

# Online Dating Is Shifting Educational Inequalities in Marriage Formation in Germany

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**ABSTRACT** Digital technologies govern a large part of our social lives, including the pursuit of a romantic partner. Despite recent inquiries into the social consequences of meeting online, what remains unclear is how the link between education and union formation varies in online versus offline meeting contexts, particularly on the backdrop of growing educational gaps in marriage. Using 2008–2019 *pairfam* data from Germany ( $N=3,561$ ), this study ran a series of Fine-Gray competing risks models to assess how online dating shapes the transition to marriage for partnered adults with nontertiary and tertiary education. Results reveal that irrespective of education, men in online-formed couples had greater chances of marrying than men in couples established offline. Highly educated women who met their partner in nondigital ways were less prone to marry than lower-educated women; for women in couples initiated online, however, the pattern was reversed. The internet dating marriage advantage of well-educated women was partly related to better matching on marriage attitudes and gender ideology. Facing a scarcity of eligible partners offline, high-educated women draw on more abundant online options to select more egalitarian-minded men. This study overall suggests that internet dating fosters an uneven distribution of opportunities for marriage, highlighting the role of digital partner markets in the social demography of union formation.

**KEYWORDS** Marriage • Internet dating • Technology • Education • Gender

## Introduction

Online dating through websites, phone apps, chat rooms, or social networks has introduced new ways for individuals to meet and interact with potential partners (Finkel et al. 2012). Research has already started noting some of the sociodemographic transformations triggered by internet dating. For heterosexual couples, for example, meeting online is linked to more couple diversity in the United States and Germany (Potarca 2017; Thomas 2020) and to faster transitions to marriage in the United States (Rosenfeld 2017). Still, how the internet as a prevalent source of meeting partners (Rosenfeld et al. 2019) has affected marital union formation for different social groups remains unclear. Groups are defined here by education, one of the most

important commodities on the marriage market (Becker 1993; Oppenheimer 1988) and, although by no means their only indicator, a reliable marker of economic and cultural resources (Blossfeld 2009).

In most Western countries, current educational differences in union formation describe a positive gradient, with marriage more often associated with the well-educated (McClendon 2018; Van Bavel et al. 2018). For Germany (the country of focus in this study), past research has mostly found the opposite: individuals at the bottom of the educational distribution have had greater chances of marrying than those at the top (Baizán et al. 2003; Mulder et al. 2006). Information based on more recent data is nevertheless lacking. Regardless of current patterns, several predictions can be made about the internet's role in shaping union formation across educational groups. On the one hand, at a time when urban spaces and work settings are becoming more socioeconomically segregated (Marcinčzak et al. 2016; McClendon et al. 2014), online meeting pools provide greater opportunities for encounters, potentially generating more chances for marriage among people of all educational levels. On the other hand, better-educated adults, who are more skilled at navigating new technologies (Ollier-Malaterre et al. 2019), may be engaging more effectively with online resources to meet and find well-suited partners. Facing a shortage of eligible candidates offline (Eckhard and Stauder 2019), university-educated women may particularly seize the opportunities granted in a larger and less restrictive market to select more value-compatible partners (Finkel et al. 2012) and thus form more marriage-inducing unions (Houts et al. 1996).

To test these scenarios and assess whether the educational gap in marriage varies across meeting contexts, this study focuses on how people with lower (i.e., nontertiary) and higher (i.e., tertiary) education experience the transition into marriage, as opposed to cohabiting or breaking up, among partnered men and women who met their match online versus elsewhere. Based on the German Family Panel (*pairfam*) data, this research targets adults aged 18–48, a subpopulation most likely to be using the internet as a romantic marketplace. By providing a wealth of couple-level information, *pairfam* also allows for direct empirical tests of theoretical mechanisms, particularly the examination of how partner matching on family values (Press 2004), such as marriage attitudes and gender ideology, affects marital chances for couples who met online compared with those who met through conventional channels. Marriage-favorable attitudes and expectations at both the individual (Sassler and Schoen 1999) and the couple level (Waller and McLanahan 2005) represent a central correlate of eventual transitions to marriage. Gender ideology embodies a set of beliefs regarding men's and women's involvement in separate spheres of activity (Davis and Greenstein 2009). Traditional ideology imposes a gendered division of labor (e.g., men as breadwinners and women as caregivers), whereas egalitarian prescripts promote joint responsibilities for both genders. How (dis)similar romantic partners are in gender ideology matters not only for the actual division of unpaid work (Nitsche and Grunow 2016, 2018) but also for relationship progression; recent studies similarly using *pairfam* data have highlighted the effect of gender ideology on partnership stability (Hudde 2020) and the transition to parenthood (Hudde and Engelhardt 2020). I contend that if internet dating encourages more compatibility in family values (Finkel et al. 2012), especially for the well-off,

then individuals who met their partner online and who belong to a certain social background will marry faster than others.

Germany is a compelling context in which to study the consequences of digital dating on educational inequalities in marriage. Germany is not only a context with widely adopted online dating practices, based on tools such as dating platforms (Schulz et al. 2008) or (more recently) phone apps (Bitkom Research 2017; Suhr 2020), but it is also representative of Western countries stuck in a male breadwinner model (Bellani, Esping Andersen, and Pessin 2017; Blossfeld 2009). The internet and its promise of challenging gendered concepts of courtship (Hardey 2002) may have opened up partnering possibilities by allowing high-educated women to select partners willing to take a more nontraditional role in marriage. Furthermore, despite having an established system of stratified education, known for efficiently coordinating with the labor market (Dieckhoff 2008), Germany has also displayed a recent upturn in the unemployment (Klein 2015) and poverty gaps (Spannagel 2016) between the lower- and higher-educated. In light of these growing inequalities and the resulting decline in the economic mate value of the lower-educated (Zagel and Breen 2018), this study seeks to identify whether the previously observed negative marriage gap still holds and which German adults are more likely to marry in the digital age. Although the German context also requires considering cohabitation as a viable long-term union form (Hiekel et al. 2015), this analysis focuses mainly on marriage, given its greater cultural and institutional advantages (Lück and Ruckdeschel 2018).

The current research makes several important contributions. First, it is one of the few studies seeking to understand the demographic consequences of online dating, and it is the first to examine educational differences in the internet's effect on marriage formation. With digital dating becoming one of the main ways to find a partner (Rosenfeld and Thomas 2012; Rosenfeld et al. 2019), an increase in the partnering (dis)advantage of certain groups among online-formed couples could potentially redraw current inequalities in marriage.

Second, this study uses rich, multi-actor longitudinal data to model the complexity of union formation and to test for dyadic (i.e., respondent-partner) matching on family values. Although fully overcoming the limitations of previous work focusing on associations is unlikely, given that the data are still based on a nonrandom sample of observations, the current study accounts for multiple sources of selection bias by controlling for the observed heterogeneity of people dating online and by also addressing pre-partnering patterns.

Finally, this research offers an unprecedented empirical window into how digital modes of interaction change marriage formation. Macro-level studies examining the diffusion of stable broadband connections within households have concluded that the expansion of the internet increased the number of people getting married (Bellou 2014). This type of research, though, cannot determine whether new technologies are actual agents of change or are simply reflecting preexisting shifts in union formation. As Cesare et al. (2018) argued, understanding whether digital tools for dating have genuinely altered marital patterns requires a direct comparison between adults who used online dating and those who did not. This study hence relies on a micro-level, event-centered approach to identify the stratifying consequences of online dating on marital union formation.

## The Educational Marriage Gap

In the United States, less-educated individuals have lower chances of getting married as well as staying married (McClendon 2018; Parker and Stepler 2017). A positive educational gradient in marriage for both men and (more recently) women is also evident in Europe (Jalovaara 2012; Van Bavel et al. 2018), although its extent varies from country to country, depending on prevailing gender roles and levels of economic inequality (Kalmijn 2013). In Germany, Kalmijn (2013) found a positive gradient for the probability of being in a union among 40- to 49-year-old men born between 1953 and 1971. Among West German women born during approximately the same period, however, a high level of schooling was linked to a lower risk of transitioning to a first union (cohabitation or direct marriage) or of transitioning from cohabitation to marriage (Baizán et al. 2003). Mulder and colleagues (2006) also showed that in contrast to the United States, higher education is associated with a lower likelihood of first union formation for young women in Germany. Whereas some studies have asserted that this pattern merely reflects the delaying effect of educational expansion (Blossfeld and Jaenichen 1992), others have postulated an overall negative human capital effect on marriage propensity, both during and after schooling (Brüderl and Diekmann 1994).

