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Marriage, adaptation and happiness: Are there long-lasting gains to marriage

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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. Further, we compare different empirical approaches to measure the extent of adaptation and show that depending on the approach the same sample may generate evidence of full or partial adaptation. This result may be equally important for studies that analyse the nexus of loss compensation and habituation in the context of other life events.

Keywords: life satisfaction; happiness; reference JEL classification: I31, J12, J18

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 (for a review, see Diener, Suh, Lucas and Smith 1999). 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 regarding the results of the cross-sectional literature is the idea of hedonic adaptation (e.g. Loewenstein, O'Donoghue and Rabin 2003, Loewenstein and Ubel 2008). 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 provide inconsistent evidence. For example, Lucas, Clark, Georgellis and Diener (2003), Lucas and Clark (2006) and Clark, Diener, Georgellis and Lucas (2008) conclude that individuals on average fully adapt to marriage within 1-2 years after marriage. Frijters, Johnston and Shields (2011) analyze quarterly data from the Household, Income and Labor Dynamics in Australia survey (HILDA) and argue that individuals fully adapt to marriage within a two years. By contrast, Zimmermann and Easterlin (2006) report that individuals' happiness two years after marriage is higher than the baseline level. The divergent conclusions are difficult to resolve due the different samples, methodologies and control variables used in these studies.

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.[1] 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 estimate for the happiness boost of males in a union lasting five years roughly ranges from 23,000 to 84,000 Euros a year.

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 demonstrate that estimates of adaptation are very sensitive with respect to the chosen reference period. Both findings are important from a policy perspective. If individuals quickly return to a baseline which is determined by their personality, all policy attempts to improve well-being are in vain. Similarly, the 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) or the valuation of public goods (Luechinger and Raschky 2009, Luechinger 2009, 2010).

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 other life events and income. Hence, the returns to marital unions may be one of the important non-monetary inputs.

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.[2] 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.[3]

[1] 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] See Burdett and Coles (1999) for a review of the search-theoretic literature. Note that this prediction does not necessarily hold for all future periods. It may be rational for individuals to enter a temporary marriage, expecting that they will divorce in the future (see, for example, Barham, Devlin and Yang 2009).

[3] 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

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. Oswald and Wu 2010, 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

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

where r is reported well-being, $u\left(\cdot\right)$ is individual utility depending on income y, a set of personal characteristics x, time t and marital status m, and $h\left(\cdot\right)$ 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 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) compare different groups of individuals, for example individuals who cohabit prior to marriage and those who marry without providing an observable cohabitation period. Consequently, models that exploit between-individual-variation are needed and the authors rely on linear mixed effects models (hierarchical / multilevel models). However, it is difficult to rule out selection effects in such models. Moreover, 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 and age, which renders the assumption invalid and suggests to employ a fixed effects framework.[4]

The second important factor is the way how potential benefits to marriage are identified empirically. As already mentioned, the concept of adaptation refers to the broad idea that individuals get used to the positive impact of marriage over time.[5] However, there are several ways to take adaptation into account. One of the most important choices in this respect is the way the baseline life satisfaction is modeled, i.e. the level of life satisfaction to which the different levels of happiness that occur over time are compared to.

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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).

[4]Ferrer-i-Carbonell and Frijters (2004) provide a discussion on this matter.

[5]The theoretical channels that generate adaptation in general are mainly developed in a literature dealing with consumption and income rather than life events like marriage. For example, the idea that own consumption in the past or consumption of other comparison groups can affect the utility derived from own income is discussed by Duesenberry (1949) and Pollak (1970). Clark, Frijters and Shields (2008) provide a review of this literature.

Lucas and Clark (2006) compare average life satisfaction across three different time periods: the baseline period comprises all years that are at least two years prior to marriage. The "reaction period" covers the year just before, the year of and the year just after marriage (t_{-1}, t_0, t_1); finally all years at least two years after marriage comprise the adaptation period. Zimmermann and Easterlin (2006) also define three time periods, but the reaction period is more narrowly defined and comprises only the year of marriage and the year immediately after marriage (t_0, t_1). As mentioned above, both studies provide inconsistent evidence and rely on linear mixed effects models.

