

# The marital satisfaction of differently aged couples

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**Abstract** We investigate how the marital age gap affects the evolution of marital satisfaction over the duration of marriage using household panel data from Australia. We find that men tend to be more satisfied with younger wives and less satisfied with older wives. Interestingly, women likewise tend to be more satisfied with younger husbands and less satisfied with older husbands. Marital satisfaction declines with marital duration for both men and women in differently aged couples relative to those in similarly aged couples. These relative declines erase the initial higher levels of marital satisfaction experienced by men married to younger wives and women married to younger husbands within 6 to 10 years of marriage. A possible mechanism is that differently aged couples are less resilient to negative shocks compared to similarly aged couples, which we find some supportive evidence for.

**Keywords** Assortative matching · Marital age gap · Marital duration · Marital satisfaction

**JEL classification** D1 · J12

## 1 Introduction

A well-documented feature of the marriage market is that individuals match assortatively on age and that the most common pairing is one in which the husband is a few years older than the wife (Presser 1975; Glick and Lin 1986). While this pattern of

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matching on age is well known, the underlying mechanism that generates this sorting is not well understood. For example, some studies suggest that marital gains are largest in older husband-younger wife pairs (Bergstrom and Bagnoli 1993) while others find that marital gains are largest for similarly aged couples (Choo and Siow 2006). A number of theoretical models assume that men (and in some models, women) prefer younger spouses for their “fitness” or fecundity (Siow 1998; Coles and Francesconi 2011; Diaz-Gimenez and Giolito 2013), while analysis using online and speed dating data suggest that both men and women instead prefer similarly aged partners (Belot and Francesconi 2013; Hitsch et al. 2010).

Marital sorting is an outcome of both male and female preferences as well as the distribution of characteristics in an individual’s marriage market. Assortative matching on age can occur if both men and women prefer similarly aged spouses, but this same pattern of sorting can also result from underlying preferences in which both men and women prefer younger spouses. Women could, for example, prefer to match with younger men, but if most men receive large disutility from marrying an older woman, women will avoid seeking younger male partners.

This paper adds to the existing literature by analyzing how marital satisfaction varies with the marital age gap. Specifically, this paper analyzes data from the 2001–2013 waves of the Household, Income and Labor Dynamics in Australia (HILDA) data. These longitudinal data are particularly well suited to this study as they contain annual reports of satisfaction with relationship with one’s current spouse from both the husband and the wife. Determining whether marital satisfaction is greater for similarly aged couples, for men and women married to younger spouses, or for both men and women in older husband-younger wife pairings will provide insight regarding the conflicting assumptions and results from previous theoretical and empirical research on marital sorting by age.

In addition to studying the cross-sectional relationship between the marital age gap and marital satisfaction, ours is the first study to analyze how the marital age gap affects the evolution of marital satisfaction over the duration of the marriage. Because we observe annual reports of marital satisfaction, we are able to control for individual fixed-effects in our analysis. Unlike analysis that compares recently married couples to couples with longer marital duration, this fixed-effects analysis is identified using within-marriage changes in marital satisfaction over time. We are therefore able to ascertain whether marital satisfaction evolves differently over the duration of the marriage for differently aged couples compared to similarly aged couples. For example, if men married to younger wives initially express greater marital satisfaction, does this higher level of marital satisfaction persist, increase, or decrease over the duration of the marriage?

Research on marital dissolution has found that differently aged couples are more likely to divorce than similarly aged ones (Cherlin 1977; Lillard et al. 1995), which suggests that differently-aged couples may experience greater declines in marital satisfaction over time. Previous work suggests that unanticipated shocks to marital gains are a key cause of marital dissolution (Becker et al. 1977; Weiss and Willis 1997). Therefore, if our analysis finds that marital satisfaction declines over time for differently aged couples relative to similarly aged couples, a potential mechanism is that differently aged couples suffer larger losses to marital gains when experiencing a negative shock. This could happen if, for example, differently aged

couples are less similar in their preferences for consumption, making it more difficult for them to adjust to a negative economic shock. Fortunately, the HILDA data include self-reports of whether there was a “major worsening of finances” in the past year, which allows us to test this mechanism.

Our key findings are (1) men tend to be more satisfied with younger wives and less satisfied with older wives. (2) Likewise, women tend to be more satisfied with younger husbands and less satisfied with older husbands. (3) For both men and women, marital satisfaction declines over the duration of the marriage for those married to differently aged partners relative to those married to similarly aged partners. These relative declines erase the initial higher levels of marital satisfaction experienced by men married to younger wives and women married to younger husbands within 6 to 10 years of marriage. (4) Differently aged couples experience larger declines in marital satisfaction in response to a negative economic shock compared to similarly aged couples.

## 2 Literature and background

### 2.1 Theoretical models of marital sorting and marital age gaps

Several theoretical papers in economics focus on the gender differences in timing of marriage or the age gap between partners. Predictions from these papers regarding the relationship between the marital age gap and marital gains are driven by assumptions regarding individual preferences for partner characteristics and the evolution of earnings and/or fecundity over the lifecycle.<sup>1</sup>

Bergstrom and Bagnoli (1993) assume that husband quality is revealed at later ages than wife quality. This happens when marital gains come from household specialization, and men’s market productivity increases over time but women’s household productivity does not. All women marry young, because delays in marriage do not increase their value on the marriage market. High-quality women marry high-quality older men who have delayed marriage to reveal their high earnings potential. Low-quality young women marry low-quality young men, who do not bother to delay marriage because their earnings potential will not improve over time.

The Bergstrom and Bagnoli model predicts that differently aged couples contain matches of high-quality husbands and wives, generating greater surplus, while similarly aged couples contain lower-quality husbands and wives with lower surplus. This predicts greater marital satisfaction for both men and women in older husband-younger wife couples compared to similarly aged couples.

Coles and Francesconi (2011) assume that both men and women receive utility from their partner’s income but also from their partner’s “fitness,” which decays with age. Financially successful men and women are both able to attract younger spouses. The

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<sup>1</sup> In the discussion below, we assume that individual reports of marital satisfaction are a proxy for the marital gains they experience. It should be noted that we implicitly assume that marital search is costly. If it were the case that individuals search at very low cost in large marriage markets with no gender imbalances, we would expect for competition among prospective mates to compete away any excess marital gains so that all couples begin marriage with equivalent (and zero) gains relative to their outside alternative (Weiss and Willis 1997). Given that even among recently married couples there is considerable variation in marital satisfaction, this seems a reasonable assumption.

younger partners receive disutility from matching with an older spouse but are compensated by the higher earnings of the older spouse. Unlike Bergstrom and Bagnoli (1993), it is not clear that the younger spouses in large age gap couples will be more satisfied than one in a small age gap couple. The younger spouse has traded off one feature (household income) for another (partner “fitness”).<sup>2</sup> We would expect the relationship between marital age gap and marital satisfaction to be sensitive to controls for partner characteristics, such as education and income.

Both Bergstrom and Bagnoli (1993) and Coles and Francesconi (2011) predict that in couples with large age gaps, the older spouse is financially successful. Mansour and McKinnish (2014), however, find empirically that both members of differently aged couples tend to be negatively selected on education, earnings, and cognitive ability. This calls into question whether these theoretical models are realistic descriptions of the process that generates differently aged couples.<sup>3</sup>

Diaz-Gimenez and Giolito (2013) develop a model in which older husband-younger wife pairs are generated simply because fecundity declines more rapidly for women than men over the lifecycle. Women prefer to marry young, while still fecund, and are willing to accept marriage proposals from older men, whose fecundity declines at a slower rate. In contrast, it is less costly for men to delay marriage and they reject proposals from less-fecund older women. Their results imply that men should receive greater disutility from an older spouse than women, given women’s more rapidly declining fertility.

It should be noted that the theoretical papers on marital sorting discussed in this section generate predictions regarding the formation of couples but do not provide any insight regarding how marital gains evolve over time inside marriage.

## 2.2 Revealed preference and marital age gaps

While there is no empirical research that directly analyzes individual’s preferences for marital age gaps, the relevant empirical research is consistent with preferences for similarly aged spouses, with a preference for pairings with slightly older husbands compared to slightly older wives. For example, Choo and Siow (2006) develop and estimate a structural model of the marriage market. They estimate systematic net gains to marriage based on age of husband and wife and find that women maximize their net gain with a slightly older husband, and men maximize their net gain with slightly younger wives. These larger estimated gains to marriage for slightly older husband-slightly younger wives pairings are generated by the fact that these pairings are the most common, conditional on the distribution of available partners in the market.

