FAMILY AND LIFE SATISFACTION: LONG-TERM SWB INTERDEPENDENCE WITHIN FAMILIES

A Master's Thesis

by
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Ankara
September 2015

...to my family

FAMILY AND LIFE SATISFACTION: LONG-TERM SWB INTERDEPENDENCE WITHIN FAMILIES

The Graduate School of Economics and Social Sciences
of
İhsan Doğramacı Bilkent University

by

GAMZE GİZEM KASMAN

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in

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September 2015

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Economics.

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Supervisor

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ABSTRACT

FAMILY AND LIFE SATISFACTION: LONG-TERM SWB INTERDEPENDENCE WITHIN FAMILIES

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In this thesis, using British Household Panel Survey (BHPS) for the time period 1996-2008 (excluding 2001) we examine the magnitude of longitudinal interdependence of Subjective Well-Being (SWB) within the family. We estimate the overall as well as spousal and fraternal correlation of life satisfaction. By adopting Winkelmann's (2005) methodological approach, we find the correlation coefficient of 0.27 which suggests a 27 percent intra-family correlation in well-being. We also find that the correlation coefficient of spouses is 0.40 whereas 0.24 for children. Suggesting that SWB of family members is obviously correlated however shared economic and environmental conditions may be more important in determining well-being than shared genes.

Keywords: Subjective Well-Being, Life Satisfaction, SWB, Family, Correlation

ÖZET

AİLE VE YAŞAM MEMNUNİYETİ: UZUN DÖNEMDE AİLE İÇİ YAŞAM MEMNUNİYETİ KOVARYANSI

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Bu tezde "British Household Panel Survey" panel veri setini kullanarak aile üyelerinin uzun vadedeki yaşam memnuniyetleri arasındaki kovaryansı hesaplıyoruz. Tüm aile bireyleri arasındaki yaşam memnuniyeti kovaryansının yanı sıra kardeşler ve eşler arasındaki kovaryansı da hesaplıyoruz. Winkelmann (2005) 'ın yöntemini kullanarak aile içi kovaryansı %27, kardeşler arasındaki kovaryansı %24 ve eşler arasındaki kovaryansı %40 buluyoruz. Bu sonuçlardan yola çıkarak ailece paylaşılan ekonomik ve sosyal koşulların yaşam memnuniyeti üzerindeki etkisinin biyolojik (paylaşılan genler) koşullardan daha fazla olduğu sonucuna varıyoruz.

Anahtar Kelimeler: Yaşam Memnuniyeti, Aile, Kovaryans

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CHAPTER 1

INTRODUCTION

The concept of utility dates back to the writings of Bentham (Stark and Bentham, 1954) who used utility as a measure of happiness and claimed that utility was a measurable cardinal quantity that could be compared between individuals. Bentham's utility concept prevailed until it is showed that demand theory could be derived by the ranking of different alternatives (Pareto, 1909). This led to the ordinal utility concept, in which utility refers to a preference ordering of alternatives and cannot be compared between individuals. This ordinal view of utility, dominated economic theory and is still held by most economists. (Gerdtham and Johannesson, 2001)

Since individuals have their ideas about happiness and well-being, the observed preferences may not be the best way of measuring utility. Therefore, economists adopt a subjective view of utility in which individuals assess their levels of happiness or life satisfaction (Frey and Stutzer, 2010). They use Subjective Well-Being (SWB) which is a broad scientific term used in psychology. SWB includes indi-

vidual's emotional responses, satisfaction with different domains of life and own assessment of overall life satisfaction (Diener et al., 2000).

Most of the studies in the literature that use SWB as a measure of utility use a similar method. They take individuals' judgment of life satisfaction into consideration that is one of the categories of Subjective Well-Being.[1] Datasets they use include questions asking people: how satisfied they are with 'life as a whole' and the categories are numbered from 0 or 1 to 5, 7 or 10, where 'not satisfied at all' corresponds to the lowest level and 'completely satisfied' with the highest level. Studies respecting the strict ordinal structure of the data, treat Subjective Well-Being response as a latent variable and thus use ordered probit or logit models. The latent life satisfaction variable is explained by a vector of variables such as personal characteristics, income, unemployment, and socially developed characteristics etc.

There is a large literature on the determinants of SWB including unemployment, income, health, education, religion, satisfaction with family life or other domains of life etc. However, few studies have explicitly investigated interdependence of SWB within the family. Most of the previous studies that use family as an explanatory variable in SWB take marital status into consideration. Being married is associated with the highest level of SWB whereas being divorced is negatively related to the SWB of couples (Helliwell, 2003). Winkelmann and Winkelmann (1995) finds that husband's unemployment has a substantial negative effect on SWB of his wife by taking interdependence of SWB within family into consideration. However, even such an approach fails to fully model SWB as an interdependent process within the family. To model the interdependence we

[1]Since we apply the same category of SWB with those studies, we use life satisfaction and Subjective Well-Being(SWB) interchangeably.

study the joint distribution of SWB within the family. Meaning that in terms of the interdependence of SWB we consider not only spouses but also children.

Some studies show that the life satisfaction levels of family members who live together are positively correlated (Headey et al., 2014). Factors such as "shared general economic conditions of the family, genes, nurture" (Winkelmann, 2005) suggest us that there is a correlation between the SWB of family members.

