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**Conference Paper**

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Beiträge zur Jahrestagung des Vereins für Socialpolitik 2010: Ökonomie der Familie -  
Session: Marriage and Divorce, No. E11-V2

**Provided in Cooperation with:**

Verein für Socialpolitik / German Economic Association

Suggested Citation: Qari, Salmai (2010) : Marriage, adaptation and happiness: Are there long-lasting gains to marriage?, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2010: Ökonomie der Familie - Session: Marriage and Divorce, No. E11-V2, Verein für Socialpolitik, Frankfurt a. M.

This Version is available at:

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# Marriage, adaptation and happiness: Are there long-lasting gains to marriage?\*

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February 9, 2010

## Abstract

This paper uses 23 waves of German panel data and investigates if individuals who decide to marry become permanently happier. Following the same persons over several years we show that they do, thereby challenging a number of recent longitudinal studies in psychology and economics which suggest that individuals fully adapt to the positive impact of marriage. We then convert the estimates into Euro values. It is well known that most newlyweds experience a “honeymoon period” shortly after marriage. We calculate the monetary equivalent of being married for five years to avoid overestimation due to this honeymoon effect. These long-run monetary benefits are quite large, e.g. for males on average 85,000 Euros a year. This supports the findings by Blanchflower and Oswald (2004, Journal of Public Economics) which are based on cross-sectional data.

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\*I thank Tom Cusack, Sebastian Kessing, and particularly Kai A. Konrad for helpful comments and suggestions. I am grateful for financial support from the Anglo-German foundation through the CSGE research initiative. I thank Martina Grunow for excellent research assistance. The usual caveat applies. The data used in this article were made available by the German Socio Economic Panel Study at the German Institute for Economic Research, Berlin.

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## 1. Introduction

A simple revealed preference argument suggests that persons who marry are better off than in their previous situation while single. An important question is whether this utility gain is reflected in individuals' happiness. Of course there are counterarguments, for example that the true quality of the partner may only gradually be revealed. Given that some non-zero divorce costs exist (e.g. monetary, psychological or social), some individuals may end up worse off than while single. But for the vast majority of existing unions one should expect that utility while married is larger than the previous utility while single.

The early literature based on cross-sectional data consistently found a positive impact of marriage on individuals' life satisfaction (see Diener, Suh, Lucas and Smith (1999) for a review). One obvious shortcoming of these studies is that they are unable to distinguish whether or not this correlation just reflects preexisting differences between the two groups. Stutzer and Frey (2006) provide evidence for this argument by comparing several groups of singles over time. They find that those who are on average happier than other singles have a higher propensity to marry than the less happy ones. They conclude that a large part of the cross-sectional correlation is due to selection of the happier individuals into marriage.

A second objection against the results of the cross-sectional literature is the idea of hedonic adaptation (Brickman and Campbell, 1971). In this context the theory implies that individuals quickly get used to the positive effects of having a partner which in turn suggests that their utility bounces back to the level before marriage. A number of recent longitudinal studies test this hypothesis and report that individuals on average fully adapt to marriage (Lucas, Clark, Georgellis and Diener, 2003, Lucas and Clark, 2006, Clark, Diener, Georgellis and Lucas, 2008). One exception is Zimmermann and Easterlin (2006) who report that individuals' happiness two years after marriage is higher than the baseline level, where the baseline is one year prior to marriage.

Our aim is to reconsider the effects of marriage on individuals' happiness using a different empirical strategy. We use 23 years of German panel data and follow the same individuals over several years. All individuals included in the sample marry in the course of time. Instead of entering a single marriage dummy we use a series of duration dummies. In this way we can identify an individual's happiness profile over time, starting five years before to five years after marriage. The reference period for our calculations is five years prior to marriage. In this way we are able to pick up the value of being single as the reference utility level more accurately. We include individual fixed effects into

our analysis. The reasons are twofold. First, the fixed effects model implies the weakest assumptions in order to capture the idea of hedonic adaptation. If individuals over time return to some genetically determined level of happiness, this will be picked up by the fixed effects. Second, the coefficient estimates are solely driven by variation within the same person thereby ruling out selection effects.

As in the previous literature we find the strongest positive impact on happiness in the years around marriage and a huge drop one year after marriage.<sup>1</sup> However, after this honeymoon period effect reported happiness stabilizes. Since we use pre-marital singlehood as the reference period our estimates readily allow us to gauge the value of marriage in terms of money. The gains are large. For example, the happiness boost for males in a union lasting five years roughly equals 85,000 Euros a year. Thus, our results are more in line with recent cross-sectional studies than recent longitudinal studies.

This paper has two main contributions. First, we obtain a more reliable estimate of the marriage benefits by using a longer time span. Second, we show that the evidence of adaptation to marriage reported by the recent longitudinal literature could be driven by the choice of the baseline period. Both findings are important from a policy perspective given that the welfare state often creates incentives for marriage, for example through tax benefits for married couples. If the degree of adaptation is low, one may ask if such policies are needed in light of high and persistent marriage rents. On the other hand, a strong degree of habituation to marriage may play a role for the calculation of loss compensation (Adler and Posner, 2008, Dolan and Kahneman, 2008, Oswald and Powdthavee, 2008b).

Our results also contribute to the broader positive literature on individual well-being. For example, Stevenson and Wolfers (2008) employ data from the General Social Survey for the years 1972-2006 and show that in the United States income inequality increased while at the same time happiness inequality decreased. They conjecture that over time non-monetary factors have become an increasingly important input for individual well-being. Our estimates suggest that the gains to marriage are rather large compared to the income coefficients and the disutility associated with unemployment. Hence, the returns to marital unions may be one of the important non-monetary inputs.

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<sup>1</sup>There are several explanations for this drop, e.g. partial adaptation or rising aspiration levels. The focus of this paper is not to distinguish between these factors. Our results suggest that individuals enjoy long-lasting happiness gains from marriage and as such are compatible with Easterlin (2005), who argues that individuals' aspirations in the income domain change strongly whereas aspirations with regard to marriage tend to be stable.

## 2. Background

The theory of search and matching clearly predicts that a single individual chooses to marry only if the (expected) utility from the partnership exceeds the value of being single. However, there is no clear prediction on how the marriage surplus is split among the partners, as this strongly depends on the underlying theoretical model.<sup>2</sup> Moreover, observed transitions from singlehood into marriage in panel data do not directly reveal the marriage surplus. The concept of adaptation introduces a further complication, as it suggests that the marriage gains fade away over time while everything else is kept constant. In order to investigate the marriage gains empirically, we build on previous papers which convincingly argue that self-reported well-being is a reasonable approximation to individual utility (e.g. Blanchflower and Oswald, 2008, Di Tella, MacCulloch and Oswald, 2003, Di Tella and MacCulloch, 2006, Frey and Stutzer, 2002 and Luttmer, 2005). In particular, we follow Blanchflower and Oswald (2004) and assume that reported individual well-being is equal to

$$r = h(u(y, x, m, t)) + e \tag{1}$$

where  $r$  is reported well-being,  $u(\cdot)$  is individual utility depending on income  $y$ , a set of personal characteristics  $x$ , time  $t$  and marital status  $m$ , and  $h(\cdot)$  is a non-differentiable function linking actual to reported well-being. The error term  $e$  captures all unobserved effects including the individuals' inability to report perfectly their true utility. Although not (always) explicitly stated, previous longitudinal studies, which use life satisfaction as the explained variable, implicitly adopt this framework.