In their recent longitudinal study of anticipation and adaption to various life events, Clark, Diener, Georgellis and Lucas (2008) analyze adaptation to unemployment, marriage and other life events over time by entering a separate dummy for each year after the event into the regression (up to five years after marriage). Regarding the baseline period, this approach is similar to Zimmermann and Easterlin (2006), and it effectively defines the average of the years before the event as the baseline. Regarding the adaptation period, the use of five dummies obviously allows a more in-depth analysis of adaptation over time. Using this approach, they show that individuals fully adapt to various life events including marriage, divorce and childbirth.

The potential drawback of defining the baseline life satisfaction in such a way becomes immediately clear when predictable life events are considered. For example, the birth of a child is highly predictable and it is possible that the associated changes in happiness are present several years before the event. By aggregating all periods up to one or two years prior to the event into a single baseline level, the estimated reaction and adaptation effects potentially refer to periods that are affected by the life event, thereby complicating the interpretation of the estimates. One way to resolve this issue is to enter a whole set of "anticipation" and adaptation dummies into the same regression. Gardner and Oswald (2006) present a graphical version of this approach and provide evidence that couples who decide to divorce benefit from splitting-up in the long-run; however their sample covers only a five-year span ranging from two years before to two years after divorce. Frijters et al. (2011) analyze quarterly data with this approach and find that individuals fully adapt to marriage after two years. Finally, Clark and Georgellis (2012) analyze adaptation to various life events with BHPS data using this approach and find once again complete adaptation to various events including marriage after several years. Both studies measure adaptation relative to the year of marriage $(t = 0)$ and provide estimates for the degree of adaptation. However, the study by Frijters et al. (2011) explicitly discusses that anticipation effects should be taken into account for the calculation of the long-run effects of life events on life satisfaction, and therefore their approach is closely related to our setup. As we will see, our results imply that there is a sizeable positive impact of marriage on life-satisfaction five years after marriage, *although* there is a considerable moderation of this boost over time.

Our results are particularly interesting in light of Stutzer and Frey (2006), who show that those singles who are generically happier that 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 (SOEP), covering the years 1984-2006. The SOEP 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 SOEP 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 SOEP 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 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, Diener, Georgellis and Lucas 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). After this 5-years span individuals may stay married, divorce or become widowed.

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 SOEP 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):

$$LS_{i,t} = \alpha_i + \mathbf{x}'_{\mathbf{it}}\beta + \gamma y_{i,t} + \sum_{j=\underline{j}}^{\bar{j}} \theta_j MD^j_{i,t} + \epsilon_{i,t} \tag{2}$$

where $LS_{i,t}$ denotes self-reported life satisfaction, $\mathbf{x}'_{\mathbf{it}}$ 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 α_i. As often in well-being equations ordered and cardinal estimators produce the same qualitative findings (see, for example, Ferrer-i-Carbonell and Frijters 2004 for a discussion). Hence, for ease of interpretation we focus on FE

OLS results. One concern about this estimation strategy is attenuation bias regarding the income coefficient. On the other hand, there is evidence that neglecting unobserved heterogeneity leads to income coefficients that are biased upward (see, for example, Powdthavee 2010). Therefore, we present both sets of results and will use the FE regressions to derive a lower bound of the income-effect and accordingly the pooled OLS results for derivation of the respective upper bound.[6]

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 ($MD^0_{a,1994} = 1$). 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 ($MD^{-1}_{a,1993} = 1$) and the dummy indicating one year after marriage equals one in 1995 ($MD^{1}_{a,1995} = 1$). We enter eleven dummies into our baseline estimation, indicating the time span from five or more years before marriage ($\underline{j} = -5$) up to five or more years after marriage ($\overline{j} = 5$). The omitted reference category is five or more years before marriage ($j = -5$).

As explained, this approach is similar to Frijters et al. (2011) and 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, Diener, Georgellis and Lucas (2008), who analyze adaptations to major life events employing the average of the years before the event as the reference. In the terminology of equation (2) they enter the dummies for $j = 0, \ldots, 5$, but omit the dummies for $j = 5, \ldots, -1$.