As previously noted, we lack direct evidence regarding more recent patterns of partnering or marriage across educational groups in Germany. One can expect that rising levels of economic inequality (Lipps and Oesch 2018) over the last two decades, particularly among men (Zagel and Breen 2018), created conditions for a positive gradient in union formation. Given increased returns to education (Psacharopoulos and Patrinos 2018), one could also expect that for the growing numbers of young women investing in their education, the previously conventional option of choosing marriage over full-time employment (Drobnic et al. 1999) is no longer optimal. Research has confirmed that compared with the less-educated, better-educated German women are more often linked to lifelong singlehood (Bellani, Esping-Andersen, and Nedoluzhko 2017), childlessness, and nonfamily living arrangements (Sobotka 2011). In a context in which the male breadwinner model is still thriving (Bellani, Esping Andersen, and Pessin 2017), it may seem that economically independent women are gradually withdrawing from traditional marriage. Nevertheless, it is unclear whether this pattern reflects a decreasing centrality of marriage (Oppenheimer 1994) or scarce meeting and mating opportunities (Eckhard and Stauder 2019). If the latter is the case, then digital dating modalities and the large set of options they provide could significantly boost marriage opportunities for marriage-oriented university-educated German women.

## Social Structure and Foci of Interaction

The *theory of social structure* (Blau 1978; Blau et al. 1984) states that interpersonal choices, including those related to partners, are largely affected by the macro-social structure of the environment. Opportunities for contact determine not only the probability of finding a marital partner but also the degree of sorting—that is, how similar partners are on various social aspects (Blau and Schwartz 1997). The concept of *foci of activity* (Feld 1984; Marsden 1990) narrows structural influence to the specific

contexts where individuals routinely interact, such as the workplace, neighborhood, or family. Their different size and level of sociodemographic segregation mean that each setting provides a distinct set of possibilities for interaction and a specific pool of potential partners. Several studies have confirmed the relevance of where couples meet (Kalmijn and Flap 2001; McClendon 2018), including the role of meeting online (Potarca 2017; Rosenfeld 2017; Thomas 2020), for the timing of marriage formation and the mechanism of sorting.

Despite the particularities of different online dating contexts (e.g., see section A of the online appendix for a discussion), this study considers them as a single partnership market by virtue of them sharing structural features that uniquely distinguish them from all offline partner markets. In addition to reducing uncertainty by making partnering intentions explicit and unequivocal (Schmitz 2017), internet dating grants access to an unprecedentedly diverse pool of candidates and provides users with various screening tools to fine-tune their choices. In light of these features, one could argue that internet dating improves marital chances across all groups. Online, individuals of both lower and higher education find a variety and abundance of choices that would not otherwise be accessible. Without exploring patterns across people with different social backgrounds, previous work indeed found that U.S. heterosexual couples who met online experienced faster transitions to marriage (Rosenfeld 2017). Certain groups, however, might benefit from certain social contexts, including online dating spaces, more than others.

## Cultural Capital and Digital Skills

In Bourdieu's (1989, 1998, 2013) conceptualization of social space and symbolic goods, social structure is viewed as both external and internalized in the form of preferences. Bourdieu (2008), cited by Schmitz (2017), also showed that a wider structure of opportunity does not necessarily prompt an all-encompassing increase in marital prospects: before the internet age, an enlargement of the marriage market in 1960s rural France (as a result of modernized infrastructure and economy) led to more segregation rather than to an opening of marital choices. The theory of social space (Bourdieu 1989, 1998, 2013) states that social agents position and classify themselves in relation to other agents by level of cultural capital. Socialization processes and education ensure that individuals exhibit class-specific tastes, dispositions, and habits (i.e., embodied capital), own symbolic possessions (i.e., objectified capital), and have specific qualifications and skills (i.e., institutionalized capital). Social groups with greater cultural capital convert such assets into more or other types of capital to preserve dominance and exclude others from gaining high-status positions, hence reinforcing social inequality. Applying a Bourdieusian view on digital mating in Germany, and showing that social class reproduction strongly permeates people's online preferences and interactions, Schmitz (2017) already noted that internet dating benefits well-positioned groups more than others.

Generally more endowed with cultural capital and specifically more equipped in knowing how to engage with technology (Ollier-Malaterre et al. 2019), highly educated adults are likely more skilled at navigating and ultimately seizing what online partner markets have to offer. Compared with those who have less education, the

well-educated are better at self-presentation, can locate digital resources more efficiently, and are able to more easily sift through unwanted options (Ollier-Malaterre et al. 2019). In the online quest for a partner, digital skills and strategies of efficiency (Dröge and Voirol 2011) may result in better-matched unions, with a greater likelihood of advancing to marriage.

The greater internet-related acceleration in marriage formation for individuals with tertiary education relative to others might particularly apply to women. Facing limited marital prospects in offline spaces, high-educated women may more purposely engage with and benefit from internet dating than high-educated men. Online dating pools often include a surplus of men (Feliciano et al. 2009; Skopek et al. 2011), theoretically providing a demographic advantage to women across the board. Nevertheless, by means of greater economic resources, highly trained women have more bargaining power and could thus more easily uphold their preferences than the lower-educated (Meeussen et al. 2019). Because individuals with higher mate standards are more determined to find a compatible partner (Sprecher et al. 2019), high-educated women might thus make the best use of digital dating possibilities for more refined, marriage-promoting partnership choices.

## Online Matching on Marital and Gender Values

University-educated women may also access online partner markets to seek compatibility along non-economic lines, such as shared values or interests. In light of enhanced participation in the labor market and increases in financial independence, highly educated women are focusing less on the economic prospects of a partner and more on nonmaterial traits (Press 2004). The recent increase in the prevalence and stability of hypogamous unions (Grow et al. 2017; Schwartz and Han 2014), in which the female partner is better educated and often the primary breadwinner of the family (Klesment and Van Bavel 2017; Qian 2018; Van Bavel and Klesment 2017), is also believed to herald a shift in the qualities that women prefer in a partner (Bouchet-Valat and Dutreuilh 2015). Less reliant on men's economic resources or high social status, well-educated women may instead evaluate prospective mates in terms of potential contributions to domestic and family work, personality, physical attractiveness, or sociability (Press 2004; Zentner and Eagly 2015). Recent evidence confirmed that economically well-off women prefer family-oriented men who prioritize time with their family and take a nontraditional role in caring for children (Croft et al. 2020; Meeussen et al. 2019; Thomae and Houston 2016).

The realization of such preferences, however, is often contingent on a country's advancement toward gender equality (Zentner and Eagly 2015). In contexts of transitional gender ideology (Press 2004), where progress in achieving equality between men and women has stalled (England et al. 2020), university-educated women are often caught between modern and traditional scripts, encouraged to gain (some) income but still expected to do the lion's share of housework (Gui 2020). In Germany, where a conservative cultural and institutional context still sanctions a non-egalitarian division of labor, marriage remains a largely traditional affair (Bellani, Esping Andersen, and Pessin 2017; Müller and Dräger 2019). Even within highly



educated homogamous couples, partners still specialize, partaking in an unequal division of paid and unpaid work (Buschner et al. 2018). Given limited availability of eligible partners (Eckhard and Stauder 2019), high-educated women living in traditional contexts may still need to display traditional family values (Blossfeld 2009), whether genuinely self-endorsed or resulting from anticipating a future partner who is less likely to take on a caregiving role (Barg and Beblo 2012; Croft et al. 2020).

By providing ample matching possibilities and a less constraining dating space, where partnering choices could better align with people's genuine preferences and expectations (Geser 2007), internet dating may allow university-educated women to be more selective. With much greater opportunities to meet their demand, highly educated women who wish to marry yet equally share paid and family work could use internet dating options to find more gender-progressive men. Well-educated women actively searching for marital partners online would then hypothetically establish semitraditional arrangements in which partners match on traditional views regarding marriage (e.g., seen as an unbreakable bond, an institution central to family life) as well as progressive gender role attitudes. Highly trained women would thus reap the symbolic and status-enhancing rewards of marriage (Cherlin 2020) while also negotiating a more egalitarian gender ideology (and perhaps practices) within the household. Comparatively, in addition to being less (digitally) skilled at identifying and converting online opportunities into partnering success, lower-educated women who also hope for a shared division of labor but are less economically independent (i.e., less-attractive marriage partners) may face more difficulty meeting their demand and thus end up in less well-matched unions.