Our motivation comes from the fact that there are some major policy issues surrounding the family in many countries. Some countries deal with these issues by having explicit family policies but all countries have policies that affect families. The link between family and SWB comes from the fact that family life is important to people's subjective well-being. Family, financial, health and job satisfaction considered to be the most effective four domains which has central importance to overall life satisfaction (Easterlin and Sawangfa, 2007). Family effects on overall life satisfaction are among the strongest of the four major domains (Easterlin and Sawangfa, 2007; Rojas, 2006).

Testing "To what extent does the SWB of one family member affect the SWB of others in the family" will help us to understand family dynamics even more. Understanding the family structure in terms of SWB is important because family is the building block of the society and happier families may mean happier societies and more productive individuals. Also, policies can be implemented by the explained dynamics.

In this thesis, we examine the extent of intra-family correlation in life satisfaction by using British Household Panel Survey (BHPS). Our interest is overall family as well as spousal and fraternal correlation of SWB within the family. We adopt Winkelmann's (2005) approach that allows to identify correlation in SWB

within the family and apply it to BHPS for the period 1996-2008.[2] Our contribution to existing literature comes from the fact that the use of BHPS enables us to identify kinship and family relations so that unrelated observation can be eliminated. Since German Socio-Economic Panel Survey does not have this kind of information, Winkelmann (2005) may overestimate the correlation in well-being especially among siblings.

[2]We exclude 2001 since the questionnaire does not include life satisfaction questions.

CHAPTER 2

RELATED LITERATURE

Winkelmann (2005) by using longitudinal (GSOEP) data for the period 1984-1997, takes the first step to estimate long-term correlation in well-being within overall family members as well as among spouses and siblings, living in the same household. In the application part, only children older than 16 are included because only they can fill out the questionnaires. He lists the factors of correlation in life satisfaction levels of household members as such: genes, nurture, shared economic conditions. Sibling correlations, in particular are due to the shared genes. Spousal correlations of life satisfaction is due to the shared economic conditions and assortative mating referring the tendency of people to select partners who are phenotypically similar to them (Powdthavee, 2009). After controlling for individual specific effects and implementing ordered probit model with multiple random effects, he finds that 44 percent of the variation in long-term life satisfaction is due to the family effects. So he finds the long-term correlation coefficient in SWB among family members as 0.44, which is substantial. The correlation coefficient

for siblings is 0.47 and 0.20 for spouses.

Powdthavee (2009) also analyzes the correlation in SWB among spouses by using British Household Panel Survey for the period 1996-2007. Even though he does not estimate a correlation coefficient, he shows that there is a substantial correlation in well-being among spouses due to emotional contagion. In terms of the methodology he uses a linear model to estimate ordinal SWB. However, he recognizes the problems of implementing simple OLS such as correlated effects of spouse's SWB and measurement error bias. He, therefore corrects those problems by using GMM-system estimator. Our study differs from Powdthavee (2009) in the sense that we estimate correlation coefficients not only for spouses but also for siblings and the whole family. Additionally we use an ordered choice model and treat SWB as a latent variable.

In the rest of the literature, spousal correlation is explained by assortative mating, shared socioeconomic and social environment and spillover. Partner similarity in life satisfaction may be a result of spouse selection. Individuals may prefer partners who are close in status and they choose their partners on the basis of certain characteristics and behaviors they have in common (Kalmijn, 1998). One reason for this could be that by marrying someone similar to us could make living with them easier. Several previous studies have shown that people do marry partners of similar education, professional backgrounds, employment status, lifestyle, health etc. (Clark and Etilé, 2006; Contoyannis and Jones, 2004; Qian, 1998; Monden, 2007; Ultee et al., 1988). For instance, Clark and Etilé (2006) shows that correlations in smoking behavior reflect partner selection on the matrimonial market. Besides assortative mating, it is also shown that the life satisfaction levels of spouses covary over time and thus correlated SWB is explained by similarities in life circumstances such as: sharing the same home,

having a common income, sharing same health habits, being exposed to similar stressors, joint marital history, having children,unemployment etc. (Clark et al., 2008; Dolan et al., 2008; Haller and Hadler, 2006; Bookwala and Schulz, 1996; Winkelmann and Winkelmann, 1995). Couples who are sharing a household also share the same environment, the same resources and go through some major life events together (Pouwels, 2011). Married couples experience the same shocks to income. For instance, Winkelmann and Winkelmann (1995) finds that husband is being unemployed not only lowers his SWB but it also lowers his wife's SWB as well. Likewise partners sharing the same health habits and given their other similarities, may also experience health shocks together. Lastly, there may be an emotional contagion between spouses which is called "spillover effect" (Becker, 1974). Here it is assumed that there is a close relationship between partners and they care for each other. In theory, the life satisfaction of one partner is considered to be an externality for the other partner and thus it is affecting the latter ones SWB (Pouwels, 2011). The idea of the spillover effect is supported by some empirical works. For instance, Bolger et al. (1989) shows that a stressful day at work for a husband significantly increases the probability of arguments between spouses the following day. The home-to-work stress contagion found by Bolger et al. (1989) is robust to control variables that relatively stable over time but vary across individuals, due to individual-specific effects such as personality and living conditions. In another study, Repetti (1989) finds that wives' stress often lead to dissatisfaction in husbands' self-assessment of marital and family relations the following day (Powdthavee and Vignoles, 2008)