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). Effects of time-invariant personal characteristics like race and sex will be picked up by the individual fixed effects. From the list of remaining controls, we further are unable to include health as it is not available before 1992. Hence, $\mathbf{x}'_{\mathbf{it}}$ contains age, age squared, a dummy indicating if the individual is employed, years of schooling and a region dummy indicating East Germany. There is also growing evidence that institutional changes over time affect females and males asymmetrically (e.g. Stevenson and Wolfers 2009). Instead of interacting all variables with a sex dummy, we conduct all estimations separately for females and males to account for the possible

[6]We would like to thank an anonymous referee for this suggestion.

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 for both sexes. The notable exception is employment status. While among the 18,277

Table 1: Summary statistics (pooled)

(a) females

	Mean	SD
Life satisfaction	7.353778	1.632699
Age	28.61925	7.381942
$Age^2/100$	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
$Age^2/100$	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	

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 FE estimates for the sample of females, while column (3) 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).

During the years prior to marriage the results differ slightly 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

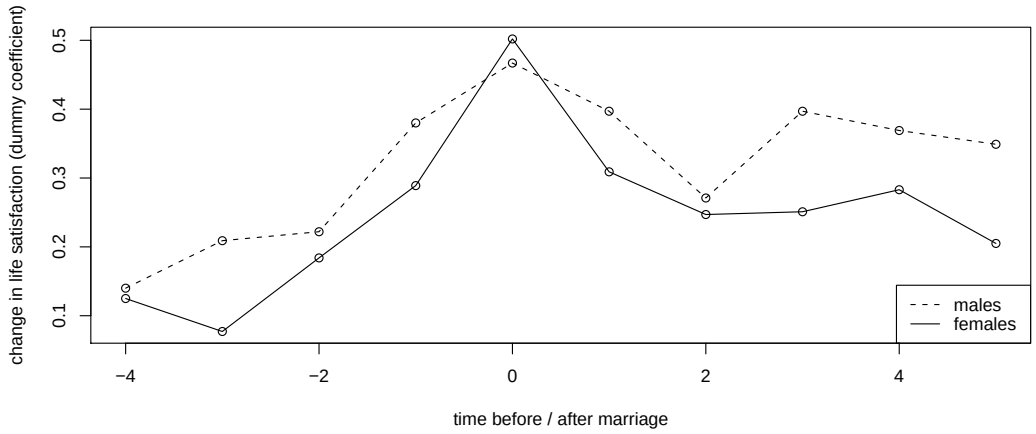
Table 2: Baseline life satisfaction regression

	(1) female, FE	(2) female, OLS	(3) male, FE	(4) male, OLS
Age	-0.0471^{**}	-0.0825^{***}	-0.0410^{**}	-0.0936^{***}
	(-3.22)	(-9.01)	(-3.10)	(-9.29)
Age^2/100	0.0126	0.0955^{***}	-0.00248	0.0948^{***}
	(0.62)	(7.65)	(-0.14)	(6.79)
Employed	0.0505^{+}	0.104^{***}	0.134^{***}	0.263^{***}
	(1.74)	(3.69)	(3.36)	(6.77)
HH income	0.00556^{***}	0.00893^{***}	0.00414^{***}	0.00816^{***}
	(6.61)	(12.04)	(5.11)	(11.05)
East	-0.0452	-0.596^{***}	-0.233	-0.533^{***}
	(-0.35)	(-16.18)	(-1.63)	(-14.65)
Education	0.0245^{*}	0.0261^{***}	-0.0134	0.0286^{***}
	(2.35)	(4.93)	(-1.47)	(6.26)
θ_{-4}	0.125^{*}	0.177^{**}	0.140^{**}	0.0795
	(2.27)	(2.90)	(2.74)	(1.40)
θ_{-3}	0.0771	0.141^{*}	0.209^{***}	0.144^{**}
	(1.42)	(2.49)	(4.12)	(2.68)
θ_{-2}	0.184^{***}	0.272^{***}	0.222^{***}	0.152^{**}
	(3.35)	(5.12)	(4.36)	(3.00)
θ_{-1}	0.289^{***}	0.373^{***}	0.380^{***}	0.310^{***}
	(5.12)	(7.44)	(7.35)	(6.49)
θ_0	0.502^{***}	0.572^{***}	0.467^{***}	0.389^{***}
	(8.31)	(11.10)	(8.50)	(7.86)
θ_1	0.309^{***}	0.415^{***}	0.397^{***}	0.328^{***}
	(4.59)	(7.33)	(6.50)	(5.96)
θ_2	0.247^{***}	0.360^{***}	0.271^{***}	0.196^{***}
	(3.39)	(5.98)	(4.14)	(3.38)
θ_3	0.251^{**}	0.350^{***}	0.397^{***}	0.320^{***}
	(3.21)	(5.53)	(5.70)	(5.29)
θ_4	0.283^{***}	0.371^{***}	0.369^{***}	0.282^{***}
	(3.38)	(5.56)	(4.98)	(4.43)
θ_5	0.205^{*}	0.234^{***}	0.349^{***}	0.185^{***}
	(2.22)	(4.82)	(4.38)	(4.12)
Constant	7.892^{***}	8.024^{***}	8.272^{***}	8.275^{***}
	(36.04)	(59.87)	(41.46)	(55.26)
Number of observations	18277		19137	
Number of individuals	1662		1614	
R^2 (within)	(0.0203)	0.0373	(0.0187)	0.0372