What follows, given the importance of compatibility and partners sharing partnership-oriented values for relationship development and the transition to marriage (Chi et al. 2020; Houts et al. 1996; Kelly and Conley 1987), is that the highly educated (particularly women) who use digital tools for dating are more likely to marry than the lower-educated. This pattern would also occur beyond the effect of sociodemographic homogamy. Past work showed that sorting on social background mattered more in the early phase of partnering, when individuals selected similar others to guarantee shared interests, whereas similarity in values was more important to the couple's progression to a more committed stage of their union (Kerckhoff and Davis 1962). Therefore, high-educated women in couples that formed online, with high values compatibility, are expected to progress much faster toward marriage than the lower-educated, irrespective of status compatibility (e.g., sharing the same educational level, or the same place of origin).

## Hypotheses

To summarize, I anticipate that highly educated adults who met their partner online will more often transition to marriage than the less-educated, particularly among women (Hypothesis 1). The online dating marriage advantage of the highly educated will hold beyond the effect of sociodemographic homogamy and will be partially explained by matching on traditional marriage values and egalitarian gender role beliefs (Hypothesis 2).

## Are Online and Offline Dating Spaces Mutually Exclusive?

The arguments presented earlier do not imply any overlap between conventional and online dating, but the lines between the two may not be that clear in real life. For example, couples who met offline may still use digital communication (e.g., social media, messaging apps, video calls) as a relationship maintenance tool (Bergdall et al. 2012). Nevertheless, even if offline daters unavoidably end up interacting digitally, what distinguishes them from online daters is how they select their partners. As previously stated, online contexts provide access to numerous potential encounters and possibilities of screening, which people potentially use to select more well-suited partners. Searching for a partner online could generate different matches than exclusively searching offline, with implications for further progression to marriage likely unaltered by any subsequent use of digital communication between already established partners.

## Selection Into Online Dating

Drawing causal inferences about the effect of online dating on marriage formation would ideally require an experimental design randomly assigning adults to different search strategies. In the absence of such random assignment, observational studies of differences in marital chances between offline and online daters might be subject to selection biases. In addition to specificities in sociodemographic profile (e.g., Hitsch et al. 2010)—including an overrepresentation of men (Schulz et al. 2008)—people adopting online mating strategies may have inherently different fixed or variable characteristics, which might in turn affect union formation. Several idiosyncratic factors may determine both the choice of dating strategy and marital success. First, the psychological profile of online daters could play a role. Although initial accounts depicted individuals using internet dating as stereotypically shy and socially anxious (McKenna et al. 2002; Whitty and Carr 2006), subsequent studies have found such technology users to score low on dating anxiety (Valkenburg and Peter 2007) and high on sociability (Kim et al. 2009), extraversion, or openness (Timmermans and De Caluwé 2017). Other studies found no connection between personality, self-esteem, and digital dating (Blackhart et al. 2014; Orosz et al. 2018), but scholars have acknowledged that the psychological profile of online partner seekers likely changes as new technologies emerge and thus should be accounted for (Whitty and Young 2016).

Second, research has shown that people use online meeting tools for different purposes, with motivations ranging from casual sex to committed long-term unions (Gudelunas 2012; Sumter et al. 2017). Individuals who attach greater value to long-term relationships (e.g., more marriage-oriented, ascribing more social value to romantic unions) may specifically choose internet dating to search more easily for marriage candidates. Pre-partnering differences in value orientation between online and offline daters—and not necessarily better matching occurring online—could then explain different speeds of progression toward marriage. To deal with these multiple sources of bias, I control for a comprehensive set of potentially confounding observed factors and also conduct a complementary set of analyses examining pre-partnering patterns.



## Data and Methods

### Data

I used the German Family Panel (*pairfam*), release 11.0 (Brüderl et al. 2020), a longitudinal survey data set containing detailed yearly information on individuals' socio-demographic profile, preferences, and values, as well as the context in which they met their partner (if in a union). The *pairfam* data contain information on the partnership trajectories of an initial sample of 12,402 randomly selected men and women who are nationally representative of cohorts born in 1971–1973, 1981–1983, and 1991–1993. *DemoDiff*, which consists of an oversample of 1,489 Eastern German respondents born in 1971–1973 and 1981–1983 (Kreyenfeld et al. 2012), was initiated in parallel with *pairfam*'s Wave II. *DemoDiff* was separately conducted for three waves until Wave V, when it was fully integrated into *pairfam*. In Wave XI, a refreshment sample was added, including approximately 5,000 respondents from birth cohorts 1981–1983 and 1991–1993 as well as a new, younger cohort (2001–2003); because the current analysis targets respondents with at least two measurement points (for whom change over time can be traced), none of the respondents in the refreshment sample was included in the sample. Response rates for *pairfam* were approximately 30% to 45% at each wave, which is common for large-scale surveys conducted in Germany (Brüderl et al. 2019). A detailed description of the study and its cohort-stratified random sample can be found in Huinink et al. (2011). The data ideally suit the objectives of this study: they record information on adulthood, a stage that not only is demographically dense in family formation events (Rindfuss 1991) but also entails a high degree of familiarity with the internet and its multiple social uses (Helsper and van Deursen 2015). In addition, the panel design of *pairfam* perfectly fits the aim of tracking partnering transitions across time.

To analyze competing transitions to marriage, long-term cohabitation, or union dissolution (the latter including the five partnerships that ended in partner's death) as opposed to remaining in a nonresidential union, I created a person-partnership file based on the 11 available waves (2008/2009–2018/2019). Participants were censored once they experienced one of the events of interest or, if no transition occurred, at the last interview. For the construction of the data set, I first discarded those who were continuously single while in the panel ( $n=5,260$ ). Certain respondents ( $n=157$ ) had more than one relationship spell with the same partner. Assuming that conditions leading up to marriage formation differed over time, I chose not to exclude the second transition. Needing to account for initial assortment in marital and gender values (i.e., similarity as close to the point of relationship onset as possible) rather than converged ideologies over time (Axinn and Barber 1997; Hakim 2003), I did not include respondents in ongoing marriages (who could have provided only post-marriage information on values) nor other retrospectively recorded relationships (e.g., in event-history calendars), for which information on meeting context was also missing. This led to the exclusion of 6,474 cases. I also removed nonheterosexual respondents ( $n=129$ ), those who contributed only one observation per partnership ( $n=2,708$ ), and partnerships that started when the respondent was younger than age 18 ( $n=624$ ). Finally, I excluded participants who had missing information on key variables ( $n=66$ ). To avoid having cases of zero survival time ( $n=116$ ) dismissed in the analysis, I added

a small unit (0.5) to the time variable, as is standard practice (Alexandersson 2015). As a result of all restrictions, I ran analyses on a sample of 3,561 partnered individuals, with 4,043 observations (i.e., partnership spells) and 1,240 recorded marriage formation events.

## Measures

The dependent variable is *survival time* from relationship entry until the occurrence of marriage, cohabitation, or breakup. The majority of respondents who transitioned to marriage experienced a spell of cohabitation before marrying. The number of couples who met online and transitioned straight into a marital union was, however, too small ( $n=14$ ) to warrant a differentiation between direct and indirect marriage. I censored time at the date of the last interview if no transition was observed—that is, if individuals remained in nonresidential partnerships. The variable was constructed on the basis of information on relationship duration, cohabitation duration, or marriage duration (in months).

To capture *meeting setting*, I used information on how respondents met their partners. The measure allows for a single answer from the following options: (1) school, training, work; (2) hobby, club, sports; (3) bar, night club; (4) friends or acquaintances; (5) relatives; (6) a personal ad; (7) the internet; (8) vacation; and (9) other. All nondigital settings are grouped under a single (0) offline category. Only in Wave IV did *pairfam* begin to distinguish between two online settings (meeting through an internet partner-finding service vs. meeting through online social networks, chat rooms, and so on); starting with Wave X, it further added the possibility of having met through dating apps. To maximize the data at hand, and in line with earlier theoretical arguments, I used a broad online category for all 11 waves.

The second key predictor is *educational level*, categorized as nontertiary education (ranging from no degree, completed the first and second stage of basic education, high school education, to completed postsecondary educational training meant to prepare for labor market entry and/or tertiary education) and tertiary education (a bachelor's degree and/or postgraduate studies). The first category is largely composed of respondents with secondary education; the number of individuals with primary education who met their partner online is too small to consider separately. Given that the analysis targeted couples in their last year of participation or during the year of experiencing a specific event, education was time-constant and fixed at the most recently observed level. Even though removing respondents younger than 18 was intended to minimize the amount of intra-individual changes in education, this decision additionally ensured, for instance, that respondents who entered a partnership while having only a secondary degree but who enrolled in and completed a higher education program during the course of the relationship were regarded as highly educated.