Our empirical approach differs from previous analyses in two important dimensions. The first is the treatment of unobserved heterogeneity. Lucas et al. (2003), Lucas and Clark (2006) and Zimmermann and Easterlin (2006) rely on linear mixed effects models (which are also known as hierarchical or multilevel models). While these models would yield more efficient estimates, they require that the random parameters are orthogonal to other fixed regressors. However, it seems reasonable that unobserved personality traits are correlated with regressors such as employment status, which renders the assumption

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<sup>2</sup>In bargaining models the respective partners' negotiate the split of the marriage surplus. Bargaining power depends on the "threat-points", which is equivalent to divorce in the early literature (Manser and Brown, 1980, McElroy and Horney, 1981). Alternatively, it is some non-cooperative behavior if the partners fail to reach an agreement. Examples of these models include Lundberg and Pollak (1993) and Konrad and Lommerud (2000). For reviews see Lundberg and Pollak (1994), Pollak (1994), Lundberg and Pollak (1996) and Lundberg and Pollak (2007).

invalid and suggests to employ a fixed effects framework.<sup>3</sup>

The second important factor is the choice of the reference period. In their recent longitudinal study of anticipation and adaptation to various life events, Clark et al. (2008) aggregate all periods before the event into a single reference period. For example, to trace individual's adaptation to unemployment, they enter dummy variables indicating the years in which the individuals became unemployed and subsequent years. Using this approach, they convincingly show for their primary life event –unemployment– that compared to the years of employment there is not much recovery from the drop in happiness. Unemployment starts bad and stays bad and this effect is more strongly pronounced for men. However, while it is perfectly valid to employ the years right before the transition as the reference period in the case of unemployment, we think that it is not a good choice for the analysis of marriage. Most individuals enjoy having a partner some years before they marry and move in together. Therefore, using one or two years prior to marriage as the reference year (Lucas et al., 2003, Lucas and Clark, 2006, Zimmermann and Easterlin, 2006, Clark et al., 2008) leads to overestimation of the “baseline” utility.

Our results are particularly interesting in light of Stutzer and Frey (2006), who show that those singles who are generically happier than other singles are also more likely to marry. Since we restrict the sample to those who marry in the course of time, our results indicate that they become even happier while married.

### 3. Data and empirical strategy

We employ data from 23 waves of the German Socio-Economic Panel (GSOEP), covering the years 1984-2006. The GSOEP is a representative panel study for Germany, which started in 1984 as a longitudinal survey of private households and individuals in West Germany and was expanded in 1990 to cover the population of the former East Germany. One particular advantage of the GSOEP design is that all adult (16 years or older) household members are asked to complete separate questionnaires. While the initial 1984 sample comprised approximately 6,000 households, this number grew to roughly 12,000 in 2006. A detailed description of the GSOEP is provided by Wagner, Frick and Schupp (2007).

Our main goal is to estimate the gains of marriage among those who decide to marry for the first time. Hence, we keep in our main sample only those individuals who change

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<sup>3</sup>Ferrer-i-Carbonell and Frijters (2004) provide a good discussion on this matter.

their reported marital status over time from “single” to “married” and are present in the sample at least five years before and at least five years after marriage. Moreover, we restrict the sample to those who experience only one transition of marital status during this time span. There are two reasons for these restrictions. First, as discussed in the introduction, happiness probably spikes during the adjoining years before and after marriage (see also Clark et al., 2008). The long time span enables us to obtain a clean estimate of utility while single and the benefits of marriage after this honeymoon period. Second, both economic theory and the psychology literature on “adaptation” suggest to exclude observations on persons who –for example– divorce during the time span. If no partner is available, it is impossible to receive marriage benefits. Likewise, “participants cannot continue to adapt to the event of marriage if the marriage is no longer intact” (Lucas et al., 2003).

Our main subsample created by these restrictions comprises 1,662 females and 1,614 males who marry in one of the years, resulting in 18,277 and 19,137 person-year observations for females and males, respectively. As discussed in the previous section, we employ reported life satisfaction as a proxy for individual utility. The respective question in the GSOEP reads “How satisfied are you with your life, all things considered?”. The survey respondents are asked to answer this question on an eleven-point scale ranging from zero to ten, where zero means “fully dissatisfied” and ten “fully satisfied”.

We assess the impact of marriage on individuals’ utility with the following empirical counterpart to equation (1):

$$LS_{i,t} = \alpha_i + \mathbf{x}'_{it}\beta + \gamma y_{i,t} + \sum_{j=\underline{j}}^{\bar{j}} \theta_j MD_{i,t}^j + \epsilon_{i,t} \quad (2)$$

where  $LS_{i,t}$  denotes self-reported life satisfaction,  $\mathbf{x}'_{it}$  is a vector of individual controls and  $y_{i,t}$  is real income. Unobserved individual heterogeneity (e.g. personality traits) is captured by a fixed effect  $\alpha_i$ . The fixed effects estimation allows the individual intercept to be correlated with other regressors and implies that the remaining coefficients pick up variation within the same person over time. Clearly, the group of singles who marry at some point in time is selective with respect of several demographic characteristics, but the fixed effects estimator rules out selection effects on top of this obvious selection. In a recent article Ferrer-i-Carbonell and Frijters (2004) conclude “that while the assumption of cardinality or ordinality does not qualitatively change the results, the treatment of unobserved time-invariant effect does.” Hence, for ease of interpretation we assume cardinality and fit equation (2) by OLS.

The main explanatory variables are a series of dummy variables indicating the number of years before or after marriage. If, e.g. person  $i = a$  marries in the year 1994, then the dummy indicating 0 years after marriage is set to one in 1994 for this individual ( $MD_{a,1994}^0 = 1$ ). The remaining person-year observations are defined relative to the year of marriage, e.g. for person  $i = a$  the dummy indicating one year before marriage is set equal to one in 1993 ( $MD_{a,1993}^{-1} = 1$ ) and the dummy indicating one year after marriage equals one in 1995 ( $MD_{a,1995}^1 = 1$ ). We enter eleven dummies into our baseline estimation, indicating the time span from five or more years before marriage ( $\bar{j} = -5$ ) up to five or more years after marriage ( $\bar{j} = 5$ ). The omitted reference category is five or more years before marriage ( $j = -5$ ).

This approach is similar to the graphical approach by Gardner and Oswald (2006), who analyze individuals' levels of mental strain before and after divorce in a five-year span (ranging from two years before to two years after divorce). It differs from the setup by Clark et al. (2008), who analyze adaptations to major life events in a six-year span starting in the year of the respective event. In the terminology of equation (2) they enter the dummies for  $j = 0, \dots, 5$ , but omit the dummies for  $j = 5, \dots, -1$ .

While this makes perfect sense for the major topic of their paper, adaptation to unemployment, it is less convincing for the analysis of marriage adaptation. Before individuals decide to marry, they usually have a permanent relationship for some time, although they are single and may live in different households. It seems therefore likely that individuals (at least partially) enjoy the benefits of having a partner one or two years before marriage. By analyzing the life satisfaction movements relative to five years before marriage, we are able to capture the benefits of having a partner compared to being single more accurately.