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 1: Change in life satisfaction before and after marriage



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, Diener, Georgellis and Lucas (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.[7]

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 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 $j = -5, \ldots, -1$ when fitting equation (2). This is in line with Clark, Diener, Georgellis and Lucas (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

[7]Although separate regresions for both genders are easier to interpret, Table A.1 in the appendix presents the results from a model where all explanatory variables are interacted with a "female"-dummy. The estimates indicate that only the interaction-term picking up the effect three years prior to marriage is statistically significant on the 10%-level.

Table 3: Evidence for adaptation due to inflated reference utility

(a) baseline sample

	(1) female	(2) male
Age	−0.0162	0.00105
	(−1.24)	(0.09)
Age^2/100	−0.0137	−0.0394*
	(−0.70)	(−2.26)
Employed	0.0457	0.138***
	(1.57)	(3.45)
HH income	0.00546***	0.00417***
	(6.49)	(5.13)
East	−0.0631	−0.226
	(−0.49)	(−1.59)
Education	0.0282**	−0.0141
	(2.72)	(−1.54)
θ_0	0.303***	0.207***
	(7.47)	(5.31)
θ_1	0.0938*	0.118**
	(2.00)	(2.63)
θ_2	0.0159	−0.0259
	(0.31)	(−0.54)
θ_3	0.00471	0.0817
	(0.08)	(1.58)
θ_4	0.0211	0.0362
	(0.35)	(0.65)
θ_5	−0.119*	−0.0627
	(−2.02)	(−1.21)
Constant	7.401***	7.611***
	(38.26)	(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	−0.0401$^+$
	(0.33)	(−1.87)
Age^2/100	−0.0657*	−0.0103
	(−2.19)	(−0.38)
Employed	0.0588$^+$	0.327***
	(1.73)	(4.66)
HH income	0.00732***	0.00395**
	(6.28)	(3.28)
East	0.00739	0.0000721
	(0.04)	(0.00)
Education	0.00809	−0.00733
	(0.42)	(−0.47)
θ_0	0.204***	0.0823*
	(4.65)	(1.97)
θ_1	−0.0250	−0.00670
	(−0.50)	(−0.14)
θ_2	−0.112*	−0.142**
	(−2.03)	(−2.74)
θ_3	−0.121*	−0.00716
	(−2.00)	(−0.13)
θ_4	−0.0962	−0.0329
	(−1.46)	(−0.54)
θ_5	−0.195**	−0.0331
	(−2.63)	(−0.50)
Constant	7.522***	8.458***
	(17.93)	(20.77)
Number of observations	11684	11748
Number of individuals	1650	1603
R^2 within	0.0365	0.0337

t statistics in parentheses

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

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.