Based on respondents' and their partners' education, I then constructed a predictor of *educational homogamy*, singling out pairs in which the two partners had the same level of education. Furthermore, I used information on country of origin for both partners to compute an indicator of homogamy on origin (i.e., born in the same country). I also considered an indicator of homogamy based on mothers' country of origin (and analyses including this measure revealed identical results); given a greater amount of missingness in these data, however, the former was preferred. Information on religion and parental social background for both partners was unavailable in the data.

To measure partner-matching on family values and to minimize the risk of endogeneity and convergence in values over time, I used the first recorded measurement of both partners' value orientations, similar to Nitsche and Grunow (2016). Because family values were measured every other year starting with Wave I, I used couple information from Wave VII, for instance, if the relationship was first observed in Wave VI. When data on values were missing, to avoid trimming the sample even further (given that not all respondents gave consent to their partners' participation, and not all partners agreed to participate themselves), I instead used information from the nearest wave when family values were recorded.

To measure marriage value orientation, I first computed a scale of *traditional marriage orientation*, constructed by summing scores for the following items: "You should get married if you permanently live with your partner," "Marriage is a life-long union that should not be broken," and "Couples should marry at the latest after a child is born." These statements were measured on a 5-point scale ranging from (1) "disagree completely" to (5) "agree completely." Cronbach's alpha was .673 among respondents and .679 among partners. To capture attitudes toward women's labor market participation—specifically, toward the reconciliation between maternal employment and childcare—I used an item measuring agreement with the statement, "A child under 6 will suffer from having a working mother." Even though *pairfam* included an additional item requesting agreement on women's paid work ("Women should be more concerned about their family than about their career"), the former was preferred given its greater variation in responses.

Finally, to gauge attitudes regarding men's involvement in the domestic sphere, I relied on an item measuring agreement with the statement, "Men should participate in housework to the same extent as women." Comparable to Nitsche and Grunow (2016), I combined the answers provided by both partners for all three types of values and constructed four categories: (1) the male and the female partner share modern views on family, (2) both are traditionally oriented, (3) only the woman has modern attitudes (mismatch 1), and (4) only the man is progressively oriented (mismatch 2). Nevertheless, because couples in which the female partner endorses traditional views on family life and the male partner is more progressive were very few, I combined categories (2) and (4) to jointly refer to couples in which the female partner has conservative beliefs, irrespective of her partner's value orientation.

Given a high proportion of data missing for partners' family values (e.g., only 44.3% provided data on attitudes toward maternal employment), I investigated whether certain factors predicted the absence of such information. Results reported in Table B1 in the online appendix (section B) reveal that the lower-educated, those with a migration background, and respondents in more recently formed unions were more likely to have missing data on partners' values. For women only, those who met their match offline also seemed to be overrepresented. One implication of these patterns—particularly the overrepresentation of the lower-educated—for analyses assessing the role of value compatibility on the likelihood of marriage is that the magnitude of educational gaps may differ from those seen in the first set of analyses. To check whether main or interactive effects of meeting context and education change compared with results obtained for the full analytical sample, I reran the main model on this restricted sample, with fairly comparable results (see Table 3).

The analyses also included the following control measures: whether employed, migration background, residence in East Germany, and the age (linear and squared)

and year when the relationship began. The latter was recoded into two categories, distinguishing between couples formed before (1989–2011) and after 2012. The second category covers unions initiated online in the post-dating app period (e.g., Tinder was launched in 2012). Indicators of whether respondents were previously married or had children when they first got together were omitted given their high correlation with age at the relationship start. They were nevertheless included in descriptive analyses.

For additional analyses exploring the role of selection into online dating, I considered the inclusion of two other variables: the *social status value of a partnership*, captured via a question asking, “How strongly do you expect to experience an increased social status because of your partner?”, with answer categories from (1) “not at all” to (5) “absolutely”; and the five constructs of *personality* (neuroticism, extraversion, agreeableness, conscientiousness, and openness), measured on a validated 21-item version of the Big Five Inventory (Rammstedt and John 2005). For each item, respondents rated their agreement using a 5-point Likert-type scale ranging from (1) “absolutely incorrect” to (5) “absolutely correct.” Personality was measured three times throughout the panel (i.e., in Waves II, VI, and X). For respondents who remained in the panel long enough to be surveyed more than once, I considered only the first measurement.

## Methods

To assess educational gaps in how meeting online influences the transition to marriage, I relied on *Fine-Gray competing risks models* (Fine and Gray 1999), which focused on the subhazard of experiencing an event of interest (i.e., marriage) as a function of time spent in a relationship. More realistically than a Cox proportional hazard model, it also accounted for two possible alternative risks (i.e., cohabitation and dissolution). The subhazard of marriage was defined as follows:

$$\bar{h}_{\text{marriage}}(t) = \lim_{\Delta t \rightarrow 0} \left( \frac{\Pr(t \leq T < t + \Delta t, \text{event} = \text{marriage} | T > t \text{ or } (T \leq t \text{ and event} \neq \text{marriage}))}{\Delta t} \right). \quad (1)$$

$\bar{h}_{\text{marriage}}(t)$  is the instantaneous probability of marriage occurring at time  $t$ , provided that no event occurred before  $t$  (Cleves et al. 2011). The model for the subhazard of marriage then took the following form:

$$\bar{h}_{\text{marriage}}(t|x) = \bar{h}_{\text{marriage},0}(t) \exp(x\beta). \quad (2)$$

$\bar{h}_{\text{marriage},0}(t)$  represents a nonparametric estimation of the baseline subdistribution hazard for marriage, whereas  $\beta$ s are regression coefficients in log subhazard ratio form. The cumulative incidence function defining the incidence of marriage occurring while accounting for alternative risks was later calculated as follows:

$$CIF_{\text{marriage}}(t) = 1 - \exp \left\{ - \int_0^t \bar{h}_{\text{marriage}}(t) dt \right\}, \quad (3)$$

where  $\int_0^t \bar{h}_{\text{marriage}}(t) dt$  is the cumulative marriage-specific subhazard function. As

opposed to the Cox regression variant for dealing with competing risks, the Fine-Gray approach retains participants who experience an alternative partnership transition in the risk set. An additional advantage, relevant to this study's goal of assessing the effect of meeting online and education on the cumulative incidence function, is the more straightforward handling of covariate effects. Because some respondents reported several partnerships, I used robust standard errors to correct for the nonindependence of partnering episodes clustered within individuals. The analysis was fitted using Stata's *stcrreg* command.

## Results

Table 1 provides descriptive statistics by meeting setting. Of 4,043 observed partnerships formed between 1989 and 2018, 13.7% consisted of couples that met online. Additional explorations (not shown) revealed that in the last five years, one in five (i.e., 20.5%) unions began online. Table 1 furthermore shows that compared with individuals in couples formed offline, those who met their partner online were less often highly educated. For men with nontertiary education, homogamy was significantly more common for relationships initiated online than elsewhere. Highly educated men (but not women) were less homogamous and more likely to partner down on education online than offline (for more detailed information on educational pairings across meeting settings that also distinguishes respondents with primary, secondary, and tertiary education, see Table C1 in the online appendix, section C). Furthermore, men in couples that formed online were less likely to have a partner of the same origin (i.e., country of birth) but attached more social status value to their union than the ones in couples formed offline. For women, sociodemographic homogamy did not vary across meeting context. Furthermore, respondents who met their partner online were more frequently employed (especially men), older, and more often previously married and with children at the start of the relationship than those who met their partner offline. The two groups, however, did not differ in terms of personality.

Table 1 also indicates that among men, unions formed online were significantly more likely to include partners who share traditional marriage views. Additional cross-tabulations across gender and educational level (see Table C2 in the online appendix, section C) reveal that this was also the case among women but only among the highly educated. More specifically, Table C2 shows that whereas lower-educated women were less likely to match with their partner in terms of conservative marriage values if they met them online (13.3%) than offline (25.2%), compatibility regarding traditional marriage views for the highly educated was more likely to occur if they met online (29.3%) than offline (19.1%). Furthermore, among highly educated men and especially women, both partners holding progressive views regarding mothers' participation in paid work was more common among online-initiated couples. Among respondents with nontertiary education, however, couples were less frequently progressive and more often in unions where only the female partner held modern views on maternal employment. When it comes to values pertaining to men's involvement in the domestic sphere, particularly among lower-educated men and higher-educated women, there is a greater chance of both partners sharing modern values and a lower chance of mismatches among couples formed online than offline.

