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Research Article

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Abstract

BACKGROUND
Lifelong singlehood is a comparatively rare demographic phenomenon, averaging about 5% across the European Union. However, levels of lifelong singlehood vary greatly between countries in Europe. What explains this variation? Our main thesis is that it reflects the prevailing norms regarding gender roles. We hypothesize that in societies that have not adapted to women's new roles there will be a greater propensity toward lifelong singlehood, especially among highly educated women.

OBJECTIVE
We analyze the link between levels of gender egalitarianism and the probability of lifelong singlehood, both overall and by educational attainment.

METHODS
We apply multilevel modeling to European Social Survey (ESS) and European Values Study (EVS) data collected between 2002 and 2014. We focus on differences in nonpartnering across levels of education. We run separate models for men and women.

RESULTS
In support of our hypothesis, our analysis reveals an inverse U-shaped relationship between levels of gender equity and the likelihood of lifelong singlehood for women. The association is particularly marked for more highly educated women, while it is linear for low-educated men.

CONCLUSIONS
Our results suggest that high levels of singlehood are concentrated very much within those societies where traditional gender values have waned but gender egalitarianism remains poorly diffused. Where gender egalitarianism has become normatively

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dominant, we find higher levels of partnering for better-educated women and for low-educated men.

CONTRIBUTION

Our study contributes to the limited research on singlehood as well as to the growing body of literature on the demographic consequences of the ongoing revolution in women's roles.

1. Introduction

Single-person households are increasingly widespread, driven primarily by young people leaving the parental home, high divorce risks, and population aging (Fokkema and Liefbroer 2008). In this study we focus on lifelong singlehood in Europe. Lifelong singles (also referred to as the 'never partnered' and the 'permanently single') are defined as individuals who have not experienced a coresidential partnership (either marriage or cohabitation) by the age of 40.[3] As we shall see, they represent about 5% in Europe, ranging from below 3% in Denmark to a high of 10% in Ireland and Italy (our elaboration on ESS data).

Permanent singlehood can have important implications for people in terms of emotional and economic support, well-being, and health. Single people are more exposed to loneliness and, since they are not emotionally and economically supported by a partner, they are more likely to experience psychological and material disadvantages, especially in old age (Pinquart and Sörensen 2011; Kalmijn 2013).

Demographic and sociological studies on this topic are few and far between (Wiik and Dommermuth 2014) and, like Kiernan's (2002, 2004), they tend to be predominantly explorative. Recent exceptions are the studies of Dykstra and Poortman (2010) and Wiik and Dommermuth (2014), both of which focus on the socioeconomic correlates of never partnering (in the Netherlands and Norway respectively). We follow a similar explorative approach, but rather than focusing on a single country we study

[3] See below for a more detailed definition. In this study partnerships (or unions) refer to marriages and cohabitation. One variant of partnership that our data cannot identify is living apart together (LAT). Although LAT has become quite common (between 5% and 10%) in most European societies during the last decades (Liefbroer, Poortman, and Seltzer 2015), our inability to identify it is unlikely to influence our results in any major way. Several studies show that LAT is quite distinct from singlehood, representing primarily a stage in union formation dynamics. It tends to occur after the dissolution of a previous union (or spousal death) and in the majority of cases people intend to live together in the future (Liefbroer, Poortman, and Seltzer 2015; Evertsson and Nyman 2013; De Jong Gierveld 2004).

lifelong singlehood and its educational gradient across a large number of European countries.[4]

Recent research has documented an increase in singlehood across countries (e.g., Fokkema and Liefbroer 2008). Indeed, this is what one would predict from Becker's (1981) framework, in which the primary utility of partnering derives from gender role specialization. Accordingly, if men's and women's market productivity begins to converge, the raison d'être of union formation weakens. There is ample empirical support for this prediction (Brines and Joyner 1999; Blossfeld and Timm 2003). The choice of singlehood, it is argued, is a by-product of women's greater earning capacity and, consequently, of less reliance on a male partner's earnings (Oppenheimer 1997). Several studies have actually established that nonpartnering is especially likely among higher-educated women. It is similarly likely among low-educated men, whose earning capacity has declined over the past decades (Blossfeld and Drobnic 2001; Kalmijn 2011; Wiik 2009).

But recent evidence suggests that the association between individuals' resources and partnering has weakened in some countries, and that the educational gradient of singlehood has turned from being positive to being null (or negative) for women, and from negative to null for men. In some countries the likelihood of partnering among higher-educated career women has increased (Domínguez-Folgueras and Castro-Martín 2008). In parallel, research indicates that men's earning potential is ever less crucial in women's decision to partner (Sweeney 2002). Other attributes, such as companionship or involvement in domestic work, are gaining ground (Dykstra and Poortman 2010).