Belot and Francesconi (2013) analyze data from speed-dating events and find that both men and women prefer dates where the man is 0–5 years older rather than dates

<sup>2</sup> Siow (1998) generates a very similar prediction: that older husband-younger wife pairs are generated because financially successful older men prefer younger “fecund” women and compensate their younger partners for marrying them with higher earnings. His model, however, does not result in older wife-younger husband pairings because he assumes that only young women are fecund and all women marry young in order to produce children.

<sup>3</sup> Mansour and McKinnish argue that their empirical results likely reflect the fact that men and women with higher earnings potential spend more time in age-homogenous settings (e.g., postsecondary and graduate education, jobs with career ladders) and therefore are more likely to marry similarly aged spouses.

where the man is more than 5 years older or where the man is younger than the woman. Using online dating data, Hitsch et al. (2010) find that both men and women are more likely to contact similarly aged partners. Their estimates also indicate that both men and women particularly avoid pairings in which the woman is older than the man. In the absence of strategic behavior, these results suggest that preferences for age difference match the empirically observed age differences at marriage.<sup>4</sup>

However, these studies only reveal true preferences if individuals are not acting strategically (Fisman et al. 2006). If men or women avoid contacting much younger potential partners because they suspect the chance of success is very low, this will make it appear as if they prefer similarly aged spouses more than they actually do. Therefore, the fact individuals are more likely to contact, date, and marry similarly aged partners could be generated by preferences for similarly aged partners, but this sorting could also be generated by the case in which both men and women prefer younger spouses.

Studying how marital satisfaction varies with marital age gap therefore complements the existing literature on marital age gap preferences. There is no reason to believe that strategic behavior plays a role in how people report their marital satisfaction. Therefore, if we find that married individuals report greater satisfaction when married to similarly aged partners, this would be consistent with previous findings that individuals prefer to date and marry similarly aged partners. Alternatively, if we find that individuals report greater marital satisfaction when married to younger spouses, this suggests that the prior findings may in part have been generated by strategic behavior.

There is limited prior research estimating the relationship between marital age gaps and marital satisfaction. Using cross-sectional data from Florida in the early 1970s, Vera et al. (1985) find no significant differences in marital quality among couples from various age gap categories. Their null result may stem from the fact that husbands and wives were pooled into the same regression.<sup>5</sup> Rogler and Procidano (1989) also find no evidence that marital quality varies with the marital age gap in their analysis of 200 Puerto Rican families in New York City. Alternatively, Groot and Van Den Brink (2002) find that both men and women report greater life satisfaction if there is a positive age gap between husband and wife, but they do not study marital satisfaction. Their sample is fairly different from ours, as theirs is a sample of older Dutch couples in which the head of household is aged 43–65, and they also fail to control for marital duration.<sup>6</sup> Finally, Zhang et al. (2012) find in a cross-sectional sample of Hong Kong couples that husbands 2 to 4 years older than their wives were 1.92 times more likely to be satisfied with their marriages compared with those whose wives were of a similar age to themselves. The Zhang et al. study, however, controls for both husband's and

<sup>4</sup> Hitsch et al. (2010) investigate for evidence of strategic behavior using appearance ratings. They find that for both men and women, regardless of appearance rating, the probability of e-mailing a potential dating partner is monotonically increasing in the attractiveness of the potential partner. There is no evidence, for example, that less attractive individuals strategically avoid contacting the most attractive potential partners. Based on these, Hitsch et al. (2010) conclude that there is little evidence of strategic behavior, although they acknowledge that they are only considering one characteristic: physical appearance.

<sup>5</sup> In other words, if husbands are happier in older husband-younger wife marriages than marriages without an age gap, but wives are less happy in older husband-younger wife marriages than marriages without an age gap, this can average out to no effect of age gap on marital satisfaction if husbands and wives are pooled together.

<sup>6</sup> Another paper which studies the outcomes of older married couples as a function of the marital age gap is Drefahl (2010), who finds that in a sample of Danish individuals over 50, having an older spouse increases the mortality rate for both men and women, and having an older spouse increases the mortality rate for women.

wife's age in addition to their set of age difference categories. Because simultaneously controlling for both husband's and wife's age controls for any linear effect of age difference, their coefficient estimates for the age difference categories are difficult to interpret, only reflecting non-linear effects conditional on any linear effect.

### 2.3 Marital duration, marital age gaps, and marital satisfaction

There are no studies we are aware of that examine from either a theoretical or empirical perspective how the marital age gap affects the evolution of marital satisfaction over the duration of the marriage. Prior work by economists argues that couples marry with imperfect information, and unanticipated shocks can cause gains to marriage to change in ways that were not predictable at the time of the marriage (Becker et al. 1977; Weiss and Willis 1997). The marital age gap could therefore affect changes in marital satisfaction over time by influencing how unanticipated shocks affect the gains from the marriage.

For example, if similarly aged couples are more similar in their preferences for consumption, they might be better able to adjust to a negative financial shock than a differently aged couple. If differently aged couples engage in more household specialization, they might be more negatively affected by a health shock (because the spouses are poor substitutes for each other in both market and household production). It should be acknowledged, however, that if this larger negative effect of the shock on the differently aged couple causes divorce, an analysis of marital satisfaction using the selected sample of surviving couples will underestimate this effect.

In our analysis, we first test whether the evolution of marital satisfaction over the duration of the marriage is affected by the marital age gap. We also allow the degree of household specialization to affect trends in marital satisfaction. Finally, we test whether the effect of negative financial shocks and health shocks on marital satisfaction differs for differently aged couples compared to similarly aged couples.<sup>7</sup>

## 3 Data and methods

### 3.1 Analysis sample

This analysis uses the Household, Income, and Labor Dynamics in Australia (HILDA) survey data for the years 2001–2013. The HILDA is a household-based panel study which began in 2001 with a nationally representative sample of Australian households in private dwellings. The initial wave surveyed 7682 households containing 19,914 individuals, who have then been re-surveyed annually. In each survey year, all current household members of these initial wave 1 respondents are included in the survey.

One feature of the HILDA survey is that each year, it asks respondents to report life satisfaction on a variety of dimensions, including reporting level of satisfaction with

<sup>7</sup> Another form of unanticipated shock to a marriage can be a shock to one's outside alternatives. If there is a shock that changes a married individual's perception of the average quality of his or her alternative mates, this will likely also affect their reported satisfaction with their current marriage. We cannot observe these shocks empirically and do not have any a priori reasoning for why the effect of such shocks should differ by marital age gap.

relationship with partner on a scale from 0 to 10. Therefore, these HILDA data are unusually rich in that they provide, for a large representative sample, annual reports of relationship quality made by both members of the couple for as many as to 13 years in a row.

Our analysis sample contains observations in which (1) both members of the couple report that they are currently married, (2) both are in their first marriage, and (3) both members are aged 20–55.<sup>8</sup>

The independent variable of interest is the within-couple age difference:

$$\text{AgeDiff} = \text{Husband's age} - \text{Wife's age}$$

Table 1 reports descriptive statistics for our analysis sample. For Table 1, the sample is divided based on *AgeDiff* into 7 categories: +7 or more, +4 to 6, +1 to 3, 0, -1 to -3, -4 to -6, and -7 or more. Columns 1 and 2 report frequencies and percentages for the distribution of *AgeDiff*. As has been previously well documented, most married couples have a husband who is 0 to 3 years older than the wife (55.6%). While it is somewhat common to have a husband who is at least 7 years older than the wife (8.9%), it is relatively uncommon for the wife to be 4 or more years older than the husband (3.6%).

Columns 3 and 4 of Table 1 report the mean reported satisfaction level of husbands and wives by age difference category. The sample means indicate that on average, husbands report greater satisfaction than their wives. This is consistent with previous studies of marital satisfaction which have found that wives' reports of marital satisfaction are significantly lower than husbands'. For example, national surveys of married adults in the USA in 1980 and 2000 found that, on average, women reported lower levels of marital quality (Amato et al. 2007).

Men with wives who are at least 7 years older report the lowest levels of satisfaction, and satisfaction increases monotonically as husband's age increases relative to wife's, up until the husband is more than 3 years older than the wife. For women, the relationship between marital satisfaction and age difference with spouse is less obvious from the raw means.

Figure 1 plots male marital satisfaction by marital age gap and marital duration conditional on male age and age-squared.<sup>9</sup> This descriptive plot improves upon the raw means reported in Table 1 in two ways. First, it is important to control for age when analyzing the relationship between marital age gap and marital satisfaction. On average, men married to younger wives enter the analysis sample at older ages and men married to older wives enter the sample at younger ages. Older individuals report lower marital satisfaction on average, even conditional on marital duration. Therefore, the lower average levels of marital satisfaction reported in Table 1 for men married to younger

<sup>8</sup> Although the paper does not focus on cohabitating couples, cohabitation is relatively common in Australia and often precedes marriage. In 2010, almost eight in ten (79%) marriages were preceded by a period of cohabitation (Australian Bureau of Statistics, 2012). Selection into marriage from cohabitation (or more broadly selection into marriage from dating) does mean that results might differ if we were studying couples from their first date or from the start of cohabitation but should not threaten our interpretation of our results as conditional on entry into marriage.