**Table 1** Sample descriptive statistics, by meeting context: *pairfam* Waves I–XI (2008–2019)

	Male Sample			Female Sample		
	Offline	Online	Sig.	Offline	Online	Sig.
Type of Transition (%)						
No transition	16.6	11.5		15.5	13.6	
Marriage	31.4	35.8		29.7	28.2	
Cohabitation	34.1	36.6		38.5	45.0	
Breakup	17.9	16.0		16.3	13.3	
Respondent's Education (%)						
Tertiary	42.9	38.3		42.8	37.2	†
Educational Homogamy (%)						
Nontertiary × homogamy	63.7	73.3	*	62.0	63.4	
Tertiary × homogamy	56.4	50.5		58.7	60.0	
Origin Homogamy (%)	91.0	86.4	*	88.6	88.6	
Marriage Values' Match (%)			**			
Both modern	55.4	45.2		60.2	59.4	
Both or only the woman traditional	28.4	43.3		22.4	20.3	
Only the woman modern	16.2	11.5		17.4	20.3	
Gender Values' Match: Women's Paid Work (%)						
Both modern	26.5	24.8		28.7	31.8	
Both or only the woman traditional	45.5	49.5		46.4	41.7	
Only the woman modern	28.0	25.7		24.9	26.5	
Gender Values' Match: Men's Domestic Work (%)						
Both modern	71.3	77.1		70.7	75.2	
Both or only the woman traditional	14.1	10.5		12.0	9.8	
Only she modern	14.6	12.4		17.3	15.0	
Employed (%)	77.5	83.1	*	63.8	64.7	
Migration Background (%)	15.8	12.3		16.7	14.9	
Previously Married (%)	6.6	12.3	**	12.5	23.6	***
Children at $t_1$ (%)	9.1	14.8	**	22.9	32.0	***
Living in Eastern Germany (%)	28.6	29.6		30.2	31.4	
Year at $t_1$ : After 2012 (%)	29.2	46.1	***	31.7	43.0	***
Partnership Duration at Marriage:						
Range 0.5–283 (mean)	71.97 (45.95)	39.68 (26.60)	***	74.96 (46.57)	47.33 (29.75)	***
Age at $t_1$ : Range 18–46 (mean)	25.69 (6.34)	28.61 (7.31)	***	25.51 (6.76)	29.09 (7.35)	***
Neuroticism: Range 1–5 (mean)	2.52 (0.74)	2.39 (0.76)		2.92 (0.83)	3.01 (0.82)	
Extraversion: Range 1–5 (mean)	3.50 (0.79)	3.42 (0.78)		3.65 (0.79)	3.67 (0.77)	
Agreeableness: Range 1–5 (mean)	3.20 (0.68)	3.22 (0.55)		3.26 (0.75)	3.20 (0.71)	
Conscientiousness: Range 1.5–5 (mean)	3.75 (0.64)	3.73 (0.58)		3.92 (0.61)	3.82 (0.67)	
Openness: Range 1.4–5 (mean)	3.62 (0.69)	3.56 (0.61)		3.66 (0.73)	3.74 (0.72)	
Social Status Value of Union: Range 1–5 (mean)	2.07 (1.03)	2.26 (1.06)	**	1.87 (0.97)	1.86 (0.98)	



Table 1 (continued)

	Male Sample			Female Sample		
	Offline	Online	Sig.	Offline	Online	Sig.
Number of Observations	1,675	243		1,816	309	
Number of Individuals	1,512	236		1,610	293	

Notes:  $t_1$  = the first year of partnership. Standard deviations are shown in parentheses.

<sup>†</sup> $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

Fine-Gray Competing Risks Models

I now present the results of a competing-risks analysis predicting transitions into marriage (subhazards reported in Table 2). Figure 1 also provides men’s and women’s predicted cumulative incidence curves of entry into marriage based on this estimation, across educational group and by meeting setting. For the graph, I restricted the relationship duration to 180 months because the occurrence of events among couples who met online rarely extended beyond this window. As previously noted, the model treats transitioning into a cohabiting union and dissolving the partnership as alternative risks to marrying. Results in connection to events other than marriage are secondary to this study, and I therefore do not expand on them. Nevertheless, results in Table 2 show that meeting context and education were not associated with the transition to cohabitation for either gender and that high-educated women had a marginally significant lower risk of union dissolution if they met their partner online versus offline.

Focusing on the event of interest, Figure 1 first indicates that for men who met their partner offline, there was no pronounced gap between those with tertiary and nontertiary education. Among women who found their partner offline, however, there was a significant educational gap, with the lower-educated more likely to transition into marriage than the higher-educated. The graph then shows that meeting online was associated with greater chances of marrying for men, irrespective of education; for women, the highly educated who met their partner online were significantly more prone to transition to marriage than the less-educated. Because of small differences in the incidence of marriage across meeting context for those with nontertiary education, the reversal of the original pattern was due to the significant increase experienced by women with tertiary education.

The estimates reported in Table 2 provide a more precise indication of the magnitude of this increase. Given that the models include both main and interactive effects of education and meeting context, the subhazard for meeting online, for instance, represents the estimated effect for the reference category of education (i.e., tertiary education). Therefore, the subhazard ratio of 1.859 shows that with time and multiple sociodemographic covariates controlled for and with competing events also allowed to occur, the marriage subhazard for highly educated women who met their partner online was 85.9% of that for highly educated women who met their partner offline. The estimated effect of meeting online for women with nontertiary educa-

**Table 2** Subhazard ratios from Fine-Gray competing risks models of (1) marriage, (2) cohabitation, and (3) breakup: *pairfam* Waves I–XI (2008–2019)

	Male Sample			Female Sample		
	Marriage	Cohabitation	Breakup	Marriage	Cohabitation	Breakup
Meeting Online	1.553* (0.278)	0.949 (0.187)	0.660 (0.222)	1.859*** (0.290)	0.971 (0.168)	0.604† (0.174)
Nontertiary	1.065 (0.087)	0.904 (0.090)	0.978 (0.117)	1.216* (0.095)	0.845 (0.091)	0.862 (0.102)
Meeting Online × Nontertiary	1.011 (0.248)	0.718 (0.198)	1.526 (0.598)	0.617* (0.141)	1.103 (0.258)	1.548 (0.544)
Employed	1.943*** (0.263)	1.228 (0.170)	0.653*** (0.081)	0.975 (0.076)	1.568*** (0.160)	0.849 (0.095)
Migration Background	1.422*** (0.152)	0.484*** (0.079)	1.125 (0.163)	1.153 (0.120)	0.750* (0.105)	1.063 (0.151)
Living in Eastern Germany	0.798** (0.067)	1.163 (0.120)	0.959 (0.133)	0.927 (0.071)	1.323** (0.126)	0.907 (0.113)
Year at $t_1$ After 2012	0.686** (0.095)	1.154 (0.112)	0.763* (0.097)	0.810 (0.113)	1.137 (0.110)	0.656** (0.086)
Age at $t_1$	1.412*** (0.083)	1.087 (0.064)	0.628*** (0.040)	1.496*** (0.090)	1.012 (0.049)	0.687*** (0.042)
Age at $t_1$ , Squared	0.995*** (0.001)	0.998 (0.001)	1.007*** (0.001)	0.993*** (0.001)	1.000 (0.001)	1.006*** (0.001)
Partnership Duration	1.062*** (0.006)	0.835*** (0.022)	1.057*** (0.016)	1.066*** (0.005)	0.727*** (0.023)	1.088*** (0.019)
Partnership Duration, Squared	0.9995*** (0.000)	1.002*** (0.001)	0.999*** (0.000)	0.9996*** (0.000)	1.005*** (0.001)	0.998*** (0.000)
Partnership Duration, Cubed	1.000001*** (0.000)	0.999999* (0.000)	1.000003*** (0.000)	1.000001*** (0.000)	0.999997*** (0.000)	1.000004*** (0.000)
Log-Pseudo- Likelihood	−4,100.8	−4,298.6	−2,354.2	−4,267.3	−5,337.2	−2,402.8
Wald $\chi^2$ ( <i>df</i> )	502 (12)	525 (12)	172 (12)	478 (12)	611 (12)	87 (12)
Prob > $\chi^2$	0.000	0.000	0.000	0.000	0.000	0.000
Number of Observations		1,918			2,125	
Number of Events	613	660	339	627	838	337
Number of Competing Events	999	952	1,273	1,175	964	1,465
Number of Censored Cases		306			323	
Number of Individuals		1,697			1,855	

Notes: Robust standard errors are shown in parentheses.  $t_1$  = the first year of partnership.