Previous research based on cross-sectional data has identified a number of individual characteristics, which are associated with different levels of life satisfaction, in particular race, sex, education, health, employment status and age (e.g. Frey and Stutzer, 2002, Blanchflower and Oswald, 2004). Since we enter an individual fixed effect into the regressions it is not necessary (and impossible) to use time-invariant personal characteristics like race or sex as control variables. From the list of remaining controls, we further are unable to include health as it is not available before 1992. Hence,  $\mathbf{x}'_{it}$  contains age, age squared, a dummy indicating if the individual is employed, years of schooling and a region dummy indicating East Germany. We conduct all estimations separately for females and males to account for sex differences.

Table 1 provides means and standard deviations for the life satisfaction scores and the control variables. For most of the variables the two summary statistics are similar



Table 1: Summary statistics (pooled)

(a) females

	Mean	SD
Life satisfaction	7.353778	1.632699
Age	28.61925	7.381942
Age <sup>2</sup> /100	8.735515	4.96222
Employed	.7354052	.4411293
HH income	31.99215	16.45593
East	.1202057	.3252108
Education	11.78946	2.550592
Number of Observations	18277	
Number of Individuals	1662	

(b) males

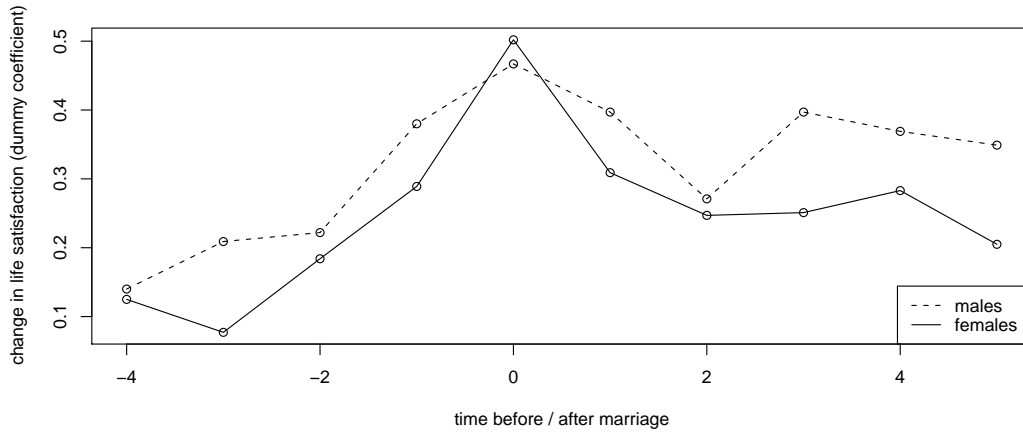
	Mean	SD
Life satisfaction	7.336939	1.556043
Age	30.41239	7.69778
Age <sup>2</sup> /100	9.841665	5.175599
Employed	.8936092	.3083452
HH income	33.63773	15.73546
East	.1053979	.3070735
Education	11.94048	2.758223
Number of Observations	19137	
Number of Individuals	1614	

for both sexes. The notable exception is employment status. While among the 18,277 female observations the employment indicator is set to one in 73% of the cases, the corresponding number for males is 90%.

#### 4. Life satisfaction regressions

Table 2 presents the main results. Column (1) shows the estimates for the sample of females, while column (2) provides the results for males. The estimates of central importance in this table are the dummy coefficients picking up the change in life satisfaction several years before and after marriage. For ease of discussion, we present these graphically as well (Figure 1).

Figure 1: Change in life satisfaction before and after marriage



During the years prior to marriage the results differ across both sexes. Compared to the baseline category of five years (or more) prior to marriage, both females and males seemingly enjoy the benefits of having a partner already two years prior to marriage. This is consistent with the idea that they are in a permanent relationship with their partner, but live in different households. Interestingly, males also report higher levels of life satisfaction four and three years before they marry, while this pattern is absent for females. Clark et al. (2008) provide a similar finding and report that males are happier 2-3 years before they marry while this “anticipation” effect for females is present only one year prior to marriage.

The figure clearly shows that life satisfaction for both females and males starts to increase steeply two years prior to marriage. After a honeymoon period around the

Table 2: Baseline life satisfaction regression

	(1) female	(2) male
Age	-0.0471** (-3.22)	-0.0410** (-3.10)
Age <sup>2</sup>	0.0126 (0.62)	-0.00248 (-0.14)
Employed	0.0505+ (1.74)	0.134*** (3.36)
HH income	0.00556*** (6.61)	0.00414*** (5.11)
East	-0.0452 (-0.35)	-0.233 (-1.63)
Education	0.0245* (2.35)	-0.0134 (-1.47)
$\theta_{-4}$	0.125* (2.27)	0.140** (2.74)
$\theta_{-3}$	0.0771 (1.42)	0.209*** (4.12)
$\theta_{-2}$	0.184*** (3.35)	0.222*** (4.36)
$\theta_{-1}$	0.289*** (5.12)	0.380*** (7.35)
$\theta_0$	0.502*** (8.31)	0.467*** (8.50)
$\theta_1$	0.309*** (4.59)	0.397*** (6.50)
$\theta_2$	0.247*** (3.39)	0.271*** (4.14)
$\theta_3$	0.251** (3.21)	0.397*** (5.70)
$\theta_4$	0.283*** (3.38)	0.369*** (4.98)
$\theta_5$	0.205* (2.22)	0.349*** (4.38)
Constant	7.892*** (36.04)	8.272*** (41.46)
Number of observations	18277	19137
Number of individuals	1662	1614
$R^2$ within	0.0203	0.0187

*t* statistics in parentheses

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

years of transition happiness drops, but 2-5 years after marriage it is still significantly larger than in the pre-marital baseline stage. Recall that these results are obtained from a fixed effects regression and as such are driven by changes within the same person over time and not by selection.

Figure 1 also suggests that the honeymoon period starts one year before and lasts until one or two years after the transition. This pattern may explain why the recent longitudinal literature is often unable to find long-lasting boosts of life satisfaction associated with marriage. Individuals in our sample enjoy higher levels of happiness already two years before they marry. Hence, fitting only a single intercept for the years before the transition leads to an inflated estimate for happiness while single.

We further inquire this conjecture in two ways. First, we use exactly the same sample as before but we omit the dummies for  $j = -5, \dots, -1$  when fitting equation (2). This is in line with Clark et al. (2008) and implicitly treats the average of the years before marriage as the reference category. Table 3(a) clearly shows that this reverses the conclusions. The estimates would now suggest full adaptation, i.e. that both females and males get used to the hedonic gains of marriages and bounce back to their baseline levels two years after marriage. For the second test we estimate the same set of dummies, but we delete all observations which date back two or more years before marriage. Thus, in this estimation the baseline value now comprises not an average, but only a single period: one year before marriage. Table 3(b) presents the results. As one could expect from figure 1 this approach further exaggerates the adaptation conclusion. Moreover, it generates coefficients which suggest a negative impact of marriage after a short honeymoon period.

We next investigate how inclusion of additional controls affects our findings. A particular interesting variable in the context of marital unions is the presence of children. We thus extend the baseline estimation (Table 2) by introducing a dummy indicating if children are present in the household. Di Tella et al. (2003) provide evidence for a correlation between individual life satisfaction and macroeconomic variables like gross domestic product. If for example an economic upturn simultaneously increases individual happiness and the propensity to marry, then our marital status dummies may pick up these macroeconomic shocks rather than the benefits of having a partner. We enter a set of time fixed effects into the baseline model to check this possibility.