Correlation between parents and children in well-being is also showed by some previous studies. The findings of the Winkelmann (2005) regarding the correlation of SWB of parents and their children can be explained in three ways: first, SWB may be genetically transmitted through parents to children. Second, parents and

children may share the same economic and environmental conditions. Third, the correlation may be due to a dependence of the parents' utility functions on the utility of their adult children, which is known as altruism (Bruhin and Winkelmann, 2009). Even though the transmission of life satisfaction could be partly due to genetic personality traits, it also appears to be due to the transmission of values and behaviors. Headey et al. (2013) list these values as such: giving priority to family values, maintaining a balance between work and leisure, active social and community participation, and regular exercise. Factors such as family income, unemployment, health habits etc. plays a similar role in the correlation of SWB as it does in spousal correlation of well-being. Lastly, Bruhin and Winkelmann (2009) finds that the effect of the children's judgment of life satisfaction on their altruistic parents' subjective well-being is substantial. Moreover, Agache and Trommsdorff (2010) shows that when parents' and children life satisfaction levels covary over time. They also report that the direction of the causation is from parental satisfaction to child satisfaction.

Lastly, sibling correlation of SWB is explained either by shared socioeconomic and environmental conditions, which we discuss before, or by shared genes. The related literature that explains sibling correlation in well-being concentrates on monozygotic and dizygotic twins. Since monozygotic twins share all of the genes and dizygotic twins share half of their genes , comparison of these two kind of twins (some raised together and others grew up separately) identify the effect of genes. Tellegen et al. (1988) reports that monozygotic twins are very similar in SWB, regardless of whether they were raised together or not. However, dizygotic twins are far less similar in terms of SWB. They estimate that the genetics explains 48 percent of the variability in life satisfaction. So it is concluded that even though to some degree SWB is inherited there are individual differences (Winkelmann,

2005).

Taking all of the previous studies that attempt to explain correlations of SWB into consideration our aim is to determine to what extend intra-family SWB is correlated.

CHAPTER 3

MODELING INTRA-FAMILY CORRELATION

Unlike psychologists treating observed life satisfaction responses as cardinal variables, we treat them as ordinal. Therefore, we need to link observed life satisfaction levels with the underlying cardinal SWB levels. To do that we use the following latent model:

$$y^*_{ijt} = a_j + u_{ij} + x'_{ijt}\beta + v_{ijt} \tag{1}$$

where y^*_{ijt} is the latent SWB of the i'th member in family j at time t. x_{ijt} is a vector of explanatory independent variables. Here a_j is a random variable representing family-specific effect that does not vary across family members or over time. u_{ij} is another random variable representing individual-specific effect that does not vary over time. v_{ijt} is a white noise error term. The model can be written as such as well:

$$y^*_{ijt} = x'_{ijt}\beta + \epsilon_{ijt} \tag{2}$$

where (as in Björklund and Jäntti, 1997, Björklund et al., 2002, Solon et al., 1991)

$$\epsilon_{ijt} = a_j + u_{ij} + v_{ijt} \tag{3}$$

Here a_j and u_{ij} capture long-term effects whereas v_{ijt} captures short-term effects since it varies over time. This model has a multilevel modeling framework because individuals (level-1 units) are nested in the household (level-2 units). Here we define individual effect in a context of a family. This assumption is used in applications where the family effect is interpreted as a proxy for family background that is shared by parents and children, or between siblings (Winkelmann, 2005).

a_j, u_{ij} and v_{ijt} are assumed to be mutually independent and distributed with mean zero and constant variances as σ_a^2, σ_u^2 and σ_v^2 respectively. It follows that the variance of ϵ_{ijt} is given by

$$\sigma_\epsilon^2 = \sigma_a^2 + \sigma_u^2 + \sigma_v^2$$

Furthermore, the covariance between observations at two different points in time, t and s, is given by the following formula if the same individual is considered:

$$Cov(y_{ijt}^*, y_{ijs}^* | x_{ijt}, x_{ijs}) = Cov(\epsilon_{ijt}, \epsilon_{ijs}) = \sigma_a^2 + \sigma_u^2 \quad t \neq s$$

whereas it is given by the following formula if the two individuals within the same family are considered:

$$Cov(y_{kjt}^*, y_{ijs}^* | x_{ijt}, x_{ijs}) = Cov(\epsilon_{kjt}, \epsilon_{ijs}) = \sigma_a^2 \quad t \neq s, k \neq i$$

The long-term within family correlation in SWB captures a longitudinal dependence due to the assumption that it is independent of the transitory error component. For any $t \neq s$ long-term family correlation is:

$$\rho = \frac{\sigma_a^2}{\sigma_a^2 + \sigma_u^2} \tag{4}$$

the covariance between y^*_{kjt} and y^*_{ijs} is σ_a^2 and the variance of either is $\sigma_a^2 + \sigma_u^2$.