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. The baseline specification suggests that females on average enjoy five years after marriage a gain of 0.21 life satisfaction points compared to their own life satisfaction while single. The corresponding point estimate for males is 0.35.[8] These estimates are economically significant. For both sexes the benefits of having a partner are 2-3 times as large as the increase in happiness associated with employment rather than non-employment. A further (unreported) regression enters a dummy for unemployment compared to employment and shows that the positive effect of marriage is roughly half of the negative effect of unemployment. Both approaches therefore indicate economically large long-lasting gains to marriage.[9]

The OLS income coefficients (columns 2 and 4, Table 2) are indeed larger than the corresponding FE estimates, which is in line with the presence of attenuation bias in the FE specification. We will discuss the impact of this bias in section 6 where the coefficients are converted into Euro values. Before we move to this conversion, the following section discusses a series of additional specifications that are carried out to inquire the robustness of the main results.

5. Robustness checks and discussion

The previous section has established that individuals on average enjoy economically large gains to marriage, even five years after marriage. 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. A further specification considers the number of children instead of the single children dummy. Once again, all results include individual FE and as such are driven by within-person variation over time. 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

[8] 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.

[9] For studies focusing on the relationship between unemployment status and happiness, see for example Kassenboehmer and Haisken-DeNew (2009) and Winkelmann and Winkelmann (1998). Booth and van Ours (2009, 2008) analyze the effects of working hours rather than working status on well-being.

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 compiles the first set of results. The children coefficient is positive in all regressions. However, the associated standard errors are quite large and as a result the estimates are statistically insignificant 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. The same qualitative evidence emerges when different dummies indicating the number of children are introduced. As shown in Table 5, the two dummies indicating one or respectively two children are positive and statistically significant only for males. Once again, the main conclusion for both females and males are unaffected.

We next investigate if the union dummies just trace out nonlinearities in the relationship between age and well-being. Table 6 shows the results of the baseline model augmented with higher order terms for age. The estimated gains to marriage in this augmented model are slightly smaller compared to the baseline model, esspecially for males. One implication of this model is that the gap between the coefficients for females and males is now smaller. For example, the estimates suggest that both females and males on average enjoy four years after marriage a benefit of 0.31 life satisfaction points. On the whole, the results closely resemble the finding obtained from the baseline estimation.

So far, we have established that there is a sizeable positive impact of marriage on life satisfaction, even five years after entering the union. Obviously, this result does not rule out that there is some degree of adaptation to marriage. In line with Frijters et al. (2011), the difference between the long-run-effect and the effect in $t = 0$ is one possible way of estimating the amount of adaptation. Using the estimates from Table 2 and calculating $\theta_5 - \theta_0$ yields -0.297 for females and -0.119 for males. In relative terms, these results indicate that there are long-run gains to marriage, although there is a considerable amount of adaptation: the positive effect five years after marriage is about 40% of the effect in $t = 0$ for females and about 75% for males. Thus, a further simple estimate for the degree of adaptation is 60% for females and 25% for males; Clark and Georgellis (2012) also employ this approach to calculate the degree of adaptation.

Table 7 presents further estimates for the degree of adaptation. As in the presented example for $t = 5$, it calculates $d_t = 1 - \frac{\theta_t}{\theta_0}$ for $t \in [1, 5]$ for the two specifications discussed in the previous section: while the first specification omits the dummies modeling the years prior to marriage, thereby inflating the baseline utility picked up by the θ_0-estimate, the second specification enters these dummies. The table illustrates the sensitivity of the adaptation estimates along two dimensions. The first dimension is the regression specification and the second is period chosen for the calculation. For example, columns (1) and (2) indicate that the degree of adaptation for males is about 60% three years after marriage and about 82% four years after marriage, while for females it is about 93-98% in both years. Hence, the choice of the period matters in particular for the male adaptation estimate. More important, the table highlights the sensitity of the estimates with respect to the regression specification. As discussed, the baseline specification (columns 3 and 4)

Table 4: Life satisfaction regressions (controlling for time fixed effects)