<sup>9</sup> Specifically, Fig. 1 is a bivariate smooth function that estimates male marital satisfaction for different combinations of the marital age gap and marital duration by tensor product P-splines (Wood 2006), conditional on male age and age-squared.

**Table 1** Within-couple age difference and marital satisfaction, descriptive statistics

| Husband's age – wife's age | Number | %    | Mean husband's satisfaction | Mean wife's satisfaction |
|----------------------------|--------|------|-----------------------------|--------------------------|
| +7 or more                 | 299    | 8.9  | 8.46                        | 8.28                     |
| +4 to 6                    | 608    | 18.0 | 8.48                        | 8.28                     |
| +1 to 3                    | 1375   | 40.8 | 8.54                        | 8.35                     |
| 0                          | 499    | 14.8 | 8.43                        | 8.32                     |
| –1 to –3                   | 469    | 13.9 | 8.39                        | 8.34                     |
| –4 to –6                   | 89     | 2.6  | 8.38                        | 8.36                     |
| –7 or more                 | 35     | 1.0  | 7.81                        | 8.25                     |

Sample of couples observed in a first marriage in HILDA 2001–2013 data where husband and wife are both in their first marriage and aged 20–55. There are 3374 couples in our sample and 18,987 couple-years. Each couple receives equal weight in the means reported in columns 3 and 4, regardless of the number of years of data

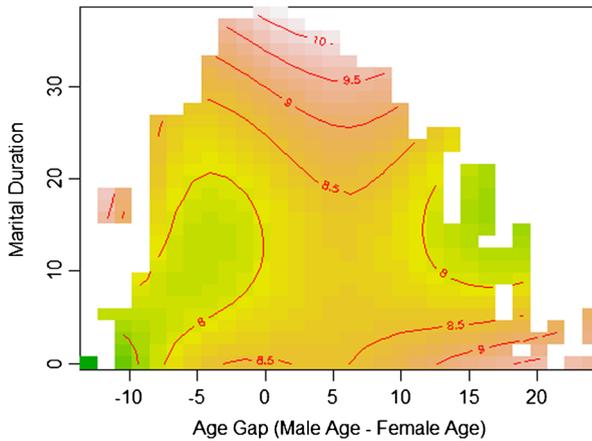
wives may be due to the fact that these men are older, rather than the fact that they are married to younger wives. Second, Fig. 1 takes into account the fact that marital satisfaction varies with marital duration, and the relationship between the marital age gap and marital satisfaction may also change over time.

Using Fig. 1 to look at men in relatively new marriages (5 years or less), there is a clear monotonic relationship between the marital age gap and husband's satisfaction, where men with much younger wives are the most satisfied and men with much older wives are the least satisfied. Figure 1 also shows that the relationship between the marital age gap and marital satisfaction changes with marital duration because marital satisfaction declines more rapidly for men with larger marital age gaps, and the decline is particularly steep for men with much younger wives. For men married 6 years or more, husbands married to moderately younger wives report the highest average levels of satisfaction.<sup>10</sup>

Figure 2 is the analogous plot for wife's marital satisfaction, this time conditional on the wife's age and age-squared. Looking at women in relatively new marriages, the plot shows that women are happiest with a negative marital age gap (younger husbands), and satisfaction declines as the marital age gap becomes more positive. Interestingly, even though women with older husbands start out at lower levels of satisfaction, they also, just like their husbands, experience the steepest decreases in marital satisfaction with marital duration. As a result, women with much older husbands who have been married at least 5 years are particularly dissatisfied.

The descriptive graphs in Figs. 1 and 2 seem to indicate an overall U-shaped relationship between duration and marital satisfaction, which is consistent with some prior studies (Glenn 1998; Van Laningham et al. 2001). It is important to remember, however, that these graphs reflect comparisons across couples with different marital

<sup>10</sup> It is important to note that Fig. 1 does not provide the density of observations, and therefore, it must be remembered that there is sparse data at the edges of the plot, for example, where the marital age gap is above 15 or below –5, or marital duration is above 25.



**Fig. 1** Husband's marital satisfaction by marital duration and marital age gap, conditional on husband's age and age-squared

durations, not within-marriage comparisons of marital satisfaction over time. This U-shaped pattern probably reflects the fact that some couples experience negative shocks to marital gains (some of which cause couples to dissolve) counteracted by the positive effects of accumulated marriage-specific capital (Weiss and Willis 1997) and positive selection into longer marital durations.

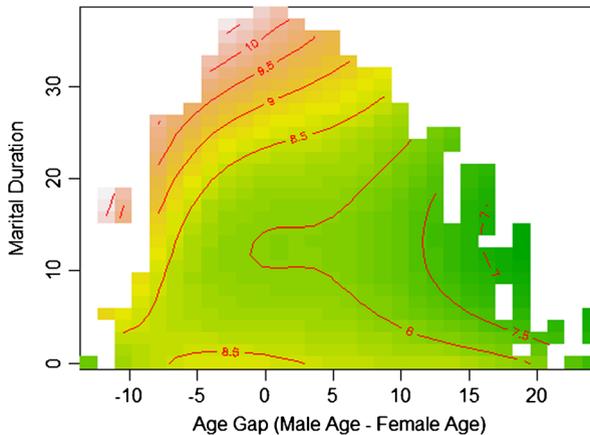
### 3.2 Characteristics of differently aged couples

Before estimating the relationship between marital age gap and marital satisfaction, it is useful to first consider how individual and couple characteristics differ with respect to the marital age gap. Table 2 sorts couples into three marital age gap categories. The first column reports variable means for couples in which the husband is more than 3 years older than the wife. The second column contains couples in which the husband is 0 to 3 years older than the wife. The third column contains couples in which the wife is older than the husband.

Panel a of Table 2 reports mean age and age of marriage by age gap category. As one might expect, men who marry younger wives and women who marry younger husbands typically have older than average ages of marriage. Because they marry at older ages, they are older than average when they appear in our sample of married couples.

Panel b of Table 2 reports mean employment rates and average weekly earnings (for positive earners) by age gap category. Men with younger wives have slightly lower employment rates and lower average weekly earnings than men with similarly aged or older wives. This is consistent with analysis by Mansour and McKinnish (2014), who also find that men with younger wives typically have worse labor market outcomes. Among married women, those married to similarly aged husbands have the highest employment rate and highest average weekly earnings.

Panel c of Table 2 reports descriptive characteristics that are related to the couple's degree of household specialization. The first two rows of panel c indicate that the



**Fig. 2** Wife's marital satisfaction by marital duration and marital age gap, conditional on wife's age and age-squared

similarly aged couples in column 2 are more similar in work hours and housework hours than the differently aged couples in columns 1 and 3. Rows 3 and 4 report measures of the wife's attitudes towards traditional gender roles. An indicator variable for *traditional gender attitudes* equals one if the wife reports that she agrees with at least 2 of the following 3 statements: "Mothers who don't really need the money shouldn't work," "It is better for everyone involved if the man earns the money and the woman takes care of the home and children," and "A preschool child is likely to suffer if his/her mother works full time." An indicator for *very traditional gender attitudes* equals one if she agrees with all three statements.<sup>11</sup> The results in the table indicate that the wives with larger marital age gaps are more likely to prefer traditional gender roles.<sup>12</sup>

The remaining rows of panel C report the mean number of children. Women with younger husbands have the fewest children, probably because they marry at older ages. Both groups of differently aged couples, however, are more likely to have young children than similarly aged couples.

Finally, panel d considers whether similarly aged couples are also similar on other dimensions. Similarly aged couples are more likely to have both spouses complete university degrees, which is consistent with university facilitating age-homogenous marital search. Similarly aged couples are not more likely to have both spouses complete high school. Finally, couples in which the husband is older than the wife are more likely to both be immigrants than other age gap categories. It could be that immigrant couples are more likely to prefer traditional older husband and younger wife

<sup>11</sup> More specifically, these gender attitude questions are asked only in 2001, 2005, 2008, and 2011. Couples are labeled as (very) traditional in all survey years if the wife reports agreement with (3) 2 of the statements in any survey year. These three statements were chosen from a larger set of questions about gender roles because they were the three questions that generated the largest variance in responses (on a seven point scale).