Table 4 shows the results. Columns (1) and (3) enter the children dummy for females and males respectively, while columns (2) and (4) additionally control for time fixed effects. The children coefficient is positive in all regressions. However, the associated standard errors are quite large and as a result the estimates are statistically insignifi-

Table 3: Evidence for adaptation due to inflated reference utility

(a) baseline sample

	(1) female	(2) male
Age	-0.0162 (-1.24)	0.00105 (0.09)
Age <sup>2</sup>	-0.0137 (-0.70)	-0.0394* (-2.26)
Employed	0.0457 (1.57)	0.138*** (3.45)
HH income	0.00546*** (6.49)	0.00417*** (5.13)
East	-0.0631 (-0.49)	-0.226 (-1.59)
Education	0.0282** (2.72)	-0.0141 (-1.54)
$\theta_0$	0.303*** (7.47)	0.207*** (5.31)
$\theta_1$	0.0938* (2.00)	0.118** (2.63)
$\theta_2$	0.0159 (0.31)	-0.0259 (-0.54)
$\theta_3$	0.00471 (0.08)	0.0817 (1.58)
$\theta_4$	0.0211 (0.35)	0.0362 (0.65)
$\theta_5$	-0.119* (-2.02)	-0.0627 (-1.21)
Constant	7.401*** (38.26)	7.611*** (43.35)
Number of observations	18277	19137
Number of individuals	1662	1614
$R^2$ within	0.0186	0.0157

$t$  statistics in parentheses

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

(b) reduced sample (see text)

	(1) female	(2) male
Age	0.00726 (0.33)	-0.0401+ (-1.87)
Age <sup>2</sup>	-0.0657* (-2.19)	-0.0103 (-0.38)
Employed	0.0588+ (1.73)	0.327*** (4.66)
HH income	0.00732*** (6.28)	0.00395** (3.28)
East	0.00739 (0.04)	0.0000721 (0.00)
Education	0.00809 (0.42)	-0.00733 (-0.47)
$\theta_0$	0.204*** (4.65)	0.0823* (1.97)
$\theta_1$	-0.0250 (-0.50)	-0.00670 (-0.14)
$\theta_2$	-0.112* (-2.03)	-0.142** (-2.74)
$\theta_3$	-0.121* (-2.00)	-0.00716 (-0.13)
$\theta_4$	-0.0962 (-1.46)	-0.0329 (-0.54)
$\theta_5$	-0.195** (-2.63)	-0.0331 (-0.50)
Constant	7.522*** (17.93)	8.458*** (20.77)
Number of observations	11684	11748
Number of individuals	1650	1603
$R^2$ within	0.0365	0.0337

$t$  statistics in parentheses

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 4: Life satisfaction regressions with additional controls

	(1)	(2)	(3)	(4)
	female	female	male	male
Age	-0.0464** (-3.17)	-0.0589*** (-3.52)	-0.0376** (-2.82)	-0.0469** (-3.02)
Age <sup>2</sup>	0.0117 (0.57)	0.0225 (1.09)	-0.00663 (-0.36)	0.00415 (0.22)
Employed	0.0557+ (1.87)	0.0542+ (1.82)	0.136*** (3.41)	0.125** (3.14)
HH income	0.00549*** (6.51)	0.00560*** (6.62)	0.00400*** (4.92)	0.00424*** (5.19)
East	-0.0486 (-0.38)	-0.0624 (-0.48)	-0.240+ (-1.68)	-0.251+ (-1.76)
Education	0.0249* (2.38)	0.0262* (2.51)	-0.0125 (-1.36)	-0.0121 (-1.32)
Children	0.0258 (0.82)	0.0302 (0.96)	0.0577* (2.01)	0.0554+ (1.92)
$\theta_{-4}$	0.126* (2.29)	0.113* (2.06)	0.139** (2.73)	0.131* (2.56)
$\theta_{-3}$	0.0782 (1.44)	0.0704 (1.29)	0.209*** (4.11)	0.205*** (4.05)
$\theta_{-2}$	0.185*** (3.37)	0.186*** (3.38)	0.221*** (4.33)	0.225*** (4.43)
$\theta_{-1}$	0.290*** (5.14)	0.288*** (5.11)	0.376*** (7.28)	0.380*** (7.36)
$\theta_0$	0.500*** (8.27)	0.510*** (8.31)	0.455*** (8.22)	0.461*** (8.23)
$\theta_1$	0.303*** (4.48)	0.307*** (4.53)	0.374*** (6.02)	0.381*** (6.13)
$\theta_2$	0.238** (3.23)	0.248*** (3.36)	0.240*** (3.57)	0.252*** (3.75)
$\theta_3$	0.241** (3.03)	0.244** (3.06)	0.361*** (5.01)	0.374*** (5.19)
$\theta_4$	0.271** (3.19)	0.258** (3.03)	0.329*** (4.28)	0.332*** (4.32)
$\theta_5$	0.190* (2.02)	0.177+ (1.87)	0.303*** (3.66)	0.304*** (3.67)
Constant	7.864*** (35.51)	8.041*** (29.40)	8.194*** (40.32)	8.357*** (31.87)
Year dummies	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>
Number of observations	18277	18277	19137	19137
Number of individuals	1662	1662	1614	1614
$R^2$ within	0.0204	0.0256	0.0190	0.0243

$t$  statistics in parentheses

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

cant for females. More importantly, both estimations corroborate the previous baseline results. Although the estimates are slightly smaller, the main conclusions remain unaffected: for both females and males reported life satisfaction while married is significantly larger than while single.

Our main conclusion therefore is that the utility gains from marriage (as suggested by simple revealed preference arguments) are reflected in changes of individuals' happiness. For both females and males life satisfaction five years after marriage is sizeably larger than while single. Depending on the specification, the estimate of  $\theta_5$  for females is between 0.18 and 0.21 (see Tables 2 and 4). This means that married females enjoy five years after marriage a gain between 0.18 and 0.21 life satisfaction points compared to their life satisfaction while single. The corresponding interval for males is 0.3 – 0.35.<sup>4</sup> The estimates in Table 2 and 4 also illustrate that these increases in life satisfaction are statistically and economically significant. For both sexes the benefits of having a partner are 2-3 times as large as the increase in happiness associated with being employed rather than unemployed. After briefly discussing some additional robustness checks in the following section, we convert the coefficient estimates into Euro values in section 6.

## 5. Further robustness checks

The previous section has shown that our main results are unaffected by the inclusion of additional control variables. We now further inquire the robustness of our findings. In particular, we create dummies covering two years instead of a single year. For example,  $MD_{i,t}^{-5}$  is set to one if the individual marries in five or more years, and  $MD_{i,t}^{[-4;-3]}$  is set to one three or four years prior to marriage. In this way we create seven dummies covering the same time span as in the baseline regression.  $MD_{i,t}^{[6]}$  is set to one in all periods six or more years after marriage. As before five or more years prior to marriage is the reference category and the respective dummy is omitted.

Table 5 regresses individual life satisfaction on the set of two-year dummies and the small set of control variables. As such the table is comparable to the baseline estimation (Table 2). The estimates corroborate our previous conclusions. Both females and males pass through a honeymoon period during the year they marry and the adjoining years. Life satisfaction of females married for four/five years is on average 0.267 points higher than while single. The point estimate for males is 0.329. Females married for six (or

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<sup>4</sup>Although some studies report that females tend to be happier than males, this result is not robust, see Dolan, Peasgood and White (2008) for a review. Our findings are not at odds with this, since the coefficients pick up the change rather than the level of well-being.