† $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

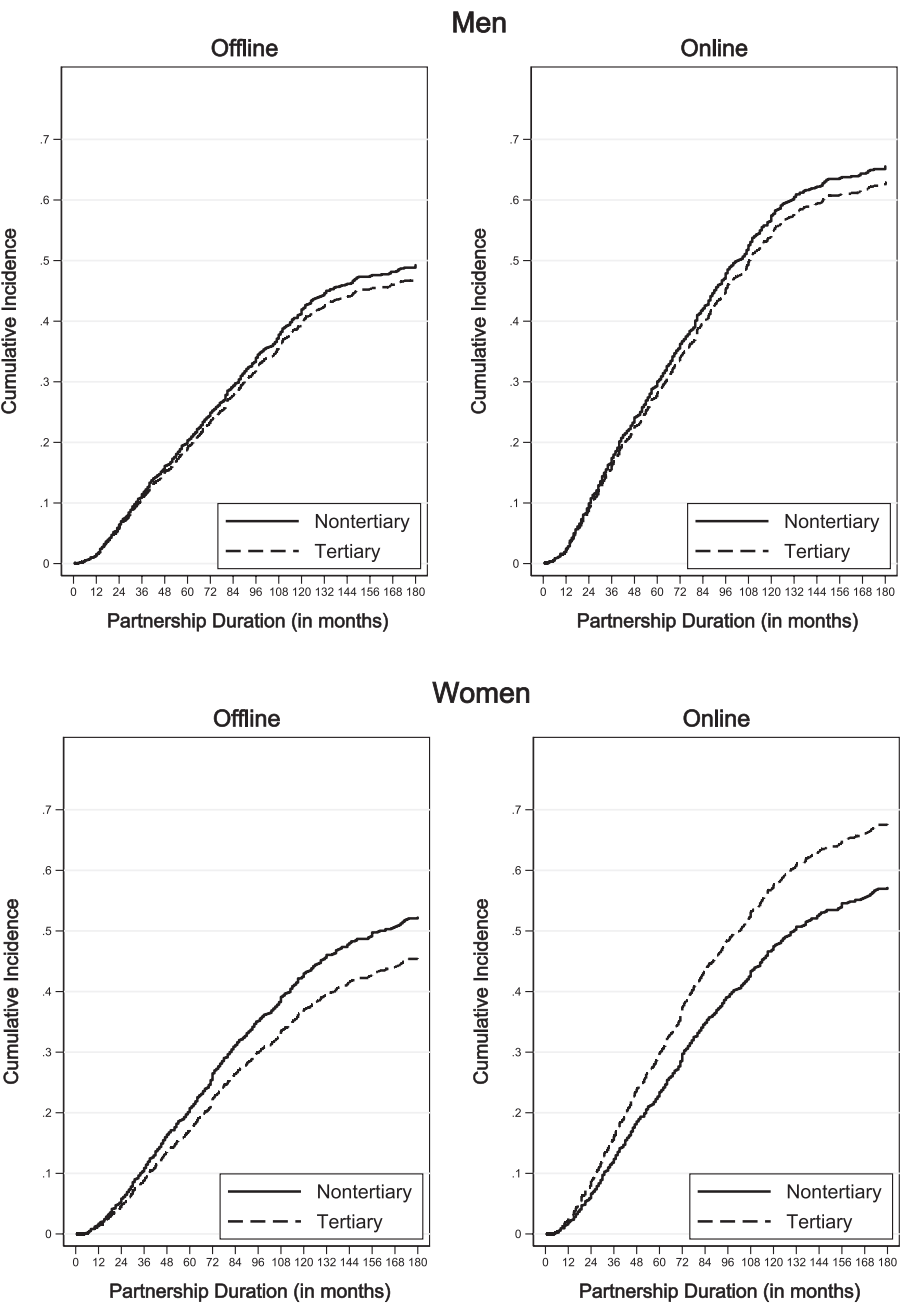


Fig. 1 Men’s and women’s predicted cumulative incidence of marriage, by meeting context and educational level. The figure is based on estimates reported in Table 2.

tion is given by  $1.859 \times 0.617 = 1.147$ . This means that for those with less education, meeting their partner through the internet was associated with a significantly smaller increase (14.7%) in the incidence of marriage. These results confirm Hypothesis 1, which predicted that especially for women, using digital tools for mate selection positions the highly educated at a marriage advantage compared with the lower-educated.

Furthermore, the mechanism suggested as triggering improvement in the marital chances of highly educated women using internet dating to find partners was the better matching on traditional marriage attitudes and progressive views on gender. Table 3 presents models testing whether value compatibility mediated the association between meeting online and the transition to marriage.

As noted earlier, given a significant reduction in sample size when including measures of partners' ideological pairings, I reran the analyses on this restricted sample (Model 1). The results are fairly similar to those previously presented, with a few exceptions observed among women.<sup>1</sup> Regarding the model-building strategy, Model 2 adds measures of educational and origin homogamy; Model 3 includes the effect of matching on marriage value orientation; and Models 4 and 5 add the effect of matching on gender values in terms of mothers' paid work and men's domestic involvement, respectively.

To assess their individual mediating contribution, I estimated the two measures of gender value matching in separate models. Furthermore, to align with theoretical arguments, I used a different baseline category for the two types of family value ideology, such that results present the effect of couples sharing traditional (vs. modern) marriage values and the effect of couples sharing modern (vs. traditional) gender values alongside the effect of couples in which only the female partner held progressive family values. Given that educational differences in women's online dating advantage were driven by the large increase in the incidence of marriage among the highly educated (with little variation in the marital chances of the lower-educated across meeting context), I mainly inspected changes in the subhazard of meeting online (i.e., the effect corresponding to university-educated women). Nevertheless, to visualize how the addition of each covariate influences the online educational gradient in marrying, Figures D1 (for men) and D2 (for women) in the online appendix (section D) present the predicted cumulative incidence of marriage by education and meeting context from these models.

As expected, results show that sociodemographic homogamy did not have a significant effect in itself, nor did its inclusion substantively alter the association between meeting online and entry into marriage. Adding a measure of matching on marriage values in Model 3, however, reduced the effect of meeting online for both highly educated men (from 58% in Model 2 to 42.1%) and women (from 54.7% to 48%). For the former, the effect of meeting online was also no longer statistically significant. For the latter, accounting for how couples pair up in terms of marriage attitudes slightly diminished the offline advantage of women with nontertiary education (from 26.5% to 22.4%). Results in connection to Model 3 furthermore reveal that for women, cou-

<sup>1</sup> The main effect of meeting online decreased in size but remained significant. The interactive term "meeting online  $\times$  nontertiary" lost statistical significance—potentially because the lower-educated were more likely to have missing information on partners' values—but retained its size.

Table 3 Subhazard ratios from Fine-Gray competing risks models of marriage (cohabitation and breakup as alternate risks), *pairfam* Waves I–XI (2008–2019)

	Male Sample					Female Sample				
	Model 1 (restricted sample 1)	Model 2	Model 3	Model 4	Model 5	Model 1 (restricted sample 1)	Model 2	Model 3	Model 4	Model 5
Meeting Online	1.610* (0.336)	1.580* (0.327)	1.421 (0.310)	1.457* (0.319)	1.429 (0.310)	1.510* (0.287)	1.547* (0.296)	1.480* (0.292)	1.460* (0.287)	1.475* (0.293)
Nontertiary	1.133 (0.113)	1.122 (0.114)	1.102 (0.113)	1.128 (0.119)	1.108 (0.113)	1.265* (0.124)	1.265* (0.124)	1.224* (0.119)	1.277* (0.129)	1.231* (0.123)
Meeting Online×Nontertiary	0.986 (0.314)	1.006 (0.320)	1.134 (0.365)	1.105 (0.355)	1.095 (0.357)	0.679 (0.212)	0.679 (0.209)	0.719 (0.230)	0.746 (0.241)	0.731 (0.233)
Educational Homogamy		1.070 (0.106)	1.070 (0.105)	1.072 (0.107)	1.061 (0.104)		1.122 (0.112)	1.155 (0.117)	1.141 (0.115)	1.156 (0.116)
Country Origin Homogamy		0.775 (0.177)	0.775 (0.189)	0.774 (0.189)	0.791 (0.196)		1.174 (0.281)	1.241 (0.310)	1.229 (0.306)	1.224 (0.298)
Marriage Values' Match (ref.=both modern)										
Both traditional			1.421** (0.156)	1.461*** (0.166)	1.431*** (0.154)			1.556*** (0.185)	1.627*** (0.195)	1.549*** (0.184)
Only the woman modern			1.196 (0.174)	1.230 (0.177)	1.201 (0.174)			1.558*** (0.194)	1.608*** (0.200)	1.591*** (0.195)
Gender Values' Match: Women's Paid Work (ref.=both traditional)										
Both modern										
Only the woman modern				1.223* (0.143)					1.277* (0.146)	
				1.003 (0.123)					1.072 (0.133)	