<sup>12</sup> It has been argued that the level of age homogamy is an important indicator of the egalitarian nature of relationships, as large age differences between spouses have been associated with more patriarchal family systems and less romantic love (Van Poppel et al. 2001; Van de Putte et al. 2009).

**Table 2** Within-couple age difference and couple characteristics

|  | Husband's age– wife's age |                |                |
|--|---------------------------|----------------|----------------|
|  | >3                        | 0–3            | <0             |
| <b>A. Age and age of marriage</b>              |                           |                |                |
| Husband's age                                  | 43.3 (7.3)                | 40.5 (8.5)     | 37.9 (8.0)     |
| Wife's age                                     | 37.2 (7.4)                | 39.1 (8.5)     | 40.3 (7.9)     |
| Husband's age of marriage                      | 29.8 (5.3)                | 25.3 (3.9)     | 25.6 (4.3)     |
| Wife's age of marriage                         | 23.7 (4.4)                | 23.9 (3.0)     | 28.0 (4.9)     |
| <b>B. Labor market characteristics</b>         |                           |                |                |
| Husband employed                               | 92.6%                     | 94.9%          | 95.0%          |
| Wife employed                                  | 70.9%                     | 76.7%          | 70.5%          |
| Husband's weekly earnings <sup>a</sup>         | 1444.8 (873.7)            | 1556.0 (970.2) | 1548.7 (944.4) |
| Wife's weekly earnings <sup>a</sup>            | 844.3 (554.9)             | 855.0 (546.7)  | 852.9 (608.0)  |
| <b>C. Household specialization</b>             |                           |                |                |
| Husband's-wife's weekly hours of work          | 21.0 (23.2)               | 20.7 (22.5)    | 23.1 (23.3)    |
| Husband's-wife's weekly hours of housework     | –13.7 (11.8)              | –12.7 (11.3)   | –13.8 (10.5)   |
| Traditional gender attitudes                   | 54.1%                     | 47.7%          | 51.9%          |
| Very traditional gender attitudes <sup>b</sup> | 31.6%                     | 24.0%          | 27.4%          |
| Number of children age 0–17                    | 1.58 (1.25)               | 1.43 (1.19)    | 1.36 (1.12)    |
| Number of children age 0–6                     | 0.626 (0.861)             | 0.551 (0.838)  | 0.626 (0.866)  |
| <b>D. Similarity</b>                           |                           |                |                |
| Both have university degrees                   | 10.9%                     | 11.9%          | 9.9%           |
| Both have high school degrees                  | 68.0%                     | 67.6%          | 61.9%          |
| Both are immigrants                            | 20.1%                     | 10.2%          | 12.6%          |
| <i>N</i>                                       | 4968                      | 10,454         | 3387           |

Notes: sample as described in Table 1

<sup>a</sup> Sample restricted to observations with positive earnings

<sup>b</sup> Construction of the gender norms variable is described in section III.B of the paper

pairings. It could also be that smaller search pools cause immigrants to widen their search with respect to the marital age gap.

### 3.3 Regression specifications

In the regression analysis, the effect of age difference is allowed to vary by whether the husband or wife is older. Specifically, our two primary explanatory variables are

$$\begin{aligned} \text{AgeDiff\_Pos} &= \text{AgeDiff} \times \text{Pos}, \text{ and} \\ \text{AgeDiff\_Neg} &= \text{AgeDiff} \times (\text{Pos} - 1), \end{aligned}$$

where  $\text{Pos} = I(\text{AgeDiff} > 0)$  and  $\text{Pos} - 1$  therefore equals 1 if  $\text{AgeDiff} \leq 0$ .  $\text{AgeDiff\_Pos}$  measures, for couples where the husband is older, the number of years the husband is older than the wife.  $\text{AgeDiff\_Neg}$  measures, for couples where the wife is older, the

number of years the wife is older than the husband.

Table 1 shows that the most common pairings are ones in which the husband is 0–3 years older than the wife. Additionally, some previous research has suggested that both men and women prefer matches in which the husband is a few years older than the wife (Choo and Siow 2006; Belot and Francesconi 2013). Therefore, it seems appropriate to also consider an alternative specification in which the change point for the slope is at an age difference of 3 rather than an age difference of 0. In these specifications, the RHS variables are

$$\begin{aligned} \text{AgeDiff\_Pos\_cp3} &= (\text{AgeDiff}-3) \times \text{Pos3}, \text{ and} \\ \text{AgeDiff\_Neg\_cp3} &= (\text{AgeDiff}-3) \times (\text{Pos3}-1), \end{aligned}$$

where  $\text{Pos3} = I(\text{AgeDiff} > 3)$  and  $\text{Pos3}-1$  therefore equals 1 if  $\text{AgeDiff} \leq 3$ .

The primary regression specification, estimated separately for husbands and wives, is

$$\begin{aligned} \text{RelSat}_{it} = & \beta_o + \beta_1 \text{AgeDiff\_Pos}_i + \beta_2 \text{AgeDiff\_Neg}_i + \beta_3 \text{Age}_{it} + \beta_4 \text{Age}_{it}^2 \\ & + \beta_5 \text{Duration}_{it} + \beta_6 \text{Duration}_{it}^2 + X_{it} \beta_7 + \delta_t + \varepsilon_{it} \end{aligned} \quad (1)$$

where  $\text{RelSat}_{it}$  is the report of relationship satisfaction on a scale from 0 to 10 of respondent  $i$  in survey year  $t$ .<sup>13</sup> Controls for respondent's age and the duration of the marriage include quadratic terms.

$X_{it}$  is a vector of controls that includes the following individual characteristics of both the husband and wife: education (indicators for high school graduate, post-secondary certification, bachelor's degree, and graduate degree), employment status indicator, earnings, indicator for indigenous background, indicator for immigrant status, indicator for chronic health/disability.  $X_{it}$  also includes the following couple characteristics from panels c and d of Table 2: difference in weekly work hours, difference in weekly housework hours, traditional and very traditional gender attitude indicators, number of children ages 0–17, number of children ages 0–6, both spouses have a university degree indicator, both spouses graduated high school indicator, and both spouses are immigrants indicator. In addition to differences in work hours and housework hours, husband's work hours and husband's housework hours are also included. Finally,  $X_{it}$  includes household-level controls for income, homeownership indicator, house value, indicators for residence in a city and inner-region of city, local area unemployment, and state-fixed effects.

Survey year fixed-effects are also included in the model. Because the sample contains repeated observations on the same individual, the standard errors are clustered at the individual level. For some specifications, the age difference variables in Eq. (1)

<sup>13</sup> There is some question as to whether *RelSat* should be treated as a cardinal or ordinal variable. If it is cardinal (a change from 7 to 8 is of similar magnitude in terms of increased satisfaction as a change from 8 to 9), then linear regression is an appropriate model. If it is ordinal (9 is happier than 8 which is happier than 7, but a change from 7 to 8 is different in magnitude than a change from 8 to 9), a model such as an ordered logit would be preferred to linear regression. Ferrer-i-Carbonell and Frijters (2004) investigate this topic directly for happiness measures and find that the cardinality assumption is reasonable and that empirical results are not sensitive to relaxing it in favor of ordinality.

are replaced by the variables described above allowing the slope to change at an age difference of 3, rather than an age difference of 0.

Relationship satisfaction changes with the duration of the marriage, and it is possible that satisfaction evolves differently for couples with different age gaps. Interaction terms are added to the model to allow for this differential effect of duration:

$$\begin{aligned} RelSat_{it} = & \beta_o + \beta_1 AgeDiff\_Pos_i + \beta_2 (AgeDiff\_Pos_i \times Duration_{it}) \\ & + \beta_3 AgeDiff\_Neg_i + \beta_4 (AgeDiff\_Neg_i \times Duration_{it}) \\ & + \beta_5 Duration_{it} + \beta_6 Age_{it} + \beta_7 Age_{it}^2 + X_{it}\beta_8 + \delta_t + \varepsilon_{it} \end{aligned} \quad (2)$$

Equations (1) and (2) are pooled cross-section regressions. In these regressions, the effects of duration and the interaction effects of duration with the age gap variables are estimated in part by comparing couples who have been married fewer years to couples who have been married more years. One advantage of the HILDA data is that we observe annual reports of relationship satisfaction for the same couple over an extended time period, allowing us to include an individual fixed-effect in order to focus on within-marriage changes in relationship satisfaction over time:

$$\begin{aligned} RelSat_{it} = & \beta_o + \beta_1 (AgeDiff\_Pos_i \times Duration_{it}) + \beta_2 (AgeDiff\_Neg_i \times Duration_{it}) \\ & + \beta_3 Age_{it}^2 + X_{it}\beta_4 + \delta_t + \varphi_i + \varepsilon_{it} \end{aligned} \quad (3)$$

In the fixed-effects specification, the main effects of the age difference variables are dropped from the model, as they are perfectly collinear with the individual fixed-effect. Additionally, when individual fixed-effects are included in the model, the linear terms for age and marital duration become perfectly collinear with the survey year fixed-effects. This is because age and duration both change for all respondents by the same amount (1 year) between survey years. Therefore, it is not possible to estimate the main effect of marital duration on marital satisfaction in a model that controls for individual fixed-effects. This specification, however, still allows us to test whether marital satisfaction changes over time *differently* for couples with different age gaps.