Table 5: Life satisfaction regressions (two-year-cells)

	(1)	(2)
	female	male
Age	-0.0482*** (-3.30)	-0.0359** (-2.72)
Age <sup>2</sup>	0.0155 (0.77)	-0.00389 (-0.21)
Employed	0.0566 <sup>+</sup> (1.96)	0.132*** (3.30)
HH income	0.00554*** (6.59)	0.00420*** (5.17)
East	-0.0482 (-0.37)	-0.233 (-1.64)
Education	0.0239* (2.28)	-0.0146 (-1.59)
$\theta_{-4;-3}$	0.0960* (2.08)	0.160*** (3.75)
$\theta_{-2;-1}$	0.237*** (4.66)	0.281*** (6.10)
$\theta_{0;1}$	0.415*** (7.00)	0.402*** (7.59)
$\theta_{2;3}$	0.249*** (3.51)	0.288*** (4.63)
$\theta_{4;5}$	0.267** (3.26)	0.329*** (4.63)
$\theta_6$	0.189 <sup>+</sup> (1.88)	0.267** (3.08)
Constant	7.903*** (36.11)	8.182*** (41.07)
Number of observations	18277	19137
Number of individuals	1662	1614
$R^2$ within	0.0193	0.0178

*t* statistics in parentheses

<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$



more) years enjoy on average a benefit of 0.189 life satisfaction points, while the average benefit for males is equal to 0.267.

Table 6 enters time fixed effects and the children dummy. This slightly reduces the  $\theta_j$  estimates, but the same qualitative findings emerge. The children dummy is positive, but small and statistically insignificant for females. For both females and males there is a positive effect of marriage, even six (or more) years after marriage. These effects are statistically significant at least on the 10 % level. More importantly, they are highly significant in economic terms. As before, the gains to marriage are 2-3 times as large as the increase in happiness associated with being employed rather than unemployed.

We also check if the two-year-setup generates evidence of adaptation, if we omit the dummies prior to marriage and therefore inflate the estimate of utility while single. Table 7 confirms this conjecture. Subtable 7(a) uses the same sample as table 5 and subtable 7(b) deletes all observations which date back two or more years before marriage (as in the previous section). The estimates in both subtables would suggest that the individuals experience gains to marriage in the honeymoon period (0-1 years after marriage), but then return to their baseline levels. Subtable 7(a) even suggests a negative impact six (or more) years after marriage.

Finally, we check if our results are sensitive to subtle changes in the sample design. Up to now we require all respondents to stay married at least for five years. After this time frame they may divorce, stay married or do not report their current marital status at all. We now force the individuals to stay married and delete the observations, if they do not meet this requirement. Note that the panel is still unbalanced. Based on this sample we repeat the entire analysis. As these estimations generate the same evidence as before we relegate the tables to the appendix.

Our main conclusions are therefore threefold. First, marriage works. Both females and males enjoy economically (and statistically) significant gains to marriage, even 5 (or more) years after marriage. The benefits are 2-3 times as large as the benefits of being employed. All regressions include individual fixed effects and hence are not driven by selection. Including more controls, in particular time fixed effects, leaves the evidence unaffected.

Second, the key factor for our results is the choice of the reference period. Using five years prior to marriage as the relevant baseline year allows us to calculate utility while single more accurately. If we –instead of this– use 1-2 years prior to marriage as the reference category, the same sample generates evidence of complete “adaptation” as in previous longitudinal studies.

Third, our conclusions are robust with respect to a number of specification checks.

Table 6: Life satisfaction regressions with additional controls (two-year-cells)

	(1)	(2)	(3)	(4)
	female	female	male	male
Age	-0.0478** (-3.27)	-0.0564*** (-3.37)	-0.0327* (-2.46)	-0.0401** (-2.59)
Age <sup>2</sup>	0.0150 (0.74)	0.0253 (1.23)	-0.00786 (-0.43)	0.00247 (0.13)
Employed	0.0600* (2.02)	0.0592* (1.99)	0.134*** (3.35)	0.123** (3.08)
HH income	0.00550*** (6.51)	0.00561*** (6.63)	0.00405*** (4.98)	0.00429*** (5.24)
East	-0.0504 (-0.39)	-0.0639 (-0.49)	-0.241+ (-1.69)	-0.252+ (-1.76)
Education	0.0242* (2.31)	0.0255* (2.44)	-0.0136 (-1.48)	-0.0132 (-1.43)
Children	0.0164 (0.52)	0.0197 (0.63)	0.0592* (2.08)	0.0567* (1.98)
$\theta_{-4;-3}$	0.0967* (2.09)	0.0893+ (1.93)	0.159*** (3.74)	0.154*** (3.62)
$\theta_{-2;-1}$	0.238*** (4.67)	0.240*** (4.73)	0.278*** (6.04)	0.284*** (6.16)
$\theta_{0;1}$	0.412*** (6.94)	0.420*** (7.02)	0.384*** (7.18)	0.391*** (7.25)
$\theta_{2;3}$	0.243*** (3.38)	0.255*** (3.54)	0.254*** (3.95)	0.268*** (4.16)
$\theta_{4;5}$	0.259** (3.11)	0.248** (2.98)	0.287*** (3.89)	0.289*** (3.91)
$\theta_6$	0.180+ (1.76)	0.178+ (1.74)	0.219* (2.44)	0.224* (2.50)
Constant	7.887*** (35.66)	8.000*** (29.21)	8.104*** (39.98)	8.231*** (31.44)
Year dummies	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>
Number of observations	18277	18277	19137	19137
Number of individuals	1662	1662	1614	1614
$R^2$ within	0.0193	0.0245	0.0180	0.0234

$t$  statistics in parentheses

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 7: Evidence for adaptation due to inflated reference utility (two-year-cells)  
(a) “baseline”-two-year sample (b) reduced sample (see text)

	(1) female	(2) male		(1) female	(2) male
Age	-0.0188 (-1.44)	-0.0000330 (-0.00)	Age	-0.00653 (-0.31)	-0.0188 (-0.93)
Age <sup>2</sup>	-0.00742 (-0.38)	-0.0331 <sup>+</sup> (-1.88)	Age <sup>2</sup>	-0.0438 (-1.58)	-0.0294 (-1.15)
Employed	0.0530 <sup>+</sup> (1.83)	0.136 <sup>***</sup> (3.40)	Employed	0.0769* (2.35)	0.273 <sup>***</sup> (4.30)
HH income	0.00543 <sup>***</sup> (6.46)	0.00422 <sup>***</sup> (5.19)	HH income	0.00661 <sup>***</sup> (6.15)	0.00350 <sup>**</sup> (3.18)
East	-0.0660 (-0.51)	-0.227 (-1.59)	East	-0.0470 (-0.26)	-0.154 (-0.79)
Education	0.0269* (2.57)	-0.0156 <sup>+</sup> (-1.70)	Education	0.0164 (0.92)	-0.0138 (-0.95)
$\theta_{0,1}$	0.211 <sup>***</sup> (6.00)	0.159 <sup>***</sup> (4.78)	$\theta_{0,1}$	0.157 <sup>***</sup> (4.33)	0.104 <sup>**</sup> (3.02)
$\theta_{2,3}$	0.0131 (0.29)	0.0118 (0.29)	$\theta_{2,3}$	-0.0442 (-0.90)	-0.0259 (-0.57)
$\theta_{4,5}$	0.0000898 (0.00)	0.0189 (0.39)	$\theta_{4,5}$	-0.0400 (-0.65)	0.0134 (0.24)
$\theta_6$	-0.148* (-2.29)	-0.123* (-2.17)	$\theta_6$	-0.131 (-1.58)	-0.0379 (-0.50)
Constant	7.435 <sup>***</sup> (38.50)	7.612 <sup>***</sup> (43.41)	Constant	7.574 <sup>***</sup> (19.21)	8.089 <sup>***</sup> (20.90)
Number of observations	18277	19137	Number of observations	13004	13036
Number of individuals	1662	1614	Number of individuals	1650	1604
$R^2$ within	0.0179	0.0157	$R^2$ within	0.0299	0.0270