	(1) female	(2) male
Age^2	0.0225	0.00415
	(1.09)	(0.22)
Employed	0.0542^{+}	0.125^{**}
	(1.82)	(3.14)
HH income	0.00560^{***}	0.00424^{***}
	(6.62)	(5.19)
East	-0.0624	-0.251^{+}
	(-0.48)	(-1.76)
Education	0.0262^{*}	-0.0121
	(2.51)	(-1.32)
Children	0.0302	0.0554^{+}
	(0.96)	(1.92)
θ_{-4}	0.113^{*}	0.131^{*}
	(2.06)	(2.56)
θ_{-3}	0.0704	0.205^{***}
	(1.29)	(4.05)
θ_{-2}	0.186^{***}	0.225^{***}
	(3.38)	(4.43)
θ_{-1}	0.288^{***}	0.380^{***}
	(5.11)	(7.36)
θ_0	0.510^{***}	0.461^{***}
	(8.31)	(8.23)
θ_1	0.307^{***}	0.381^{***}
	(4.53)	(6.13)
θ_2	0.248^{***}	0.252^{***}
	(3.36)	(3.75)
θ_3	0.244^{**}	0.374^{***}
	(3.06)	(5.19)
θ_4	0.258^{**}	0.332^{***}
	(3.03)	(4.32)
θ_5	0.177^{+}	0.304^{***}
	(1.87)	(3.67)
Constant	7.065^{***}	7.474^{***}
	(50.37)	(55.91)
Time fixed effecs	Yes	Yes
Number of observations	18277	19137
Number of individuals	1662	1614
R^2 within	0.0256	0.0243

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Life satisfaction regressions including dummies for the number of children and time fixed effects

	(1) female	(2) male
$Age^2/100$	0.0217	0.00387
	(1.05)	(0.21)
Employed	0.0511^{+}	0.126^{**}
	(1.70)	(3.15)
HH income	0.00559^{***}	0.00420^{***}
	(6.59)	(5.12)
East	-0.0672	-0.251^{+}
	(-0.52)	(-1.76)
Education	0.0257^{*}	-0.0122
	(2.46)	(-1.33)
One child	0.0392	0.0505^{+}
	(1.22)	(1.68)
Two children	-0.0232	0.0696^{+}
	(-0.52)	(1.75)
Three or more children	0.0704	0.0760
	(1.04)	(1.19)
θ_{-4}	0.113^{*}	0.132^{**}
	(2.05)	(2.58)
θ_{-3}	0.0703	0.207^{***}
	(1.29)	(4.07)
θ_{-2}	0.186^{***}	0.227^{***}
	(3.38)	(4.45)
θ_{-1}	0.288^{***}	0.382^{***}
	(5.10)	(7.38)
θ_0	0.509^{***}	0.463^{***}
	(8.27)	(8.25)
θ_1	0.306^{***}	0.384^{***}
	(4.49)	(6.15)
θ_2	0.248^{***}	0.255^{***}
	(3.34)	(3.77)
θ_3	0.248^{**}	0.375^{***}
	(3.11)	(5.20)
θ_4	0.267^{**}	0.332^{***}
	(3.13)	(4.31)
θ_5	0.191^{*}	0.301^{***}
	(2.02)	(3.62)
Constant	7.074^{***}	7.475^{***}
	(50.35)	(55.87)
Time fixed effects	Yes	Yes
Number of observations	18277	19137
Number of individuals	1662	1614
R^2 (within)	0.0259	0.0243

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Life satisfaction regressions with a quartic in age