## 4 Results

### 4.1 Pooled cross-sectional results

Table 3 reports the results from estimating Eq. (1) separately for married men and women.<sup>14</sup> Panel a reports the results for men, columns 1 and 2 allowing the slope to differ based on whether the husband is older or younger than his wife (change point at  $AgeDiff = 0$ ) and columns 3 and 4 allowing the slope to differ based on whether the husband is more or less than 3 years older than his wife (change point at  $AgeDiff = 3$ ).

<sup>14</sup> Sample sizes differ slightly for men and women because there is a relatively modest number of observations for which we only have either the wife's or the husband's marital satisfaction report.

**Table 3** Marital satisfaction and within-couple age difference, pooled cross-sectional results

|  | Slope change point<br>at <i>AgeDiff</i> = 0 | Slope change point<br>at <i>AgeDiff</i> = 0 | Slope change point<br>at <i>AgeDiff</i> = 3 | Slope change point<br>at <i>AgeDiff</i> = 3 |
|--|---|---|---|---|
| <b>A. Men</b>                              |   |   |   |   |
| Age difference,<br>positive                | 0.031** (0.015)                             | 0.031** (0.016)                             | -0.000 (0.021)                              | 0.003 (0.022)                               |
| Age difference,<br>negative                | -0.044* (0.026)                             | -0.041 (0.026)                              | -0.058*** (0.015)                           | -0.054*** (0.015)                           |
| Male age                                   | -0.030 (0.032)                              | -0.009 (0.031)                              | -0.034 (0.032)                              | -0.03 (0.032)                               |
| Male age squared                           | -0.0002 (0.0004)                            | -0.0004 (0.0004)                            | -0.0001 (0.0004)                            | -0.0003 (0.0004)                            |
| Controls for marital<br>duration and year? | Y   | Y   | Y   | Y   |
| Additional controls?                       | N   | Y   | N   | Y   |
| <i>N</i>                                   | 18,233                                      | 18,233                                      | 18,233                                      | 18,233                                      |
| <b>B. Women</b>                            |   |   |   |   |
| Age difference,<br>positive                | -0.032*** (0.012)                           | -0.028** (0.012)                            | -0.038** (0.018)                            | -0.035** (0.018)                            |
| Age difference,<br>negative                | 0.039 (0.029)                               | 0.044 (0.030)                               | 0.027 (0.017)                               | 0.028 (0.017)                               |
| Female age                                 | -0.010 (0.036)                              | 0.017 (0.037)                               | -0.011 (0.036)                              | 0.017 (0.037)                               |
| Female age squared                         | -0.0005 (0.0005)                            | -0.0009* (0.0005)                           | -0.0005 (0.0005)                            | -0.0009* (0.0005)                           |
| Controls for marital<br>Duration and year? | Y   | Y   | Y   | Y   |
| Additional controls?                       | N   | Y   | N   | Y   |
| <i>N</i>                                   | 18,499                                      | 18,499                                      | 18,499                                      | 18,499                                      |

Sample described in Table 1. Table reports estimates from Eq. (1). In columns 1 and 2, *Age Difference, Positive* is number of years the husband is older than the wife (=0 if wife is older). *Age Difference, Negative* is the number of years the wife is older than the husband (=0 if husband is older). In columns 3 and 4 *Age Difference, Positive* is the number of years the husband is older than the wife minus 3 (=0 if husband is less than 3 years older) and *Age Difference, Negative* is the number of years the wife is older than the husband plus 3 (=0 if husband is least 3 years older). All regressions include controls for marital duration, marital duration squared, and year of survey fixed-effects. Additional controls include individual and spouse characteristics: husband's and wife's education, employment status, earnings, indigenous background, immigration status, chronic health/disability; couple characteristics: both have university degrees, both have high school diplomas, both are immigrants, difference in work hours (and husband's work hours), difference in housework hours (and husband's housework hours), indicators for traditional gender attitudes, and very traditional gender attitudes; and household characteristics: number of children, number of children under 7, household income, homeownership indicator, house value, city and inner-region residence, local area unemployment, and state fixed-effects. Standard errors are clustered at the individual level

\* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

The results for men in the first column are obtained only using controls for husband's age and age-squared, marital duration and duration squared, and survey year. The estimates indicate that for husbands with younger wives, every additional year they are older than their wife increases marital satisfaction on average by 0.031 points. For husbands with older wives, every additional year their wife is older than they are decreases marital satisfaction on average by 0.044 points. Both effects are statistically significant.

The second column repeats the column one specification, but controlling for the long list of individual, couple, and household controls described above in Sect. 3. Interestingly, the coefficient estimates are only very modestly changed by the addition of these controls, though the coefficient on the negative age difference variable does become statistically insignificant.

The third and fourth column results, with the change point at  $AgeDiff = 3$ , present a slightly different picture. For men who are more than 3 years older than their wives, an additional year of age gap with their wife does not change their reported relationship satisfaction. For men who are no more than 3 years older than their wife, every additional year their wife is older relative to their own age reduces their relationship satisfaction by 0.054 points.

The results for women are reported in panel b. For women with older husbands, every additional year their husband is older than them decreases their satisfaction by 0.032. For women with younger husbands, every additional year their husband is younger than them increases marital satisfaction by 0.039, but the coefficient is not statistically significant. The results for women in columns 1 and 2 are surprisingly symmetric with the results for men, with quite similar coefficient magnitudes, just of opposite sign.

Columns 3 and 4 report the results for women when the slope is allowed to change at  $AgeDiff = 3$  instead of  $AgeDiff = 0$ . Unlike the results for men, the results for women are more modestly affected by this change in specification.

Overall, the results in Table 3 indicate that both men and women experience greater marital satisfaction when married to younger partners. These results are more consistent with the Coles and Francesconi (2011) assumption that both men and women receive higher utility from younger spouses than with the Bergstrom and Bagnoli's (1993) prediction that both men and women receive the greatest marital gains in older husband-younger wife pairings or with the Choo and Siow (2006) estimates, which suggest that net marital gains are greatest for couples in which the husband is just a few years older than the wife. The symmetry of estimates for men and women is inconsistent with Diaz-Gimenez and Giolito (2013), who predict that men receive the greater disutility from marrying older partners, given the more rapidly declining fecundity of women.

It would be premature, however, to argue that our results confirm the Coles and Francesconi (2011) model, as that model predicts that individuals will trade off one attribute (partner youth and "fitness") with another (partner income). If most individuals entering into relationships with older spouses were doing so because they were being compensated for the disutility of marrying an older partner by the higher income of the older spouse, we would expect our marital satisfaction results to be sensitive to controls for partner's education, work hours, and earnings. The fact that the results are very robust to controls for partner characteristics suggests that this trade-off is not a primary explanation for differently aged pairings.<sup>15</sup>

Additionally, the fact that men and women both report greater marital satisfaction when married to younger partners seems at odds with the dating literature results that men and women are both more likely to prefer similarly aged dates (Belot and

<sup>15</sup> One possible explanation for the insensitivity of the age difference estimates in Table 3 to the addition of a large number of individual, couple, and household controls is that different controls act to move the age difference coefficients in different directions, ultimately canceling each other out. We find, however, that is not the case. When we add the controls in small sets, we find the same degree of insensitivity of the age difference coefficient estimates.

Francesconi 2013; Hitsch et al. 2010). Our marital satisfaction results suggest that men and women may choose to contact similarly aged partners in online and speed-dating settings for strategic reasons, taking into account the age gap preferences of the potential partners, rather than because they themselves prefer similarly aged spouses. Support for this notion can be found in Antfolk et al. (2015) who find using data on preferred partner's age and actual partner's age that although men revealed a tendency to be sexually interested in women in their mid-twenties, they tended to partner up with similar-aged females in real life. The authors suggest that men's heterosexual activity is likely to be constrained by female choice.