*t* statistics in parentheses

<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

*t* statistics in parentheses

<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

They hold in samples with one- and two-year-brackets. Forcing the individuals to stay married even after the five-year-span neither increases nor decreases the relevant coefficients.

## 6. Quantifying the benefits of marriage

We now use the regression results to derive euro values of the gains to marriage (see, for example, Clark and Oswald, 2002, Blanchflower and Oswald, 2004, Oswald and Powdthavee, 2008a). This calculation should be treated with some caution, but it illustrates the relative size of the coefficients. Recall that the coefficient  $\theta_j$  picks up the change in life satisfaction  $j$  years after marriage. Hence, using the implicit function theorem and imposing  $\Delta LS = 0$  we obtain from equation (2) the following shadow value for having a partner  $j$  years after marriage:

$$\frac{\frac{\partial LS}{\partial MD^j}}{\frac{\partial LS}{\partial y}} = \frac{\theta_j}{\gamma} \equiv \lambda_j \quad (3)$$

While the average estimate of the shadow value  $\lambda_j$  is simply given by  $\frac{\hat{\theta}_j}{\hat{\gamma}}$ , we use the delta method<sup>5</sup> to construct confidence intervals for  $\lambda_j$ . Household income after taxes and transfers  $y$  is measured in units of 1000 Euros (normalized to the year 2000). Hence, the shadow value  $\lambda_j$  equals the amount of additional annual net income an individual would need to receive in order to report the same level of life satisfaction if the positive impact of marriage was removed.

Figure 2 plots 95% confidence intervals for  $\lambda_j$  where  $j$  ranges from married for one year to five years. The point estimate for females equals roughly 55,000 Euros after the first year of marriage and 36,000 in the fifth year. The associated uncertainty for these shadow values is quite large. The lower and upper bound for the first year is approximately 28,000 and 85,000 Euros respectively, while the corresponding bounds in the fifth year are around 3,000 and 72,000 Euros.

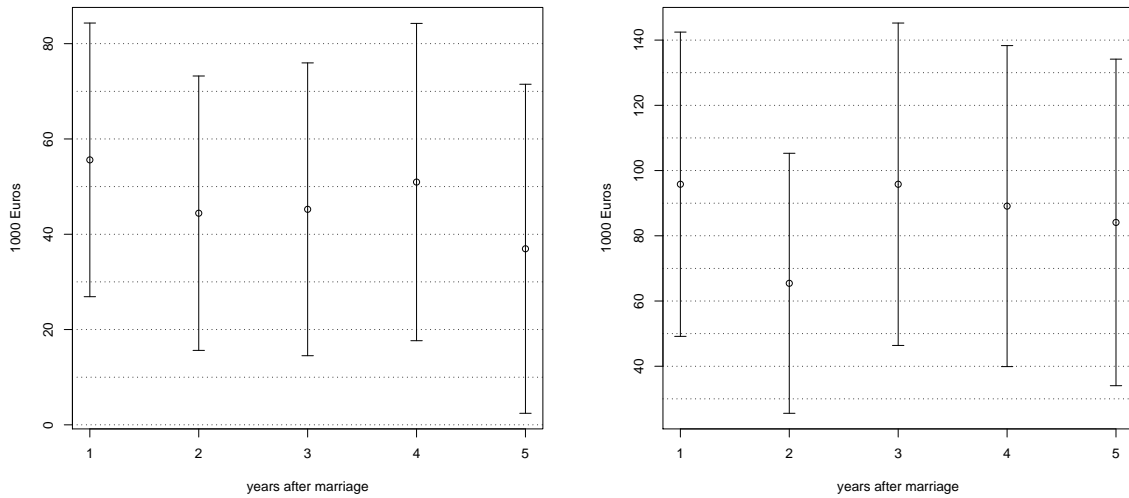
In the regressions of the previous section the income coefficient is higher for females while the marriage dummy coefficients are higher for males.<sup>6</sup> As a result the estimated shadow value of marriage is higher for males. The point estimate is equal to 95,000 in the first year, while it equals 84,000 in the fifth year after marriage. The confidence

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<sup>5</sup>The first derivatives are given by  $\frac{\partial \lambda}{\partial \theta_j} = \frac{1}{\gamma}$  and  $\frac{\partial \lambda}{\partial \gamma} = -\frac{\theta_j}{\gamma^2}$ , hence  $Var(\lambda) \approx \begin{bmatrix} \frac{1}{\gamma} & -\frac{\theta_j}{\gamma^2} \end{bmatrix} \mathbf{V} \begin{bmatrix} \frac{1}{\gamma} & -\frac{\theta_j}{\gamma^2} \end{bmatrix}'$  where  $\mathbf{V}$  is the covariance matrix of  $\theta_j$  and  $\gamma$ .

<sup>6</sup>The only exception is the year of marriage ( $t = 0$ ).

Figure 2: Shadow values for the gains of marriage (1000 Euros)  
 (a) females (b) males



interval bounds are 49,000 and 142,000 in the first year, while they equal 34,000 and 134,000 after five years.

Although it is important to include individual fixed effects to estimate correctly the marriage dummy coefficients, this raises a potential problem for the quantification approach, since the amount of within-person variation in income is typically small. However, other studies which do not include individual fixed effects and enter a single marital status dummy report comparable average estimates.<sup>7</sup> Furthermore, we do not solely rely on the average shadow value. The interval estimates take into account that  $\lambda_j$  is a ratio of two estimated coefficients and show that the data are compatible with a large range of shadow values.

## 7. Conclusions

This paper uses 23 waves of annual individual panel data to revisit the nexus between marriage and self-reported life satisfaction. Our results support the conclusion that the formation of a marital union has a permanent positive impact on individual happiness. In particular we show that individuals who are married for five or more years report significantly higher levels of happiness than while they are single. This evidence runs

<sup>7</sup>For example, Carroll, Frijters and Shields (2009) obtain a shadow value of A\$67,000 (in May 2001 dollars) and Blanchflower and Oswald (2004) report an estimate of \$100,000 (in 1990 US dollars).

counter to the idea that individuals' happiness is centered around some baseline level determined by personality and genetics and that individuals who marry quickly return to this baseline after a short honeymoon period.

