.70
no change	21.68	18.04	19.50	59.21
increase	6.59	6.79	6.70	20.09
total	35.45	32.58	31.97	100.00

Table 5: *Changes in happiness responses of parents conditional on changes for children (in percent)*

	Change in happiness of child			
Change in happiness of parent	≤ -1	$\geq +1$	≤ -3	$\geq +3$
decrease	20.26	18.05	16.27	15.50
no change	61.15	60.98	68.47	64.21
increase	18.59	20.97	15.25	20.30
total	100.00	100.00	100.00	100.00
P-val. chi-squared	0.136		0.291	

Table 6: *Dependent variable: Parent's happiness, $N = 5041$*

	Model 1 OLS	Model 2 OLS	Model 3 Fixed Effects	Model 4 Fixed Effects+IV	Fixed Effects + Transfers
Happiness of child (η)	0.2491†	0.1682†	0.0562†	0.0185	0.0562†
	(0.0275)	(0.0242)	(0.0201)	(0.0996)	(0.0243)
Transfers					0.0072
					(0.0755)
East Germany		-0.3150†			
		(0.0842)			
Female		0.0321			
		(0.0465)			
Age		0.0731	0.0715	0.0670	0.0713
		(0.0478)	(0.1426)	(0.1743)	(0.1748)
Age squared		-0.0004	-0.0007	-0.0007	-0.0007
		(0.0004)	(0.0012)	(0.0015)	(0.0015)
Good health		1.0613†	0.3779†	0.3769†	0.3780†
		(0.0583)	(0.0600)	(0.0579)	(0.0581)
Married		0.2248	0.1857	0.1887	0.1854
		(0.1372)	(0.2673)	(0.2583)	(0.2569)
Widowed		0.0560	0.0346	0.0428	0.0342
		(0.1661)	(0.4107)	(0.5495)	(0.5459)
Years of schooling		-0.0132	0.6224	0.5634†	0.6224†
		(0.0173)	(0.8807)	(0.1565)	(0.0613)
Unemployed		-0.5920†	-0.3036†	-0.3023	-0.3032
		(0.1208)	(0.1163)	(0.1634)	(0.1630)
Retired		-0.0822	-0.0199	-0.0225	-0.0199
		(0.0925)	(0.1076)	(0.1229)	(0.1225)
House ownership		0.3038†	-0.2008	-0.2031	-0.2003
		(0.0783)	(0.1771)	(0.1934)	(0.1951)
Log household income		0.6890†	0.3122†	0.3204†	0.3121†
		(0.0902)	(0.1106)	(0.1397)	(0.1375)
Log household size		-0.4385†	0.0694	0.0511	0.0696
		(0.1565)	(0.2021)	(0.2179)	(0.2051)
Distance (in 100 km)		-0.1021†	-0.0750	-0.0778	-0.0747
		(0.0395)	(0.0754)	(0.0764)	(0.0750)
Same district		-0.0315	-0.1120	-0.1183	-0.1117
		(0.0994)	(0.1636)	(0.1841)	(0.1786)
Number of children		-0.0236	0.0620	0.0620	0.0623
		(0.0488)	(0.0876)	(0.0909)	(0.0900)
Year effects	No	Yes	Yes	Yes	Yes
R-squared	0.0418	0.2160	n.a.	n.a.	n.a.

Notes:
Standard errors are adjusted for clustering at the household level
† indicates statistical significance at the 5-% level

Table 7: *Ordered Probit Models of Parent's happiness, N = 5041*

	Model 1	Model 2	Model 3
Happiness of child (η)	0.2416†	0.1835†	0.0603†
	(0.0252)	(0.0246)	(0.0251)
East Germany		-0.2422†	-0.2228†
		(0.0528)	(0.0538)
Female		0.0327	0.0306
		(0.0303)	(0.0309)
Age		0.0450	0.0075
		(0.0300)	(0.1245)
Age squared		-0.0003	-0.0005
		(0.0003)	(0.0010)
Good health		0.7263†	0.2628†
		(0.0402)	(0.0411)
Married		0.1266	0.1071
		(0.0857)	(0.1732)
Widowed		0.0145	-0.0126
		(0.1032)	(0.3512)
Years of schooling		-0.0054	-0.0111
		(0.0109)	(0.0111)
Unemployed		-0.3221†	-0.1730
		(0.0691)	(0.0967)
Retired		-0.0373	-0.0206
		(0.0594)	(0.0811)
House ownership		0.2098†	-0.1691
		(0.0506)	(0.1243)
Log household income		0.4286†	0.1615†
		(0.0583)	(0.0824)
Log household size		-0.2811†	0.0906
		(0.1011)	(0.1339)
Distance (in 100 km)		-0.0668†	-0.0636
		(0.0244)	(0.0516)
Same district		-0.0356	-0.1153
		(0.0639)	(0.1184)
Number of children		-0.0114	0.0310
		(0.0314)	(0.0560)
Year effects	No	Yes	Yes
Individual means	No	No	Yes
Log-Likelihood	-9534.2	-9014.5	-8944.7

Notes: see Table 6

Each model includes in addition 10 cut values