The overall correlations in latent SWB depend on the variance of the transitory error term. As the transitory error term increase overall correlations decrease:

$$Corr(\epsilon_{ijt}, \epsilon_{ijs}) = \frac{\sigma_a^2 + \sigma_u^2}{\sigma_a^2 + \sigma_u^2 + \sigma_v^2} \tag{5}$$

and

$$Corr(\epsilon_{ijt}, \epsilon_{kjs}) = \frac{\sigma_a^2}{\sigma_a^2 + \sigma_u^2 + \sigma_v^2} \tag{6}$$

Attempts of estimating long-term correlations in SWB from cross-section data result in downward bias since in a short span of time transitory fluctuations tend to be greater. Studies using cross-section data to analyze the longitudinal correlation of SWB within family tend to consider temporary shocks specific to a short span of time and thus erroneously gives lower correlation. Therefore, we use panel data both to minimize transitory error term and properly estimate the long-term correlation. Next chapter explains our data.

CHAPTER 4

METHOD

4.1 Data

In this thesis, we use data taken from British Household Panel Survey (BHPS). Only persons aged 16 and over are included in the sample and they have been interviewed every subsequent year. Since there is both entry into and exit from the panel, data is unbalanced and the number of people interviewed is changing over time. The panel includes both individual and household questionnaires. Starting from sixth wave, the survey contains information about each individuals overall levels of life satisfaction. We use waves of 6-18 excluding Wave 11 which refers to period 1996-2008 excluding 2001. We also use health satisfaction, a gender dummy, household size, family income, age, employment status as explanatory variables to control individual specific effects on overall life satisfaction that are

found to be important determinants of SWB. We discuss these variables in control variables section.

By means of our family definition and the purpose of our analysis, only observations are kept where, for a given year, both partners and at least one child lived in the same household and provided valid information on the variables that we use in our analysis. Unlike German Socio-Economic Panel Survey used by Winkelmann (2005), British Household Panel Survey has the information about kinships and family relations and thus we are lucky for being able to distinguish between natural and adopted or step children and exclude non-biological observations. Making a distinction between natural and biologically unrelated children is important in terms of observing the effects of genes in the transmission of the SWB. Therefore, unlike Winkelmann (2005) we can observe pure effect of genetics.

After we eliminate the observations according to criteria mentioned above, we obtain 20,165 person-year observations and 6,118 family-year observations (for 1591 different families). Among the 20,165 person-year observations, 12,236 are for parents and 7,929 are for children.

4.2 Measures

Our measure of life satisfaction comes from the individual's own evaluation of the extent to which he or she is satisfied with his or her life. Each individual was asked to evaluate their life satisfaction on a 7-point-scale from 1 (not satisfied at all) to 7 (completely satisfied). The relative frequencies are displayed in Figure 1, separately for parents and children. The two distributions look quite similar except for the fact that children seem slightly happier than their parents. The

distributions are skewed to the right and the mode response is 6.

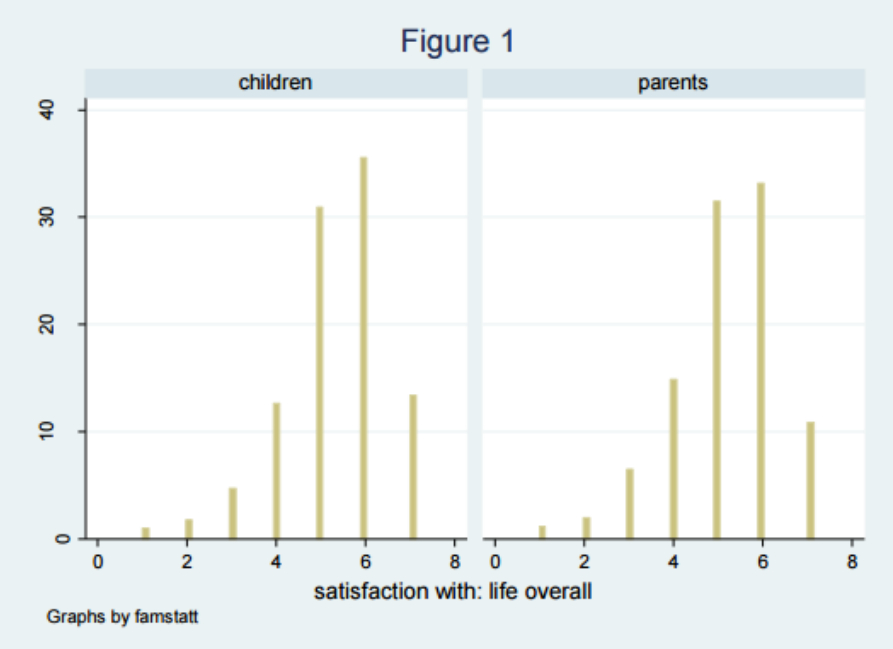

Figure 1: Relative Frequencies Of Parents And Children

4.3 Control Variables

As we have mentioned earlier, we include set of control variables such as health satisfaction, a gender dummy, household size, family income, age and employment status. Health satisfaction is also measured as a categorical variable, ranging from "1: not satisfied at all" to "7: completely satisfied". Gender is a dummy variable: 1 if the individual is male and 0 if female. Household size represents the number of people living in the same household in a natural logarithm. We use annual household income in logarithm. We use age in two variables: the first one is age divided by 10 and the other one is age squared divided by 100. Employment status is also a dummy variable and equals one if the individual is unemployed

and zero otherwise.