We show that these findings strongly depend on the choice of the reference period. We compare the movements of self-reported life satisfaction relative to five years prior to marriage. If we instead –as in the previous longitudinal literature– employ one year prior to marriage as the baseline level of happiness, the permanent impact of marriage vanishes. In this case the evidence suggests complete adaptation to marriage after two years. We believe that previous studies chose this point of reference due to a lack of suitable data and argue that this choice is not appropriate in this setting. It seems reasonable that individuals enjoy having a partner one or two years before they marry and move into a joint household. This in turn suggests that individuals' reported life satisfaction 1-2 years prior to marriage is considerably larger than in the state of singlehood. Our sample also suggests that the honeymoon period starts one year before marriage and lasts for two years. Comparing the life satisfaction movement of individuals who are married for 3 or more years relative to this inflated level of life satisfaction leads to the conclusion of quick adaptation to marriage.

After checking the robustness of our findings, we assess the size of our coefficients. The life satisfaction literature has established that being employed rather than unemployed has a large positive impact on happiness. Our results suggest that the happiness gain associated with being married for five or more years is 2-3 times as large as this employment effect. We also derive shadow values for this happiness gain. The average shadow value for females and males is 36,000 and 84,000 (Euros) respectively. We finally look at interval estimates and show that the data support a fairly wide range of possible values. Although this paper focuses on marital unions, we think that our results are equally important for other areas of public policy. An innovative and growing literature highlights the consequences of adaptation to events like disease or bereavement in the context of resource allocation or loss compensation.<sup>8</sup> Our findings suggest to carefully check the robustness of these results with respect to the reference period.

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<sup>8</sup>Cf. Adler and Posner (2008), Layard (2006), Oswald and Powdthavee (2008a,b)

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## **A. Supplementary Appendix (available upon request)**

The supplementary appendix replicates the same set of regressions as the main text for a different sample. In this sample, all respondents are required to stay married after the five-year-span. In the baseline sample individuals can divorce, stay married or become widowed after a five-year-span of marriage.

### **A.1. Estimation results (one-year-cells)**

Table A.1: Life satisfaction regressions

	(1)	(2)
	female	male
Age	-0.0506*** (-3.44)	-0.0443*** (-3.33)
Age <sup>2</sup>	0.0183 (0.89)	0.00212 (0.12)
Employed	0.0555 <sup>+</sup> (1.90)	0.135*** (3.35)
HH income	0.00557*** (6.56)	0.00425*** (5.19)
East	-0.0196 (-0.15)	-0.248 <sup>+</sup> (-1.73)
Education	0.0220* (2.09)	-0.0143 (-1.55)
$\theta_{-4}$	0.129* (2.34)	0.142** (2.78)
$\theta_{-3}$	0.0810 (1.49)	0.210*** (4.15)
$\theta_{-2}$	0.191*** (3.46)	0.220*** (4.32)
$\theta_{-1}$	0.297*** (5.25)	0.379*** (7.32)
$\theta_0$	0.533*** (8.53)	0.487*** (8.52)
$\theta_1$	0.321*** (4.76)	0.403*** (6.59)
$\theta_2$	0.259*** (3.54)	0.278*** (4.24)
$\theta_3$	0.264*** (3.36)	0.405*** (5.80)
$\theta_4$	0.296*** (3.52)	0.376*** (5.07)
$\theta_5$	0.215* (2.32)	0.354*** (4.45)
Constant	7.957*** (36.11)	8.334*** (41.56)
Number of observations	18041	18893
Number of individuals	1660	1614
$R^2$ within	0.0208	0.0193

*t* statistics in parentheses

<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table A.2: Life satisfaction regressions with additional controls

	(1)	(2)	(3)	(4)
	female	female	male	male
Age	-0.0498*** (-3.38)	-0.0551*** (-3.61)	-0.0410** (-3.05)	-0.0482*** (-3.44)
Age <sup>2</sup>	0.0174 (0.85)	0.0281 (1.35)	-0.00206 (-0.11)	0.00912 (0.48)
Employed	0.0608* (2.03)	0.0595* (1.99)	0.136*** (3.39)	0.126** (3.12)
HH income	0.00551*** (6.45)	0.00562*** (6.58)	0.00411*** (5.00)	0.00435*** (5.28)
East	-0.0230 (-0.18)	-0.0372 (-0.29)	-0.255 <sup>+</sup> (-1.77)	-0.268 <sup>+</sup> (-1.86)
Education	0.0225* (2.13)	0.0236* (2.24)	-0.0133 (-1.44)	-0.0130 (-1.41)
Children	0.0267 (0.84)	0.0307 (0.97)	0.0575* (1.99)	0.0552 <sup>+</sup> (1.90)
$\theta_{-4}$	0.130* (2.36)	0.118* (2.14)	0.142** (2.77)	0.133** (2.61)
$\theta_{-3}$	0.0822 (1.51)	0.0745 (1.37)	0.210*** (4.14)	0.207*** (4.08)
$\theta_{-2}$	0.192*** (3.49)	0.193*** (3.50)	0.219*** (4.30)	0.224*** (4.40)
$\theta_{-1}$	0.298*** (5.27)	0.296*** (5.24)	0.376*** (7.26)	0.381*** (7.35)
$\theta_0$	0.531*** (8.49)	0.532*** (8.51)	0.474*** (8.25)	0.478*** (8.33)
$\theta_1$	0.315*** (4.64)	0.317*** (4.66)	0.380*** (6.11)	0.387*** (6.22)
$\theta_2$	0.249*** (3.38)	0.258*** (3.49)	0.247*** (3.67)	0.259*** (3.85)
$\theta_3$	0.253** (3.17)	0.254** (3.18)	0.368*** (5.11)	0.382*** (5.29)
$\theta_4$	0.283*** (3.32)	0.268** (3.14)	0.336*** (4.37)	0.339*** (4.41)
$\theta_5$	0.199* (2.11)	0.184 <sup>+</sup> (1.95)	0.308*** (3.72)	0.310*** (3.74)
Constant	7.929*** (35.57)	7.991*** (32.00)	8.256*** (40.40)	8.376*** (36.50)
Year dummies	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>
Number of observations	18041	18041	18893	18893
Number of individuals	1660	1660	1614	1614
$R^2$ within	0.0208	0.0261	0.0195	0.0249

$t$  statistics in parentheses

<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

## A.2. Estimation results (two-year-cells)

Table A.3: Life satisfaction regressions (two-year-cells)

	(1)	(2)
	female	male
Age	-0.0514*** (-3.50)	-0.0393** (-2.96)
Age <sup>2</sup>	0.0209 (1.02)	0.000675 (0.04)
Employed	0.0624* (2.14)	0.132** (3.28)
HH income	0.00556*** (6.54)	0.00430*** (5.25)
East	-0.0230 (-0.18)	-0.249+ (-1.73)
Education	0.0213* (2.02)	-0.0154+ (-1.67)
$\theta_{-4;-3}$	0.100* (2.16)	0.161*** (3.80)
$\theta_{-2;-1}$	0.245*** (4.79)	0.280*** (6.06)
$\theta_{0;1}$	0.427*** (7.08)	0.411*** (7.62)
$\theta_{2;3}$	0.258*** (3.63)	0.295*** (4.73)
$\theta_{4;5}$	0.276*** (3.37)	0.335*** (4.71)
$\theta_6$	0.196+ (1.94)	0.271** (3.13)
Constant	7.967*** (36.17)	8.244*** (41.17)
Number of observations	18041	18893
Number of individuals	1660	1614
$R^2$ within	0.0196	0.0183