	(1) female	(2) male
Age	-0.372^{***}	-0.736^{***}
	(-3.90)	(-5.65)
Age^2	1.286^{***}	2.889^{***}
	(3.36)	(5.12)
Age^3	-0.0203^{**}	-0.0500^{***}
	(-3.17)	(-4.82)
Age^4	0.000108^{**}	0.000304^{***}
	(2.92)	(4.43)
Employed	0.0541^{+}	0.154^{***}
	(1.82)	(3.83)
HH income	0.00526^{***}	0.00375^{***}
	(6.20)	(4.59)
East	-0.0486	-0.245^{+}
	(-0.38)	(-1.72)
Education	0.0299^{**}	-0.00803
	(2.83)	(-0.87)
Children	-0.00725	0.00565
	(-0.22)	(0.19)
θ_{-4}	0.140^{*}	0.144^{**}
	(2.54)	(2.81)
θ_{-3}	0.0951^{+}	0.211^{***}
	(1.74)	(4.13)
θ_{-2}	0.206^{***}	0.219^{***}
	(3.70)	(4.28)
θ_{-1}	0.313^{***}	0.371^{***}
	(5.47)	(7.12)
θ_0	0.529^{***}	0.450^{***}
	(8.59)	(8.05)
θ_1	0.337^{***}	0.368^{***}
	(4.88)	(5.86)
θ_2	0.274^{***}	0.230^{***}
	(3.64)	(3.39)
θ_3	0.277^{***}	0.344^{***}
	(3.42)	(4.73)
θ_4	0.305^{***}	0.305^{***}
	(3.52)	(3.92)
θ_5	0.209^{*}	0.251^{**}
	(2.18)	(3.00)
Constant	10.70^{***}	14.07^{***}
	(12.79)	(13.06)
Number of observations	18277	19137
Number of individuals	1662	1614
R^2 within	0.0211	0.0209

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: Estimates for the degree of adaptation

	specification with inflated reference utility				baseline specification			
	(1)		(2)		(3)		(4)	
	female		male		female		male	
d_1	0.690	(0.148)	0.428	(0.214)	0.385	(0.100)	0.150	(0.104)
d_2	0.948	(0.168)	1.126	(0.242)	0.508	(0.114)	0.420	(0.111)
d_3	0.984	(0.184)	0.605	(0.240)	0.499	(0.124)	0.150	(0.117)
d_4	0.930	(0.197)	0.825	(0.261)	0.436	(0.132)	0.210	(0.125)
d_5	1.394	(0.222)	1.304	(0.278)	0.591	(0.151)	0.254	(0.123)
N	18277		19137		18277		19137	

Standard errors in parentheses

indicates that the degree of adapation five years after marriage is 60% for females and 25% for males. These estimates are much smaller compared to columns (1) and (2) and once again indicate that the first specification over-estimates the degree of adaptation by inflating the estimate in $t = 0$.

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, at least in our sample, marriage works. Both females and males enjoy economically (and statistically) significant gains to marriage, even 5 (or more) years after marriage. 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. 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). Recall that the coefficient θ_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:

$$\frac{\theta_j}{\gamma} \equiv \lambda_j \tag{3}$$

Household income after taxes and transfers y is measured in units of 1000 Euros (normalized to the year 2000). Hence, the estimated shadow value $\frac{\hat{\theta}_j}{\hat{\gamma}}$ 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. As discussed in section 3, one potential caveat of the FE estimation strategy is attenuation bias regarding the income coefficient. Therefore, we use the regression estimates including individual FE to derive an upper bound of the pecuniary value and the OLS estimates omitting individual FE for derivation of the lower bound.

Figure 2: Shadow values for the gains of marriage (1000 Euros)