We use control variables that have been found significant determinants of individual SWB in the literature.[3] Earlier studies commonly find that there is a U-shaped relationship between age and SWB. In particular, at the very young age and old age people are more satisfied with their lives than they are at middle age. To test U-shaped effect we use a second order polynomial in age. Another important determinant of SWB is gender. Earlier studies investigating the relationship between gender and SWB find different results. Some studies find that women tend to report higher levels of life satisfaction (Alesina et al., 2004). On the other hand a few studies report no gender differences even using the same datasets (Dolan et al., 2008). We explore the relationship between gender and SWB. In addition to age and gender, health satisfaction of individuals has been found significant in well-being. Gerdtham and Johannesson (2001) finds that self-reported health status has a significant positive effect on happiness. Easterlin (2003) finds out that who say they are less healthy also say they are less satisfied with their lives. Unemployment is another determinant of well-being. Previous studies commonly find a negative relationship between unemployment and SWB. They show that the unemployed have around 5-15 percent lower scores in well-being than the employed. Lastly previous studies show that income has a big impact on SWB of individuals. The results concerning income and SWB of the individual suggest positive but diminishing returns to income (Dolan et al., 2008).

[3]We omit education from our analysis due to the fact earlier studies using BHPS find no significant relationship between education and life satisfaction (Flouri, 2004).

4.3 The Model

We use ordered probit model to link the observed SWB responses and the latent well-being (McKelvey and Zavoina, 1975). Due to our data we use a seven-point ordered scale for SWB responses.

Recall that our latent regression model is:

$$y^*_{ijt} = x'_{ijt}\beta + \epsilon_{ijt}$$

in which the continuous latent utility or measured SWB, y^*_{ijt} is observed in discrete a form through a censoring mechanism;

$$\begin{aligned}
y_{ijt} &= 1 \quad \text{if} \quad y^*_{ijt} \leq \mu_1 \\
y_{ijt} &= 2 \quad \text{if} \quad \mu_1 < y^*_{ijt} \leq \mu_2 \\
y_{ijt} &= 3 \quad \text{if} \quad \mu_2 < y^*_{ijt} \leq \mu_3 \\
y_{ijt} &= 4 \quad \text{if} \quad \mu_3 < y^*_{ijt} \leq \mu_4 \\
y_{ijt} &= 5 \quad \text{if} \quad \mu_4 < y^*_{ijt} \leq \mu_5 \\
y_{ijt} &= 6 \quad \text{if} \quad \mu_5 < y^*_{ijt} \leq \mu_6 \\
y_{ijt} &= 7 \quad \text{if} \quad y^*_{ijt} > \mu_6
\end{aligned}$$

Conditional probability function associated with the observed outcomes are:

$$f(y_{ijt}|x_{ijt}, a_j, u_{ij}) = \Phi(\mu_{y+1} - x'_{ijt}\beta - a_j - u_{ij}) - \Phi(\mu_y - x'_{ijt}\beta - a_j - u_{ij})$$

where Φ represents the cumulative density function of the standard normal distribution. To identify the model parameters we make some normalizations as such:

$$\mu_j > \mu_{j-1} \qquad \text{(Assumption 1)}$$

We make Assumption 1 to make sure that probabilities have a positive sign.

$$\mu_0 = -\infty \quad \text{and} \quad \mu_7 = \infty \qquad \text{(Assumption 2)}$$

In Assumption 2 we assume that the support is the entire real line. The intuition behind this assumption is that the lower bound of the observed life-satisfaction variable represents the lowest possible level of life satisfaction, while the upper bound of the observed life satisfaction variable represents the highest possible level of life satisfaction that can be reached.

$$v_{ijt} \sim N(0, 1) \qquad \text{(Assumption 3)}$$

Assuming variance to be a constant is necessary since free variance parameter is not identified and thus could not be estimated.[4] This kind of normalization is done in order to eliminate free structural scaling parameters.

$$\text{x-vector includes no constant.} \qquad \text{(Assumption 4)}$$

Assumption 4 is made due to identification reasons.

The remaining six threshold parameters $\mu_1, \ldots, \mu_6$, are freely estimated to-

[4] In probit model the usual approach is to assume variance equal to 1.

gether with β .

The model (Winkelmann, 2005) has a multilevel structure. Individuals are clustered into families: there are J different families with N_J family members. Even though family observations are independent across different families, within family observations are correlated due to family-specific effects.

The joint probability function of $y_j|x_j$ is then given by:

$$f(y_j|x_j) = \int_{-\infty}^{\infty} \prod_{i=1}^{N_j} \left[\int_{-\infty}^{\infty} \prod_{t=1}^{T_i} f(y_{ijt}|x_{ijt}, a_j, u_{ij}) h(u_{ij}) \mathrm{d}u_{ij} \right] g(a_j) \mathrm{d}a_j \qquad (7)$$

where

$y_j = (y_{1j1}, \ldots, y_{1jT_i}, \ldots, y_{N_jj1}, \ldots, y_{N_jjT_{N_j}})$ and
$x_j = (x_{1j1}, \ldots, x_{1jT_i}, \ldots, x_{N_jj1}, \ldots, x_{N_jjT_{N_j}})$

Other assumptions of the model are as follows:

1) u_{ij} and a_j are independent.