*t* statistics in parentheses

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table A.4: Life satisfaction regressions with additional controls (two-year-cells)

	(1)	(2)	(3)	(4)
	female	female	male	male
Age	-0.0510*** (-3.46)	-0.0563*** (-3.69)	-0.0360** (-2.69)	-0.0428** (-3.07)
Age <sup>2</sup>	0.0204 (1.00)	0.0308 (1.48)	-0.00332 (-0.18)	0.00743 (0.39)
Employed	0.0659* (2.21)	0.0650* (2.18)	0.134*** (3.33)	0.123** (3.06)
HH income	0.00551*** (6.46)	0.00563*** (6.59)	0.00416*** (5.06)	0.00440*** (5.33)
East	-0.0253 (-0.19)	-0.0392 (-0.30)	-0.256+ (-1.78)	-0.268+ (-1.87)
Education	0.0216* (2.05)	0.0229* (2.17)	-0.0144 (-1.56)	-0.0141 (-1.52)
Children	0.0171 (0.54)	0.0204 (0.64)	0.0587* (2.04)	0.0563+ (1.95)
$\theta_{-4;-3}$	0.101* (2.18)	0.0936* (2.02)	0.161*** (3.78)	0.156*** (3.67)
$\theta_{-2;-1}$	0.245*** (4.81)	0.248*** (4.86)	0.278*** (6.01)	0.283*** (6.14)
$\theta_{0;1}$	0.425*** (7.02)	0.431*** (7.12)	0.394*** (7.21)	0.400*** (7.33)
$\theta_{2;3}$	0.252*** (3.49)	0.263*** (3.65)	0.261*** (4.04)	0.275*** (4.26)
$\theta_{4;5}$	0.268** (3.21)	0.257** (3.07)	0.293*** (3.97)	0.295*** (3.99)
$\theta_6$	0.185+ (1.81)	0.183+ (1.79)	0.224* (2.49)	0.229* (2.55)
Constant	7.949*** (35.70)	8.013*** (32.16)	8.167*** (40.07)	8.277*** (36.22)
Year dummies	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>
Number of observations	18041	18041	18893	18893
Number of individuals	1660	1660	1614	1614
$R^2$ within	0.0196	0.0249	0.0185	0.0238

$t$  statistics in parentheses

+  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

### A.3. Evidence for adaptation due to inflated reference utility

Table A.5: Evidence for adaptation due to inflated reference utility

	(1)	(2)
	female	male
Age	-0.0186 (-1.41)	-0.00222 (-0.19)
Age <sup>2</sup>	-0.00914 (-0.46)	-0.0351* (-2.00)
Employed	0.0504 <sup>+</sup> (1.73)	0.139*** (3.44)
HH income	0.00546*** (6.42)	0.00427*** (5.21)
East	-0.0387 (-0.30)	-0.241 <sup>+</sup> (-1.67)
Education	0.0259* (2.48)	-0.0150 (-1.63)
$\theta_0$	0.328*** (7.54)	0.228*** (5.43)
$\theta_1$	0.0987* (2.10)	0.125** (2.78)
$\theta_2$	0.0206 (0.40)	-0.0181 (-0.37)
$\theta_3$	0.00936 (0.17)	0.0903 <sup>+</sup> (1.74)
$\theta_4$	0.0255 (0.42)	0.0444 (0.80)
$\theta_5$	-0.119* (-2.01)	-0.0549 (-1.06)
Constant	7.450*** (38.27)	7.672*** (43.47)
Number of observations	18041	18893
Number of individuals	1660	1614
$R^2$ within	0.0190	0.0162

*t* statistics in parentheses

<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table A.6: Evidence for adaptation due to inflated reference utility (reduced sample)

	(1)	(2)
	female	male
Age	0.00707 (0.32)	-0.0442* (-2.05)
Age <sup>2</sup>	-0.0655* (-2.18)	-0.00540 (-0.20)
Employed	0.0633 <sup>+</sup> (1.85)	0.320*** (4.47)
HH income	0.00742*** (6.26)	0.00434*** (3.55)
East	0.0549 (0.27)	-0.0604 (-0.26)
Education	0.00400 (0.20)	-0.00998 (-0.63)
$\theta_0$	0.205*** (4.34)	0.0884 <sup>+</sup> (1.95)
$\theta_1$	-0.0287 (-0.56)	-0.00565 (-0.12)
$\theta_2$	-0.116* (-2.08)	-0.140** (-2.66)
$\theta_3$	-0.125* (-2.04)	-0.00262 (-0.05)
$\theta_4$	-0.0998 (-1.50)	-0.0303 (-0.49)
$\theta_5$	-0.201** (-2.70)	-0.0300 (-0.44)
Constant	7.573*** (17.93)	8.571*** (20.87)
Number of observations	11448	11504
Number of individuals	1645	1603
$R^2$ within	0.0377	0.0349

*t* statistics in parentheses

<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$



#### A.4. Evidence for adaptation due to inflated reference utility (two-year-cells)

Table A.7: Evidence for adaptation due to inflated reference utility (two-year-cells)

	(1)	(2)
	female	male
Age	-0.0210 (-1.60)	-0.00328 (-0.28)
Age <sup>2</sup>	-0.00310 (-0.16)	-0.0289 (-1.63)
Employed	0.0587* (2.01)	0.137*** (3.39)
HH income	0.00544*** (6.40)	0.00432*** (5.27)
East	-0.0417 (-0.32)	-0.242 <sup>+</sup> (-1.68)
Education	0.0244* (2.32)	-0.0164 <sup>+</sup> (-1.78)
$\theta_{0,1}$	0.217*** (5.90)	0.170*** (4.86)
$\theta_{2,3}$	0.0148 (0.33)	0.0189 (0.46)
$\theta_{4,5}$	0.00101 (0.02)	0.0261 (0.54)
$\theta_6$	-0.152* (-2.34)	-0.117* (-2.05)
Constant	7.482*** (38.49)	7.674*** (43.52)
Number of observations	18041	18893
Number of individuals	1660	1614
$R^2$ within	0.0181	0.0162

*t* statistics in parentheses

<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table A.8: Evidence for adaptation due to inflated reference utility (two-year-cells, reduced sample)

	(1)	(2)
	female	male
Age	-0.00623 (-0.30)	-0.0223 (-1.09)
Age <sup>2</sup>	-0.0440 (-1.58)	-0.0251 (-0.98)
Employed	0.0823* (2.50)	0.286*** (4.44)
HH income	0.00675*** (6.20)	0.00379*** (3.40)
East	-0.0370 (-0.20)	-0.191 (-0.96)
Education	0.00878 (0.49)	-0.0174 (-1.18)
$\theta_{-4;-3}$	0	0
$\theta_{-2;-1}$	0	0
$\theta_{0;1}$	0.149*** (3.88)	0.107** (2.92)
$\theta_{2;3}$	-0.0498 (-1.00)	-0.0230 (-0.50)
$\theta_{4;5}$	-0.0461 (-0.74)	0.0166 (0.29)
$\theta_6$	-0.141 <sup>+</sup> (-1.68)	-0.0347 (-0.46)
Constant	7.658*** (19.31)	8.180*** (21.00)
Number of observations	12768	12792
Number of individuals	1647	1604
$R^2$ within	0.0307	0.0281

$t$  statistics in parentheses

<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$