#### 4.2 Interaction between age difference and marital duration

Tables 4 and 5 report the results from estimating Eqs. (2) and (3). These specifications include interaction effects of the age difference variables with marital duration. Table 4 reports the results for husband's marital satisfaction, and Table 5 reports the results for wife's marital satisfaction. In both tables, panel a uses the same age difference variables used in columns 1 and 2 of Table 2, which allow the slope to change at  $AgeDiff = 0$ , while panel b reports the results using the age difference variables used in columns 3 and 4 of Table 3, which allow the slope to change at  $AgeDiff = 3$ .

In panel a of Table 4, the pooled cross-section results reported in column 1 show that the main effect of the positive age difference variable is positive and statistically significant. This indicates that at the beginning of the marriage, men derive greater satisfaction from being married to younger wives. The coefficient on marital duration is positive, implying that marital satisfaction increases over time. This estimate must be interpreted with caution, however, as this likely reflects the fact that couples surviving to greater marital durations were happier to begin with. The coefficients on the interactions of the age difference variables with duration are negative, though statistically insignificant. These interaction terms indicate that relative to the positive main effect of marital duration, marital satisfaction increases at a slower rate for husbands with differently aged spouses compared to husbands with similarly aged spouses.

When individual fixed-effects are added to the model in column 2, the main effects of the age difference variables and the main effect of marital duration can no longer be estimated. The interaction of positive age difference with duration becomes more negative and statistically significant. While men married to younger wives start out more satisfied, their marital satisfaction declines relative to men married to similarly aged wives over the duration of the marriage. The magnitude of the coefficient ( $-0.005$ ), when compared to the coefficient on the main effect of positive age difference in column 1 ( $0.040$ ), suggests that the greater marital satisfaction enjoyed by men with younger wives dissipates by the eighth year of marriage. Marital satisfaction for men married to older wives also declines relative to men with similarly aged wives, but the coefficient is not statistically significant.

Table 2 indicated that differently aged couples differ in their degree of household specialization compared to similarly aged couples. This suggests that differently aged couples and similarly aged couples may typically generate marital gains

**Table 4** Interaction effects of age difference and marital duration on marital satisfaction—men

|  | Pooled            | Fixed-effects     | Additional interactions | Never-separated sample |
|--|-------------------|-------------------|-------------------------|------------------------|
| <b>A. Men</b>  |                   |                   |                         |                        |
| Age difference, positive                             | 0.040** (0.020)   |                   |                         |                        |
| Age difference, negative                             | -0.003 (0.034)    |                   |                         |                        |
| Marital duration                                     | 0.020** (0.008)   |                   |                         |                        |
| Age difference, positive × marital duration          | -0.001 (0.001)    | -0.005*** (0.002) | -0.005*** (0.002)       | -0.004** (0.002)       |
| Age difference, negative × marital duration          | -0.005 (0.003)    | -0.004 (0.004)    | -0.004 (0.004)          | -0.003 (0.004)         |
| Specialized couple × marital duration                |                   |                   | 0.003 (0.009)           | 0.006 (0.010)          |
| Very traditional gender attitudes × marital duration |                   |                   | -0.012 (0.009)          | -0.009 (0.010)         |
| Total children × marital duration                    |                   |                   | 0.195*** (0.033)        | -0.058*** (0.022)      |
| <i>N</i>   | 18,233            | 18,233            | 18,233                  | 10,704                 |
| <b>B. Men, slope change at 3</b>                     |                   |                   |                         |                        |
| Age difference, positive                             | 0.057* (0.020)    |                   |                         |                        |
| Age difference, negative                             | -0.020 (0.029)    |                   |                         |                        |
| Marital duration                                     | 0.022** (0.009)   |                   |                         |                        |
| Age difference, positive × marital duration          | -0.006*** (0.002) | -0.010*** (0.003) | -0.010*** (0.002)       | -0.009** (0.002)       |
| Age difference, negative × marital duration          | -0.003** (0.002)  | -0.002 (0.002)    | -0.002 (0.002)          | -0.002 (0.002)         |
| Specialized couple × marital duration                |                   |                   | 0.003 (0.009)           | 0.006 (0.010)          |
| Very traditional gender attitudes × marital duration |                   |                   | -0.012 (0.009)          | -0.009 (0.010)         |
| Total children × marital duration                    |                   |                   | 0.182*** (0.031)        | -0.060** (0.023)       |
| <i>N</i>   | 18,233            | 18,233            | 18,233                  | 10,704                 |

Regressions include full set of controls used in Table 2. Column 1 reports estimates from Eq. (2). *Age Difference, Positive* is the number of years the husband is older than the wife (=0 if wife is older). *Age Difference, Negative* is the number of years the wife is older than the husband (=0 if husband is older). Column 2 adds individual fixed-effects to the specification in column 1. Column 3 adds interactions of marital duration with measures of couple specialization, attitudes about gender roles, and number of children. Column 4 restricts the sample to couples who are observed for at least 8 years in the HILDA data and for whom separation is never observed. Standard errors are clustered at the individual level

\* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

from different sources (e.g. household specialization versus joint investment and consumption). It is possible that different sources of marital gains will differ in how well the gains persist over the duration of the marriage. Column 3 of Table 4

**Table 5** Interaction effects of age difference and marital duration on marital satisfaction—women

|  | Pooled         | Fixed-effects    | Additional interactions | Never-separated sample |
|--|----------------|------------------|-------------------------|------------------------|
| A. Women   |                |                  |                         |                        |
| Age difference, positive                             | -0.024 (0.017) |                  |                         |                        |
| Age difference, negative                             | 0.049 (0.036)  |                  |                         |                        |
| Marital duration                                     | 0.017* (0.008) |                  |                         |                        |
| Age difference, positive × marital duration          | -0.000 (0.001) | -0.004** (0.002) | -0.004* (0.002)         | -0.004** (0.002)       |
| Age difference, negative × marital duration          | -0.001 (0.003) | -0.009** (0.004) | -0.009** (0.004)        | -0.008* (0.004)        |
| Specialized couple × marital duration                |                |                  | -0.000 (0.010)          | 0.000 (0.010)          |
| Very traditional gender attitudes × marital duration |                |                  | -0.013 (0.010)          | -0.014 (0.010)         |
| Total children × marital duration                    |                |                  | 0.260*** (0.035)        | -0.076*** (0.024)      |
| <i>N</i>   | 18,499         | 18,499           | 18,499                  | 10,866                 |
| B. Women, slope change at 3                          |                |                  |                         |                        |
| Age difference, positive                             | -0.023 (0.020) |                  |                         |                        |
| Age difference, negative                             | 0.032 (0.029)  |                  |                         |                        |
| Marital duration                                     | 0.016* (0.009) |                  |                         |                        |
| Age difference, positive × marital duration          | -0.001 (0.002) | -0.007** (0.003) | -0.007** (0.003)        | -0.007** (0.003)       |
| Age difference, negative × marital duration          | -0.001 (0.002) | -0.004 (0.003)   | -0.004 (0.003)          | -0.003 (0.003)         |
| Specialized couple × marital duration                |                |                  | 0.000 (0.010)           | 0.001 (0.010)          |
| Very traditional gender attitudes × marital duration |                |                  | -0.013 (0.010)          | -0.015 (0.010)         |
| Total children × marital duration                    |                |                  | 0.242*** (0.033)        | -0.076*** (0.023)      |
| <i>N</i>   | 18,499         | 18,499           | 18,499                  | 10,866                 |

Table is the same as described in notes of Table 4, with the dependent variable now wife's marital satisfaction, instead of husband's. Standard errors are clustered at the individual level

\* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

therefore adds additional interaction terms that allow for the possibility that more specialized couples experience different trends in marital satisfaction than less-specialized couples. Specifically, marital duration is interacted with three time-constant variables: (1) a *specialized couple* indicator that equals 1 if the couple is in the top quartile of average difference in work hours or average difference in housework hours, where work hours and housework hours have been averaged across all survey years; (2) the *very traditional gender attitudes* indicator reported in Table 2; and (3) the maximum total number of children ever reported by the couple in the survey across all survey years.

Most importantly, the results in column 3 indicate that the age difference interactions are insensitive to these additional controls.<sup>16</sup> Of the three additional interaction variables, only the interaction of marital duration with total number of children is statistically significant. The coefficient estimate indicates that couples with more children experience increases in marital satisfaction over the duration of the marriage relative to couples with fewer children. This result, however, must be interpreted with caution, as couples that are happier and last longer will be more likely to have more children. We reconsider this result in the next section.