2) $u_{ij} \sim N(0, \sigma_u^2)$

3) $a_{ij} \sim N(0, \sigma_a^2)$

The distributions of $h(u_{ij})$ and $g(a_j)$ is given as such:

$$h(\sigma_u z_{ij}) = \frac{1}{\sqrt{\pi}} e^{-z_{ij}^2}, \qquad g(\sigma_a \tilde{z}_j) = \frac{1}{\sqrt{\pi}} e^{-\tilde{z}_j^2}$$

where $z_{ij} = u_{ij}/\sigma_u$ and $\tilde{z}_j = a_j/\sigma_a$

The maximum likelihood procedure is implemented by maximizing the likeli-

hood function with respect to $\theta = (\beta, \mu_1, \ldots, \mu_6, \sigma_u^2, \sigma_a^2)$.

The likelihood function is:

$$L(\theta|y, x) = \prod_{j=1}^{J} f(y_j|x_j, \theta)$$

where $f(y_j|x_j)$ is defined as in equation (6).

The maximum likelihood estimator has usual properties: it is consistent, efficient and approximately normally distributed. (Winkelmann, 2005)

CHAPTER 5

RESULTS

Before estimating results, we implement Hausman (1978) test to determine whether our model is correctly specified. We suspect that individual-specific or family-specific random effects may be correlated with the control variables. We apply Hausman test on STATA using linear model estimations. According to our results, the null hypothesis that the covariance between random error terms and explanatory variables is zero cannot be rejected. Therefore after the maximum likelihood procedure our estimators are expected to be consistent and efficient.

The regression results for the full sample of 20,165 person-year observations are shown in Table 3 and 4. Table 3 shows the ordered probit results without random effects. Table 4 shows the results of the ordered probit with multiple random effects, estimated using multilevel mixed-effects ordered probit regression in STATA. Log-likelihood being higher in Table 4 than in Table 3 suggests us that ordered probit model with random effects should be the preferred in terms

of goodness of fit.

The individual-specific (fixed) effects is similar to previous findings. According to our results SWB is U-shaped in age meaning that the life satisfaction of individuals is higher at the very young and old age than at the middle age. We can reach this result by just looking at our second-order polynomial in age. In both Table 1 and 2, coefficient of the variable agedivby10 has a negative sign and agesquareddivby100 has a positive sign. Similarly, unemployment has large negative effect on SWB whereas as the health satisfaction of individuals increases their life satisfaction increase as well. Since a doubling in income is predicted to increase SWB by about 0.09, whereas the negative effect of unemployment is about 0.37, we can see that the implicit cost of unemployment, measured in terms of reduced SWB for the individual experiencing unemployment, is substantial.

The point estimates for the variances of a and u are $\sigma_a^2 = 0.246$ and $\sigma_u^2 = 0.661$, respectively. Since the variance of the white noise error term (σ_v^2) is normalized to 1, we can conclude that $(0.246 + 0.661)/(0.246 + 0.661 + 1) = 47.56$ percent of the total variance is long-term as opposed to transitory. The three-components error model allows to decompose the long-term variance into family and individual specific parts. Our results show that the family effect important in the sense that 27.12 $[(0.246/(0.246 + 0.661)]$ percent in variation in long-term well-being is due to the family effects. Therefore the long-term SWB of family members is substantially correlated, namely 27.12 percent. According to Winkelmann (2005) earlier estimates indicate higher correlations without the household size and family income. Our results, however, show that the correlation remains substantial even if we include control variables such as family income and household size.

To distinguish between the effect of genetics and elaborate our analysis, we repeat our analysis on different samples, namely: spouses and siblings. In the first

sample we only consider children. We drop only-child family observations and are left with 4117 observations. The other sample that we consider is spouses, resulting in a sample of 12,236 observations. This sample enables us to observe non-biological effects in determining SWB among spouses. Thus, the correlation to be estimated between them will show us the effect of assortative mating, shared social environment and also spillovers.

The results are given in Table 5 and 6. Here the estimated coefficients and the signs suggest us the qualitatively same results. Except for family income is not significant for siblings. Since sibling analysis is done with a much smaller sample, the results that do not make sense is open to discussion. Because small samples may fail to represent the whole population. Luckily, the correlation results suggest some promising patterns. In Table 5 we see that the point estimates for the variances of a and u are $\sigma_a^2 = 0.131$ and $\sigma_u^2 = 0.424$, respectively. Similarly, that the point estimates for the variances of a and u are $\sigma_a^2 = 0.439$ and $\sigma_u^2 = 0.665$ in spouse case. Long-term sibling correlation in SWB is 23.60 $(0.131/(0.131+0.424))$ percent whereas long-term spousal correlation in SWB is 39.76 $(0.439/(0.439 + 0.665))$ percent. Long-term sibling correlation in SWB being less and also spousal correlation being higher than long-term intra-family correlation suggest us that assortative mating and shared economic and environmental conditions may be more important than shared genes. Long-term spousal correlation in SWB being so high (nearly 40 percent) show us that partners have a substantial influence on each other and here assortative mating plays an important role as well.