Table 3 (continued)

	Male Sample					Female Sample				
	Model 1 (restricted sample 1)	Model 2	Model 3	Model 4	Model 5	Model 1 (restricted sample 1)	Model 2	Model 3	Model 4	Model 5
Gender Values' Match: Men's Domestic Work (ref. = both traditional)										
Both modern					0.913 (0.110)					0.844 (0.123)
Only the woman modern					0.728† (0.132)					0.695* (0.126)
Log-Pseudo-Likelihood	-2,484.4	-2,483.4	-2,478.8	-2,477.3	-2,477.2	-2,369.5	-2,368.7	-2,360.2	-2,358.3	-2,358.4
Wald $\chi^2$ (df)	292 (12)	293 (14)	308 (16)	306 (18)	332 (18)	231 (12)	234 (14)	255 (16)	260 (18)	257 (18)
Prob > $\chi^2$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of Individuals	866	866	866	866	866	830	830	830	830	830
Number of Observations	910	910	910	910	910	871	871	871	871	871
Number of Events	415	415	415	415	415	396	396	396	396	396
Number of Competing Events	417	417	417	417	417	410	410	410	410	410
N (censored)	78	78	78	78	78	65	65	65	65	65

Note: Robust standard errors are shown in parentheses.

† $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$



ples in which the man had conservative marriage values, irrespective of woman's ideology, had a higher chance of marrying than couples in which both partners were more modern. For men, it was mainly couples where both partners had traditional marriage values that were significantly more prone to marriage.

Results from Model 4 furthermore indicate that in the case of women, when partners' relative ideology regarding maternal employment was controlled for, the marriage subhazard for the highly educated decreased two additional percentage points. Although adding a measure of compatibility in marriage value orientation prompted a greater decrease in the effect size of meeting context, it was accounting for matching on both marriage attitudes and gender ideology that rendered the effect statistically insignificant (at the  $p < 0.05$  level). Results also reveal that female respondents whose partners shared modern views on women's paid work were significantly more likely to marry compared with women in more traditional couples. For men, this effect was smaller in both size and significance, and its inclusion did not reduce but rather slightly increased the effect of meeting online.

Finally, results from Model 5 show that when accounting for value matching in terms of men's involvement in domestic tasks, the association between meeting context and risk of marriage decreased again for women, albeit to a lesser extent than in Model 4. Figure D2 (online appendix) also visually indicates that the inclusion of within-couple gender ideology concerning maternal employment had a greater offsetting effect on the educational gradient of women who met their partner online than the inclusion of value matching concerning men's participation in domestic tasks. The results in Table 3 also reveal that women in couples in which only they had progressive views on men's contribution to family work (but not women in couples in which both partners held modern views) were significantly less likely to marry than women in more traditional couples. For men, the effect of this mediator was more modest, and its inclusion did not diminish the effect of meeting online. The results therefore largely confirm Hypothesis 2, which suggested that especially for women, partners' combined ideology in terms of both marriage value orientation and gender roles partially explains the online dating marriage advantage of the highly educated compared with the lower-educated.

## Supplementary Analyses

First, to account for the potential selectivity of respondents who met their partner online, I estimated models with additional covariates that had the potential to shape both the context of partner selection and the probability of marriage, such as personality traits or the social status value of a partnership. Given a large amount of non-overlapping missing values, which would have excessively trimmed the subsample of respondents who met their partner online, I opted for models testing the effect of each set of covariates separately (Table E1, online appendix, section E). Because of a significant reduction in sample size when adding personality measures, I first replicated Model 1 on the subset of respondents who provided information on these items. The results for men show that the coefficient for meeting online was still substantial but statistically significant at the  $p < .10$  level only. For women, meeting online was still strongly and significantly associated with the subhazard of marriage. For both

groups, the inclusion of personality factors slightly reduced the effect of meeting context but did not entirely offset its effect. Furthermore, these analyses indicated the robustness of previous results to including a measure of social value ascribed to romantic unions. Less-educated women whose relationships formed in nondigital settings still had a higher probability of marriage, and men (irrespective of education) and high-educated women whose relationships started online had increased odds of marriage.

Second, to see whether highly educated women using online dating were not just more prone to convert their union into marriage but also had greater chances of finding a partner to begin with, I focused on the pre-partnering stage and investigated entry into a romantic partnership among singles searching for a partner online versus those searching only elsewhere in a discrete-time survival analysis (Allison 2014). Beginning with Wave III, *pairfam* asks single respondents whether they use the internet to find a partner if they responded to a prior question assessing if they would like to have a partner, using a 5-point scale ranging from (1) “not at all” to (5) “absolutely.” If respondents selected the middle value (3) or higher, then the follow-up question on whether they use the internet to find a partner was addressed. The advantage of this filtering design is that the resulting sample includes only those individuals who are seeking a relationship, minimizing the possibility that online daters have selectively stronger (or weaker) partnering intentions than offline daters. It also helps disentangle two mechanisms that potentially lead to less partnering: namely, the choice of staying single or difficulty finding a suitable partner. The observational window ranges from the start of singlehood (since the dissolution of the previous partnership, if any) or age 18 (if no previous relationships were recorded) until the year of entering a union, with right-censoring occurring if the event of interest was not experienced until their last year of panel participation.

Additional information about measures and method is provided in section F of the online appendix. The results of this analysis (reported in Figure F1, which plots predicted probabilities of starting a partnership across gender, education, and search context) reveal that the use of the internet led to a negative shift in the partnering chances of all groups but less so for highly educated women. This finding aligns with previous work showing that using digital tools for dating was not necessarily linked to more partnerships (Rosenfeld 2018). It is possible that online, too much choice and diversity of options overwhelms (Schwartz 2005), slowing the process of selecting and investing in a single connection. Male daters experienced greater delays in partnership formation than female daters, confirming that men take more time to search and perhaps engage in more casual encounters when presented with a multitude of options (Yu and Kuo 2016).

Among men, the data also expose a positive educational gradient irrespective of search context. Among women, when only seeking a partner offline, the highly trained were less successful than those with lower education; in digital markets, however, they displayed substantially greater partnering chances, and a positive educational gradient emerged. Additional analyses, including fixed-effects models (not shown), dismiss concerns regarding (un)observed heterogeneity, either fixed or time-varying, affecting the relation between online search strategy and partnering events across education and gender. In short, results reveal that seeking a partner in the virtual world perpetuated partnering inequality (Schmitz 2017) among men while reverting

the educational hierarchy among women. Within the group of singles using online dating, high-educated women experienced the highest chance of finding a mate. This, alongside previous results, confirms that well-educated women are the most skilled at tapping into the abundant and diverse pool of candidates provided online to partner and ultimately marry.

Finally, in additional analyses based on the same sample of single respondents, I sought to establish whether highly trained women with a more liberal mindset regarding gender roles were selectively drawn to online dating. Results reported in Table F1 in the online appendix indicate that as expected given educational differences in family values (Kulik 2016; Myers and Booth 2002), lower-educated men and women were generally more traditionally oriented in terms of marriage values and less progressive with regard to the distribution of gender roles. Online, despite an overrepresentation of highly educated women with traditional marriage views, there was no oversupply of highly educated women with progressive gender values. Moreover, there seemed to be a small increase in lower-educated women valuing men's involvement in domestic tasks among those searching for partners online. Therefore, the greater probability of university-educated women being part of couples with progressive views on gender roles if the union started online than offline is more likely a consequence of the matching mechanisms occurring online than a result of selectivity on values.