Panel b of Table 4 repeats the same analysis for men but using the age-difference variables from columns 3 and 4 of Table 3, which allow the slope to change at an age difference of 3. In Table 3, we reported that the coefficient on the positive age difference variable for men becomes small and insignificant when the slope change point is shifted from 0 to 3 years. In Table 4, we see that this null effect masked considerable heterogeneity by marital duration. These results indicate that there is a higher level of marital satisfaction for men with much younger wives at the beginning of the marriage; this higher level of satisfaction dissipates rather rapidly and is erased after 6 to 10 years of marriage. Therefore, the null result in Table 3 reflected the fact that we were averaging the marital satisfaction of men with younger wives across marriages of different marital duration. Overall, the results in panel b of Table 4 are very similar to those in panel a.

Table 5 uses the same specifications as Table 4 but reports the results for women. The results in panel a indicate that, compared to women married to similarly aged husbands, marital satisfaction declines over time both for women married to older husbands and women married to younger husbands. If we compare the coefficients on the interaction of marital duration with the negative age difference variable in columns 2 and 3 ( $-0.009$ ) to the main effect of negative age difference reported in column 1 ( $0.049$ ), this suggests that the initial higher-level of marital satisfaction experienced by women married to younger husbands is erased by the sixth year of marriage.

The results in panel b of Table 5 are consistent with those in panel a, though the coefficient on the positive age difference interaction becomes larger in magnitude, while the coefficient on the negative age difference variable becomes smaller and insignificant. Additionally, the coefficient estimates on the additional interactions of marital duration with the household specialization measures are very similar to those obtained for husband's satisfaction in Table 4.

Overall, the results in Tables 4 and 5 suggest that couples with larger marital age gaps experience declines in marital satisfaction over the duration of the marriage relative to couples with smaller age gaps. These declines erase the initial higher levels of satisfaction experienced by husbands married to younger wives and wives married to younger husbands within 6–10 years of marriage.

<sup>16</sup> We also find that the results are similar if we experiment with stricter definitions of specialization (for example, being in the top quartile for both the mean difference in work hours and mean difference in housework hours), use the traditional gender roles indicator instead of very traditional indicator, or add an interaction of marital duration with an indicator variable that both spouses are immigrants.

### 4.3 Sample selection

While the fixed-effects results in columns 2 and 3 of Tables 4 and 5 are estimated using within-marriage changes over time in marital satisfaction, some couples exit the sample due to divorce. This raises the concern that even the fixed-effects estimates are biased by sample-selection, because only surviving couples are observed at longer marital durations. To check for the robustness of our results to selection out of marriage, in column 4 of Tables 4 and 5, the sample is restricted to only include couples who never separate during the HILDA survey years. We further restrict the sample to only include couples who are observed for at least 8 years.

The coefficients on the age-difference interactions for men (Table 4, column 4) and women (Table 5, column 4) using this restricted sample are very similar to the results using the unrestricted sample (column 3 of Tables 4 and 5, respectively), suggesting that these results are largely unaffected by sample selection through divorce. Interestingly, this change in sample has a substantial effect on the coefficient estimate for the interaction of marital duration with number of children. The coefficient changes from positive and significant to negative and significant. This sign reversal highlights the concern raised above, that the positive coefficient in the unrestricted sample likely reflects the fact that happier, longer-lasting couples have more children. The change in the coefficient estimate when the sample is limited to long-term couples shows that this sample restriction can be effective at revealing which results are driven by sample selection into longer marital durations.

The self-selection process not only selects happier marriages into the sample over time; there is likely also to be selection into marriage with low or high age differences. Given the possible endogeneity of the marital age gap, it would be useful to pursue an instrumental variable strategy. In our application, two instruments would be required, one for *AgeDiff\_Pos* and another for *AgeDiff\_Neg*. Following Meng and Gregory (2005) who utilized the probability of marrying within one's ethnic-religion-age group and sex ratios as instruments for ethnic intermarriage, we pursued a strategy of creating instruments using male and female sex ratios based on location (state) and age in the year of marriage and alternatively in the year the individual turned 20. These sex ratios reflect the availability of potential partners at the time of marriage and arguably affect the marital age gap but not marital satisfaction directly. For multiple endogenous variables, inspection of the standard first-stage *F*-statistics is no longer sufficient and the conditional *F*-statistic is required (Sanderson and Windmeijer 2016). Unfortunately, the conditional *F*-statistic suggests that the instruments are weak for the possible endogenous regressors. Lacking a credible instrument, we therefore were unable to pursue this empirical strategy in this paper.

### 4.4 Differences in marital satisfaction between husband and wife

Because the HILDA survey elicits relationship satisfaction data from both members of the couple, it is possible to use the difference in husband's and wife's satisfaction as the dependent variable. This requires a change in the model specification. Previously, when the dependent variable was husband's satisfaction, husband's age and age difference with wife were both included as independent variables. Likewise, when the dependent variable was wife's satisfaction, the wife's age and age difference with husband were both included

**Table 6** Difference in husband's and wife's marital satisfaction

|                          | Husband's satisfaction | Wife's satisfaction | Husband's–wife's satisfaction | Husband's–wife's satisfaction | Husband's–wife's satisf., fixed-effects |
|--------------------------|------------------------|---------------------|-------------------------------|-------------------------------|---|
| Husband's age            | -0.010 (0.010)         | -0.030*** (0.010)   | 0.018** (0.008)               | -0.0026 (0.0112)              |   |
| Wife's age               | -0.033*** (0.011)      | -0.018* (0.011)     | -0.017* (0.009)               | 0.0003 (0.0119)               |   |
| Husband's age × duration |                        |                     |                               | 0.0020** (0.0009)             | 0.0008 (0.0013)                         |
| Wife's age × duration    |                        |                     |                               | -0.0014 (0.0009)              | -0.0008 (0.0013)                        |
| Duration                 |                        |                     |                               | -0.0266 (0.0185)              |   |
| N                        | 18,233                 | 18,499              | 17,923                        | 17,923                        | 17,923                                  |

Columns 1 and 2 estimate versions of Eq. (1) in which the age-difference and age variables are replaced with husband's age and wife's age. Column 3 uses the difference in husband's and wife's satisfaction as the dependent variable. Column 4 adds interactions of the age variables with marital duration. Column 5 adds couple fixed-effects. All regressions include the full set of controls listed in the notes of Table 2. Standard errors are clustered at the couple level

\* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

as independent variables. If husband's and wife's satisfaction will appear jointly on the left-hand side of the regression, the most obvious approach would therefore be to include husband's age, wife's age, and age difference between husband and wife as independent variables, but it is not possible to separately identify all three of these variables in the same regression. Therefore, the regressions using difference in husband's and wife's satisfaction as the dependent variable will use husband's age and wife's age as independent variables.

Table 6 builds up to this specification by first, in columns 1 and 2, separately regressing husband's and wife's satisfaction on both husband's and wife's ages. The results in column 1 indicate that wife's age is a much stronger predictor of husband's satisfaction than husband's age. Controlling for husband's age, husband's satisfaction decreases as wife's age increases. The results for wives in column 2 follow a very similar pattern. Husband's age is a stronger predictor of wife's satisfaction than wife's age, and controlling for wife's age, wife's satisfaction decreases as husband's age increases. Thus, for both genders, controlling for own age, marital satisfaction is decreasing in partner's age.

In column 3 of Table 6, the dependent variable is husband's satisfaction minus wife's satisfaction. It is easy to see, by looking across the first two columns, that the negative effect of husband's age on wife's satisfaction dominates its effect on husband's satisfaction. Therefore, controlling for wife's age, an older husband is associated with a larger gap between husband's and wife's satisfaction. Similarly, the negative effect of wife's age on husband's satisfaction dominates its effect on wife's satisfaction. Therefore, controlling for husband's age, an older wife is associated with a smaller gap between husband's and wife's satisfaction by decreasing husband's satisfaction relative to wife's satisfaction.

These results in Table 6 are consistent with our findings in Table 3 that men are more satisfied and women are less satisfied as the age gap between husband and wife increases. To provide some context for the estimates in column 3, the average difference in marital satisfaction between husband and wife for *same-aged* couples in our sample is 0.065. This is consistent with the descriptive analysis in Table 1 and Figs. 1

and 2, which showed that husbands on average tend to report greater marital satisfaction than wives. This combined with the positive coefficient on husband's age in column 3 indicates that couples in which the husband is older than the wife will typically experience even larger gaps in marital satisfaction. The negative coefficient on wife's age indicates that couples in which the wife is older than the husband will typically experience smaller gaps in satisfaction between the husband and wife, with couples in which the wife is 4 years older predicted to roughly "break even" with a marital satisfaction gap close to zero. It should be noted that couples in which the wife is 4 or more years older than the husband are relatively rare, only 3.6% of our sample.