According to Winkelmann (2005) intra-family correlation in SWB is 44 percent and sibling correlation in long-term well-being is estimated as 47 percent. For spouses, however, the long-term correlation in SWB is estimated as 20 percent. Therefore, he obviously concludes that the long-term correlation in SWB

is highly affected by shared genes. Our findings, however, without denying the effect of biological factors, favors non-biological factors more. The main reason for this difference between two studies which use the same technique is we can distinguish adopted children, in-laws, step father-mother, in summary any kind of kinships. Hence, we only use observations of the natural mother, natural father and natural children who live together. On the other hand since, by using GSOEP, Winkelmann (2005) could not distinguish kinships and treat some of the unrelated people as biologically related. That is why he overestimates the effect of biological factors in determining well-being by overestimating sibling correlation.

All in all unlike the previous studies that only take one year to estimate intra-family correlation in well-being and Winkelmann (2005) who use panel data, our results provide lower but substantial long-term intra-family correlations in SWB. Non-biological effects being more important long-term intra-family correlation is estimated as 27 percent.

CHAPTER 6

CONCLUSION

In this thesis, we examine long-term correlation in well-being within family. Using multilevel mixed effects ordered probit model on a sample of 20,165 observations from the British Household Panel Survey in time period of 1996-2008, we study the the extend to which intra-family correlation in SWB can be explained by shared social and economic environment, spouse selection and biological factors.

Previous studies, namely Winkelmann (2005) finds the long-term intra-family correlation in SWB as 44 percent. For siblings, he finds 47 percent correlation in SWB and for spouses it is 20 percent. He concludes that the long-term correlation in well-being among family members is highly related to shared genes than shared socioeconomic and environmental conditions. Even though we use the same method, we find different results due to our data set. In our data, we have kinship information so we distinguish between adopted children, in-laws, step father-mother and natural ones. Therefore we can estimate our results with this important information that enabled us to purify genetics effects.

Our estimation results suggest that the long-term well-being of family members

who live together is highly correlated. We find correlation coefficient of 0.27, meaning that intra-family correlation is 27 percent. More interestingly, we find that the long-term the correlation coefficient of spouses is 0.40 whereas 0.24 for children.

We, therefore, provide evidence that a purely individualistic view of explaining SWB misses part of the story. Our aim by distinguishing between family members as siblings and spouses is to make a difference between biological and non-biological factors. Since as we discuss in literature chapter there are some theories try to explain that the correlation of well-being based on shared genes. Long-term sibling correlation in SWB being less and also spousal correlation being higher than long-term intra-family correlation give us the clue that economic and environmental conditions may be more important in determining correlations in well-being than shared genes.

Without overestimating the effect of biological factors, as previous studies do we can conclude that there is a substantial interdependence in reported life satisfaction among the family members. Therefore, this kind of interdependence needs to be considered by any study aiming to understand the determinants of subjective well-being.

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APPENDIX

TABLES AND FIGURES

Table 1: Definition Of The Variables Used In The Analysis

Variable	Definition
Dependent variable	
lifesatisfaction	Assessment of personal overall life satisfaction 1=Not satisfied at all ⋮ 7=Completely satisfied
Independent variables	
health	Assessment of personal health satisfaction 1=Not satisfied at all ⋮ 7=Completely satisfied
sex	=1 if male =0 if female
unemployment	=1 if unemployed =0 otherwise
agedivby10	Age of the individual divided by 10
agesquareddivby100	Square of the age of the individual divided by 100
logfamsize	Logarithm of number of persons living in the household
logfaminc	Logarithm of annual household income
year	Time dummy

Table 2: Descriptive Statistics

Variables	Mean	SD	MIN	MAX	N
lifesatisfaction	5.2222	1.2175	1	7	20165
health	5.0976	1.4909	1	7	20165
sex	0.5166	0.4997	0	1	20165
unemployment	0.0367	0.1881	0	1	20165
agedivby10	3.8079	1.6096	2	9	20165
agesquareddivby100	17.0911	12.4515	2	81	20165
logfamsize	1.3438	0.2250	1.0986	13.5003	20165
logfaminc	10.4974	0.5558	1.2809	2.3026	20165
year	NA	NA	1996	2008	20165

Source: Data from British Household Panel Survey, 1996-2008 (excluding 2001) Estimated standard errors in parentheses. ***/**/* indicate statistical significance at the 1, 5 and 10 percent level, respectively.