## Discussion

With the widespread use and acceptance of online instruments for connecting with potential partners (Smith 2016), investigating partner matching and marital union formation in today's digital era is highly warranted. Identifying the impact that the internet has had on marriage is also an important step in providing scientific evidence that responds to growing concerns regarding the general impact of new technologies on social life (Chesley 2005, 2006). Within demographic research on family formation and inequality in particular, we lack investigations into how online dating tools are shaping current educational gradients in marriage (Carbone and Cahn 2014; Kalmijn 2013). To fill this knowledge gap, I investigated entry into marriage among couples who met online compared with those who met offline via Fine-Gray competing risks models of time until marriage (vs. cohabitation or breakup). To probe whether the internet's effects on marital prospects across education is related to better matching in terms of marriage values and gender role attitudes, over and above sociodemographic similarity, I also assessed partners' ideological pairings as a key explanatory mechanism in a direct empirical test. Finally, the analyses addressed concerns of selection into online dating either by accounting for a broad set of potentially confounding observed factors or by examining pre-partnering patterns in additional analyses.

Based on up-to-date panel data providing distinctively rich multi-actor information on the partnering choices of German adults over time, the investigations first found that in contrast with the positive marriage gap currently observed in most Western countries (Van Bavel et al. 2018), but in line with earlier findings (Mulder et al. 2006), university-educated German women who met their partner in traditional ways were less prone to marry than those with nontertiary education. For men, the differ-

ence between the lower- and higher-educated was minimal irrespective of where they met their partner. Furthermore, men of both tertiary and nontertiary education had significantly higher chances of marrying if their union started online than offline. Both lower- and higher-educated men displaying greater partner resemblance on traditional marriage values if their relationship started online versus offline (Table C2, online appendix) may explain why online dating uniformly increased marital chances among men. For women in couples who met online, the gradient was inverted. Potentially more digitally skilled at making better choices when faced with a multitude of diverse options (Ollier-Malaterre et al. 2019), highly educated women who met their match online were significantly more prone to transition into a more committed (i.e., marital) union than lower-educated women.

Accounting for partners' matching on family values partly offset the marital advantage of university-educated German women who met their partner online. Whereas status compatibility in terms of education or place of origin played a minimal role (Kerckhoff and Davis 1962), matching in terms of marriage and gender role beliefs mattered in partially explaining the higher chance of marrying among highly educated women. First, findings speak of the pivotal role that marriage still plays in Germany (Klärner and Knabe 2017) and among university-educated women in general (Cherlin 2020). Second, in view of supplementary results indicating that highly educated women with traditional marriage attitudes self-select into digital partner search (Table F1, online appendix), internet dating seems to be positioned as a long-term dating context (Li et al. 2013), selectively appealing to individuals with a stronger focus on lifelong unions and intimacy goals (Sanderson et al. 2007). Rather than being a space where people make decisions based only on impulse or market-like rationalizations, digital partner markets—particularly dating websites—may in fact be hyperromanticized spaces where traditional ideals of long-lasting love still dominate (Bergström 2011; Dröge and Voirol 2011) but where conservative gender views can simultaneously be challenged. As expected, online dating as an unrestricted space for mate selection incentivized the highly educated—particularly women with an egalitarian vision of doing family—to select partners with a similar mindset (Press 2004).

Nevertheless, the finding that couples' alignment on modern views regarding maternal employment impacted progress toward marriage yet matching on progressive attitudes regarding men's contribution to household chores carried less weight (and even hindered entry into marriage, although the effect was nonsignificant) suggests that for marriage to ensue, people cannot exceedingly depart from what is socially ascribed as family. Despite the slight overrepresentation of lower-educated women who believed in the equal sharing of domestic work among those using digital tools for dating (Table F1 in the online appendix), pre-partnering preferences did not translate into a particularly greater number of value-compatible unions. Given the possibility that initial partner preferences and attitudes change based on the structural accessibility of partners who share compatible features—that is, the ease of match (Houts et al. 1996)—future research should identify potential adaptations in partner preferences occurring throughout the whole selection process.

In line with earlier evidence indicating that similarity in gender role attitudes is more consequential for women's relationship outcomes (Ogolsky et al. 2014), the results presented here additionally show that matching on gender values had a weaker

mediating effect on men's subhazard of marriage and that accounting for it (as opposed to accounting for matching on marriage values) did not play a role in offsetting men's overall online dating marriage advantage. Furthermore, the data reveal that men—and not women—with tertiary education crossed educational boundaries more frequently in digital than nondigital settings (Table C1, online appendix) and, in so doing, perpetuated stereotypically gendered pairings of higher-educated men dating lower-educated women, as seen in previous studies (e.g., Skopek et al. 2011). Rather than signal an increase in openness, heightened online educational exogamy found in previous studies (Thomas 2020) may in fact hide a return to traditional pairings among certain highly educated men. Table C2 also reveals that compared with those who met their partner offline, high-educated men who met their match online were less likely to be part of couples with liberal views on men's contribution to family work, especially when these men partnered down (as revealed in additional analyses, not shown).

Whether one could generalize these findings to other national contexts is an open question. On the one hand, in more egalitarian contexts, with a generally greater supply of egalitarian men, online dating is less likely to establish itself as a singular space where high-earning women go in search of men who are willing to marry *and* share household labor. In these contexts, we may therefore observe fewer differences between online and offline matching patterns. On the other hand, in countries such as the United States, with a widening positive educational marriage gap (Parker and Stepler 2017) and growing economic class divides (Schneider and Hastings 2017), digital dating technologies may assist high-status individuals in selecting similarly educated partners more efficiently, exacerbating rather than inverting current educational gradients. The range of dating websites operating in each country may play an additional role, with platforms exclusively aimed at professionals or academics (e.g., EliteSingles in the United States) potentially accelerating the marital success of the highly educated. Finally, in contexts where marriage is less normatively and institutionally endorsed, attachment to marriage as the ultimate family form may be lower. Nevertheless, virtual spaces of partner selection might still emerge as the last outpost for people in search of marriage.

Other directions of inquiry could also be explored. It is worth investigating whether internet dating shifts the timing and occurrence of union formation for members of sexual minorities, who have been shown to benefit more from online matching (Rosenfeld and Thomas 2012), but for whom the sample was too small to be examined in this analysis. Moreover, the role of online dating matching on other characteristics (e.g., economic resources, religion, personality, leisure interests, good looks, or sociability) should also be scrutinized. To further test whether internet dating facilitates relationships with greater between-partner compatibility, the actual distribution of domestic tasks within online-initiated couples will be examined in a follow-up study. Furthermore, the current study did not presume to grasp the complexities of constantly evolving options of meeting online (Ellison and Boyd 2013) and the relationships formed within their bounds. Future waves of the data used in this analysis nevertheless promise to enable a more detailed look at specific modes of online social interaction. Finally, even though the analysis accounted for an extended set of potentially confounding factors, the association between education and marriage may still be subject to undetected differences and thus of a noncausal nature.

Despite its limitations, this research confirms that internet dating fosters an uneven distribution of opportunities for partnering and marriage (Schmitz 2017), reaffirming the importance of social contexts of meeting and mating (Blau 1978; Blau and Schwartz 1997; Kalmijn and Flap 2001)—particularly the continuously expanding digital environment—for the social demography of union formation. ■

**Acknowledgments** This article benefited from the support of an Ambizione grant from the Swiss National Science Foundation (grant number: PZ00P1\_174197). This research was also supported by the Swiss National Centre of Competence in Research LIVES – Overcoming Vulnerability: Life Course Perspectives, financed by the Swiss National Science Foundation (grant number: 51NF40-160590). Earlier versions of this article were presented at the annual meeting of the American Sociological Association (New York, August 2019), the European Population Conference (Brussels, June 2018), and the ISA RC06-41 Conference (Singapore, May 2018). This paper uses data from the German Family Panel *pairfam*, coordinated by Josef Brüderl, Sonja Drobnič, Karsten Hank, Franz Neyer, and Sabine Walper. *pairfam* is funded as a long-term project by the German Research Foundation (DFG). The author acknowledges support from Josef Brüderl, Nina Schumann, Rüdiger Lenke, and the entire *pairfam* team. This paper has grown thanks to everyone who provided feedback at various stages of writing, including anonymous reviewers, Clémentine Rossier, Michael Rosenfeld, Wilfred Uunk, and Josh Vidich. My deepest gratitude goes to Dorian Kessler for his generosity, constant encouragement, and always excellent advice.

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