(a) females (b) males

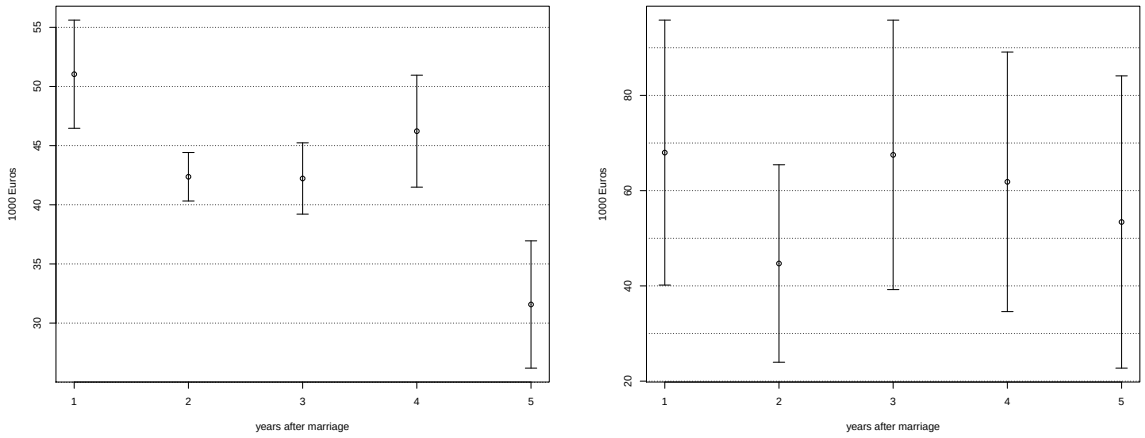


Figure 2 plots the interval obtained for λ_j using the OLS and FE bounds where j ranges from married for one year to five years. For females, the lower bound for the first year of marriage ($j = 1$) is roughly equal to 47,000 Euros while the upper bound is about 55,000. For males, the corresponding bounds for the first year of marriage are 40,000 and respectively 95,000 Euros. Five years after marriage, the shadow values ranges from 26,000 to 37,000 Euros for females and from 23,000 to 84,000 Euros for males.

We also considered a specification using log household income. Once again, we carried out separate regressions for females and males. The coefficient for log income for females is equal to 0.126, while the estimate of θ_5 in the log-specification is equal to 0.2. The predicted change in life satisfaction when household income changes from the median female household income of 32,000 to 32,100 is equal to 0.003878 and hence the associated shadow value is roughly 51 (0.2/0.003878) times the one-thousand change, yielding 51,000. For males, the corresponding shadow value calculated at the male mean household income is equal to 81,000. Hence, compared to the specifications where income enters linearly,

the specification in logs provides estimates that close to the upper bound for males and above the upper bound for females.

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 having a partner is associated with a permanent boost in life satisfaction. 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 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. Our data supports the view that individuals' happiness drops after the first year of marriage to a new post-marital level which is higher than while single. The drop after the first year may be interpreted as partial adaptation.

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 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 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.

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.[10] Our findings suggest to carefully check the robustness of these results with respect to the reference period.

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[10]Cf. Adler and Posner (2008), Layard (2006), Oswald and Powdthavee (2008a,b)

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A. Appendix

Table A.1: Life satisfaction regressions with gender interactions

	(1)	
	female and male	
Age	-0.0410^{**}	(-3.03)
Age^2/100	-0.00248	(-0.13)
Employed	0.134^{***}	(3.29)
HH income	0.00414^{***}	(5.01)
East	-0.233	(-1.60)
Education	-0.0134	(-1.44)
θ_{-4}	0.140^{**}	(2.68)
θ_{-3}	0.209^{***}	(4.04)
θ_{-2}	0.222^{***}	(4.27)
θ_{-1}	0.380^{***}	(7.21)
θ_0	0.467^{***}	(8.33)
θ_1	0.397^{***}	(6.37)
θ_2	0.271^{***}	(4.06)
θ_3	0.397^{***}	(5.58)
θ_4	0.369^{***}	(4.88)
θ_5	0.349^{***}	(4.29)
Female x Age	-0.00612	(-0.31)
Female x Age^2/100	0.0151	(0.55)
Female x Employed	-0.0839^{+}	(-1.69)
Female x HH income	0.00141	(1.21)
Female x East	0.188	(0.97)
Female x Education	0.0379^{**}	(2.74)
Female x θ_{-4}	-0.0153	(-0.20)
Female x θ_{-3}	-0.132^{+}	(-1.78)
Female x θ_{-2}	-0.0381	(-0.51)
Female x θ_{-1}	-0.0912	(-1.19)
Female x θ_0	0.0350	(0.43)
Female x θ_1	-0.0879	(-0.97)
Female x θ_2	-0.0243	(-0.25)
Female x θ_3	-0.146	(-1.39)
Female x θ_4	-0.0860	(-0.77)
Female x θ_5	-0.143	(-1.18)
Constant	8.086^{***}	(54.73)
Number of observations	37414	
Number of individuals	3276	
R^2 within	0.0196	

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$