Table 3: Ordered Probit Model Without Random Effects in Subjective Well-Being

lifesatisfaction	Coefficient
health	0.441***
	(0.011)
sex	-0.010
	(0.028)
unemployment	-0.375***
	(0.057)
agedivby10	-0.756***
	(0.060)
agesquareddivby100	0.105***
	(0.008)
logfamsize	0.067
	(0.070)
logfaminc	0.107***
	(0.024)
year	
1997	-0.039
	(0.045)
1998	-0.003
	(0.047)
1999	-0.042
	(0.047)
2000	-0.135**
	(0.050)
2002	-0.122*
	(0.050)
2003	-0.219***

Continued on next page

Table 3 – *Continued from previous page*

lifesatisfaction	Coefficient
	(0.050)
2004	-0.131*
	(0.052)
2005	-0.242***
	(0.054)
2006	-0.195***
	(0.054)
2007	-0.220***
	(0.053)
2008	-0.203***
	(0.055)
μ_1	-1.517
μ_2	-0.832
μ_3	0.035
μ_4	1.035
μ_5	2.392
μ_6	4.083
σ_ϵ^2	0.894***
Log-likelihood	-26114.0
Number of obs.	20165

Source: Data from British Household Panel Survey, 1996-2008 (excluding 2001) Estimated standard errors in parentheses. ***/**/* indicate statistical significance at the 1, 5 and 10 percent level, respectively.

Table 4: Ordered Probit Models For Long-Term Intra-Family Correlation In Subjective Well-Being

lifesatisfaction	Coefficient
health	0.433***
	(0.011)
sex	-.030
	(0.028)
unemployment	-0.367***
	(0.058)
agedivby10	-0.799***
	(0.058)
agesquareddivby100	0.110***
	(0.008)
logfamsize	0.060
	(0.070)
logfaminc	0.092***
	(0.024)
year	
1997	-0.036
	(0.045)
1998	0.002
	(0.047)
1999	-0.045
	(0.047)
2000	-0.139**
	(0.049)
2002	-0.128*
	(0.051)

Continued on next page

Table 4 – *Continued from previous page*

lifesatisfaction	Coefficient
2003	-0.225***
	(0.051)
2004	-0.136**
	(0.052)
2005	-0.253***
	(0.054)
2006	-0.205***
	(0.054)
2007	-0.232***
	(0.054)
2008	-0.213***
	(0.055)
μ_1	-1.809
μ_2	-1.123
μ_3	-0.255
μ_4	0.746
μ_5	2.105
μ_6	3.796
σ_a^2	0.246***
σ_u^2	0.661***
Log-likelihood	-26015.0
Number of obs.	20165

Source: Data from British Household Panel Survey, 1996-2008 (excluding 2001) Estimated standard errors in parentheses. ***/**/* indicate statistical significance at the 1, 5 and 10 percent level, respectively.

Table 5: Ordered Probit Model For Long-Term Correlations Among Siblings In Subjective Well-Being

lifesatisfaction	Coefficient
health	0.449***
	(0.024)
sex	0.125*
	(0 .053)
unemployment	-0.411***
	(0.103)
agedivby10	-0.871***
	(0.204)
agesquareddivby100	0.093**
	(0.034)
logfamsize	0.302
	(0.155)
logfaminc	0.027
	(0.045)
year	
1997	0.105
	(0.085)
1998	0.125
	(0.089)
1999	-0.010
	(0.096)
2000	-0.059
	(0.103)
2002	-0.093
	(0.101)

Continued on next page

Table 5 – *Continued from previous page*

lifesatisfaction	Coefficient
2003	-0.105
	(0.102)
2004	0.017
	(0.102)
2005	-0.109
	(0.103)
2006	-0.023
	(0.102)
2007	0.053
	(0.102)
2008	0.023
	(0.103)
μ_1	-1.553
μ_2	-0.976
μ_3	-0.304
μ_4	0.583
μ_5	1.836
μ_6	3.437
σ_a^2	0.131**
σ_u^2	0.424***
Log-likelihood	-5402.2
Number of obs.	4117

Source: Data from British Household Panel Survey, 1996-2008 (excluding 2001) Estimated standard errors in parentheses. ***/**/* indicate statistical significance at the 1, 5 and 10 percent level, respectively.

Table 6: Ordered Probit Model For Long-Term Correlation Among Spouses In Subjective Well-Being

lifesatisfaction	Coefficient
health	0.431***
	(0.014)
sex	-0.075*
	(0.038)
unemployment	-0.408***
	(0.085)
agedivby10	-0.568***
	(0.112)
agesquareddivby100	0.084***
	(0.013)
logfamsize	-0.150
	(0.093)
logfaminc	0.108***
	(0.031)
year	
1997	-0.061
	(0.060)
1998	0.016
	(0.061)
1999	-0.017
	(0.060)
2000	-0.127*
	(0.063)
2002	-0.021
	(0.064)

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Table 6 – *Continued from previous page*

lifesatisfaction	Coefficient
2003	-0.201**
	(0.065)
2004	-0.113
	(0.067)
2005	-0.238***
	(0.070)
2006	-0.227**
	(0.070)
2007	-0.267***
	(0.071)
2008	-0.207**
	(0.073)
μ_1	-1.679
μ_2	-0.974
μ_3	-0.026
μ_4	1.032
μ_5	2.447
μ_6	4.236
σ_a^2	0.439***
σ_u^2	0.665***
Log-likelihood	-15527.9
Number of obs.	12236

Source: Data from British Household Panel Survey, 1996-2008 (excluding 2001) Estimated standard errors in parentheses. ***/**/* indicate statistical significance at the 1, 5 and 10 percent level, respectively.