Column 4 includes interaction effects with marital duration and shows that the main effect of husband's age estimated in column 3 becomes more pronounced the longer the couple has been married. This suggests that the positive marital satisfaction gap between husband and wife widens more over time for marriages with a more positive marital age gap. This interaction effect, however, become statistically insignificant once individual fixed-effects are added to the model.

#### 4.5 Negative economic shocks and marital satisfaction

Compared to similarly aged couples, both men and women in differently aged couples experience larger declines in marital satisfaction over the duration of the marriage. One potential mechanism is that when couples experience negative shocks, differently aged couples experience a greater loss in marital satisfaction than do similarly aged couples. Put another way, similarly aged couples are more resilient to negative shocks than are differently aged couples. This could be the case, for example, if differently aged couples have less similar preferences, making it harder for them to agree on how to adjust consumption in response to a negative economic shock.

We test for evidence of this mechanism in Table 7. HILDA respondents are asked if they have experienced a "major worsening in financial situation (e.g., went bankrupt)" in the past year. Couples in our sample (26.2%) report at least one such negative economic shock; 11.5% report more at least two negative economic shocks, but only 2.5% report more than two such shocks. In panel a of Table 7, we regress marital satisfaction on an indicator for reporting a worsening of finances and also interact this indicator with the age difference variables.<sup>17</sup> The first two columns of Table 7 report the results for men and columns 3 and 4 report the results for women. Columns 1 and 3 report results without individual fixed-effects, and columns 2 and 4 report results controlling for individual fixed-effects.

The results for both men and women in panel a indicate that differently aged couples, both those with an older wife and those with an older husband, experience larger declines in marital satisfaction in response to a negative economic shock than similarly aged couples. For men, both of the interaction terms are negative and statistically significant. For women, while both interaction terms are negative, only the interaction with the positive age difference variable is statistically significant. The

<sup>17</sup> Controls for husband's and wife's age and age-squared, marital duration and duration-squared, and year fixed-effects are included in the regressions, as well as the additional controls used in Tables 2, 3, and 4, *except* economic controls (employment, earnings, household income, and house value). It would be inappropriate to include these controls given that they could control for much of the effect of a negative economic shock.

**Table 7** Effects of a negative shocks on marital satisfaction for differently aged couples vs similarly aged couples

|  | Men              |                          | Women          |                          |
|--|------------------|--------------------------|----------------|--------------------------|
|  | Pooled           | Individual fixed-effects | Pooled         | Individual fixed-effects |
| <b>A. Economic shock</b>                           |                  |                          |                |                          |
| Negative economic shock                            | -0.290* (0.181)  | 0.097 (0.102)            | -0.284 (0.193) | -0.066 (0.107)           |
| Negative economic shock × age difference, positive | -0.081** (0.041) | -0.081** (0.024)         | -0.066 (0.047) | -0.055** (0.025)         |
| Negative economic shock × age difference, negative | -0.218 (0.148)   | -0.223*** (0.075)        | -0.066 (0.106) | -0.087 (0.078)           |
| <i>N</i>   | 18,233           | 18,233                   | 18,499         | 18,499                   |
| <b>B. Health shock</b>                             |                  |                          |                |                          |
| Negative health shock                              | -0.032 (0.087)   | -0.040 (0.090)           | -0.051 (0.090) | 0.029 (0.107)            |
| Negative health shock × age difference, positive   | -0.021 (0.025)   | 0.018 (0.023)            | -0.032 (0.026) | -0.023* (0.025)          |
| Negative health shock × age difference, negative   | -0.069 (0.063)   | -0.062 (0.051)           | -0.036 (0.061) | 0.033 (0.078)            |
| <i>N</i>   | 18,233           | 18,233                   | 18,499         | 18,499                   |

*Negative Economic Shock* is an indicator for whether there is a self-reported “major worsening of finances” in the past year. *Negative Health Shock* is an indicator for whether there is a self-reported major illness or injury. *Age Difference, Positive* is the number of years the husband is older than the wife (=0 if wife is older). *Age Difference, Negative* is the number of years the wife is older than the husband (=0 if husband is older). All regressions control for husband’s and wife’s age and age-squared, duration and duration-squared, year fixed-effects, and the additional controls listed in the notes of Table 2 *except* economic controls (employment, earnings, work hours, household income and household value). Standard errors are clustered at the individual level

\* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

interaction with the negative age difference variable, while insignificant, is more negative in magnitude than the interaction with positive age difference.

Panel b performs a similar analysis using reports of whether the couple experienced a health shock (“serious personal injury or illness”) in the past year. Couples in our sample (43.8%) report at least one health shock, but only 3.6% report three or more. The pooled estimates reported in columns 1 and 3, while statistically insignificant, also indicate that differently aged couples experience larger declines in marital satisfaction than do similarly aged couples. The estimates in columns 2 and 4, however, once individual fixed-effects are included in the model, are much more mixed.

## 5 Conclusions

Our results indicate that marital satisfaction varies with the marital age gap. Specifically, we find that in the first 6–10 years of marriage, both men and women are most satisfied

with younger partners and least satisfied with older partners. Our analysis of the interaction between marital satisfaction and marital age gap suggests that marital satisfaction declines more rapidly over time for both men and women in differently aged couples compared to similarly aged couples, so that after 6–10 years, the initial higher levels of satisfaction experienced by men married to younger wives and women married to younger husbands are erased. Finally, our analysis suggests a potential mechanism for the relative declines in the satisfaction of differently aged couples, which is that differently aged couples experience larger declines in marital satisfaction in response to a negative economic shock compared to similarly aged couples.

Our finding that, in the cross-section, both men and women are the most satisfied with younger partners and least satisfied with older partners contradicts much of the existing literature on marital sorting and marital age gaps. For example, our results are at odds with the theoretical model of Bergstrom and Bagnoli (1993) which predicts that older husband-younger wife pairings experience the greatest marital gains. Our results are also inconsistent with the Choo and Siow (2006) estimates which indicate that net marital gains are maximized by pairings in which the husband is a few years older than the wife. While our results are consistent with the Coles and Francesconi (2011) assumption that both men and women prefer younger, “fitter” spouses, the insensitivity of our estimates to controls for partner’s earnings is inconsistent with their prediction that men and women who marry older spouses are being compensated for their disutility by the higher earnings of the older spouse. Finally, the symmetry of the effect of marital age gap on marital satisfaction between men and women is inconsistent with Diaz-Gimenez and Giolito (2013), who predict a greater disutility from older partners for men, due to women’s more rapidly declining fecundity.

Our results also call into question the preference estimates generated using data from online data and speed-dating events. The fact that both men and women tend to seek dates with similarly aged partners had previously been interpreted as evidence that both men and women prefer similarly aged partners (Belot and Francesconi 2013; Hitsch et al. 2010). However, this interpretation is only valid if men and women do not strategically take into account their probability of success when choosing who to contact. The fact that men, at least initially, experience high levels of marital satisfaction when married to younger wives, but women experience lower levels of marital satisfaction when married to older husbands, suggests that men may actually prefer to seek dates with younger partners but avoid doing so because they know that they would only be successful with low-quality younger partners. The same reasoning may also explain why women avoid seeking dates with younger men.<sup>18</sup>

While several theoretical papers in economics focus on the rationale for the formation of differently aged couples, there are no theoretical predictions regarding how the marital satisfaction of differently aged couples will evolve over time. While our

<sup>18</sup> An alternative explanation is that individuals are sufficiently forward looking when selecting spouses to recognize that their initial higher levels of marital satisfaction with a younger spouse will dissipate, as we find. They might then prefer similarly aged spouses, to the extent that they generate the greater net present discounted value of lifetime marital satisfaction. Given it takes about 10 years for the benefit of marrying a younger spouse to dissipate, this would likely, however, require that an individual has both a low discount rate and a low subjective probability of divorce. Additionally, to the extent that the declines in satisfaction we observe are due in part to the larger negative effects of unanticipated shocks, individuals may not be able to anticipate these declines adequately to prefer a similarly aged spouse.

analysis indicates that differently aged couples are more vulnerable to economic shocks, there might be other mechanisms through which marital age gap affects the evolution of marital satisfaction over time. For example, the fact that the husband and wife are in different points of their lifecycle may have different effects on marital satisfaction at different points in the marriage, such as when one partner wants to have children or when one partner wants to retire. Future research might want to explore in more depth why marital satisfaction declines more quickly over time for both men and women in differently aged couples as compared to similarly aged couples. This future research should also more fully address the empirical implications of selection into marriage of couples with different age gaps, as well as the selection of married couples into longer marital durations.

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#### **Compliance with ethical standards**

**Conflict of interest** The authors declare that they have no conflict of interest.

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