We need an adequate theoretical framework in order to explain why permanent singlehood varies substantially across countries – both overall and by level of education. The multiple equilibrium framework espoused by Esping-Andersen (2009) and Esping-Andersen and Billari (2015) hypothesizes a U-shaped relationship between gender role change and partnering (as well as fertility and union stability).[5] It predicts that distinct stages in the transition from a traditional to a gender symmetric partnership model are associated with different demographic responses. Accordingly, a greater propensity toward partnering is to be expected where the traditional male-breadwinner norm remains dominant. In contrast, pervasive normative uncertainty and no significant adaptation to women's new roles are likely to prevail across the initial phase of the female revolution. Under such conditions we should expect a rise in the likelihood of being single. But where gender egalitarianism has gained dominance, we should see a return to higher odds of partnering. Put differently, lifelong singlehood is likely to be

[4] The educational gradient of lifelong singlehood refers to the relationship between levels of education and the likelihood of remaining single. It can be positive (the higher-educated are more likely to remain single) or vice versa.

[5] Aassve et al. (2015) apply a very similar approach to ours but focus on fertility outcomes.

especially pronounced in societies in the midst of a transition from one dominant partnership norm to another.

The multiple equilibrium framework predicts that the higher-educated will spearhead gender egalitarianism, which will become ever more universal as the diffusion process reaches maturity (Esping-Andersen and Billari 2015). Accordingly, if gender egalitarianism exerts a major influence on union formation, in the countries experiencing the transition phase this is likely to produce highly stratified patterns in the marriage market. Here the combination of enhanced female economic autonomy and male adaptation lagging behind implies a greater likelihood of lifelong singlehood. This should especially be the case for the higher-educated. Where gender egalitarianism approaches universality we should – all things being equal – expect a lower propensity toward being lifelong single, and also more similarity in partnering probability across education levels. Where both female employment and gender egalitarianism flourish, the opportunity cost of partnering (compared to singlehood) should be lower – especially for higher-educated women. As a consequence, the effect of women's education on partnering should diminish in tandem with the spread of gender-egalitarian norms. In parallel, this should also improve the partnering prospects for low-educated males, assuming of course that they have effectively adopted gender-symmetric practices.

This study contributes to the now ample research that links demographic behavior with gender relations, as well as to the scarce comparative literature on never partnering. We exploit variations in the propensity toward permanent singlehood across European countries for the years 2002–2014, which we subdivide into two periods.[6] Our aim is to identify whether there is a link between levels of gender egalitarianism and the likelihood of being lifelong single – both overall and by levels of education. Our data does not allow for analyzing major changes across longer periods or more cohorts within countries. This implies that the primary source of variation is found in the cross-country dimension.

2. Education, gender roles, and partnering

Identifying the educational gradient of lifelong singlehood is fundamental if we want to understand its stratified dimensions. Education reflects not only a person's income potential (Card 1999) but also their sociocultural resources, which in turn influence

[6] By distinguishing time periods we trace period changes to a certain degree. However, as we explain below, in some countries we observe no substantial change in gender norms over these years. Another limitation of our study is that our data does not permit us to identify whether lifelong singlehood is the result of choice or constraints.

opportunities and constraints related to family life (McLanahan 2004; Brand and Davis 2011).

It is well established that the effect of education on partnering differs for men and women (e.g., Goldin 2004; Goldstein and Kenney 2001). Higher education has traditionally given men an advantage in the marriage market, while this is not necessarily the case for women.

Within the New Home Economics (Becker 1981), the educational gradient of partnering – negative for women and positive for men – "makes sense." According to Becker (1981), any given person is more likely to select a partner who commands resources that are complementary to his or her own. The partner with inferior earnings prospects should therefore specialize in home production. Although in principle the Becker approach is gender neutral, it is usually assumed that for women the opportunity costs of household work are lower than for men. This implies that women are expected to specialize in the domestic sphere and men in the labor market. Accordingly, women will tend to compete for men with good earnings prospects (e.g., Dykstra and Poortman 2010; Kalmijn 2013).

Within Becker's framework, career-oriented women (i.e., women with higher education), as well as low-educated men, should have a comparatively greater probability of remaining permanently single. In contrast, the marriage market should favor higher-educated men.

> *Hypothesis 1*: We would expect to find that, overall, highly educated women and low-educated men are the most likely to remain permanently single.

2.1 Gender egalitarianism and singlehood

The New Home Economics perspective has been questioned on both theoretical and empirical grounds. For one thing, female careers and family formation are not necessarily incompatible if public institutions provide adequate family–work balance policies (e.g., McDonald 2000). In parallel, as many have argued, male adaptation to women's new roles is also a fundamental precondition for reconciling female careers with partnership and motherhood (Esping-Andersen 2009; Kalmijn 2013; Esping-Andersen and Billari 2015; Goldscheider, Bernhardt, and Lappegård 2015).

Some, such as Kalmijn (2013), assume a linear relationship between gender egalitarianism and the propensity toward lifelong singlehood. The multiple equilibrium framework, which is the theoretical referent of our study, posits an inverse curvilinear effect (Esping-Andersen 2009; Esping-Andersen and Billari 2015).

The multiple equilibrium framework predicts a low probability of never partnering where the conventional male-breadwinner model (i.e., women invest primarily in unpaid work and men in paid work) remains dominant. Here specialized gender roles imply that both men and women rely on being, and are expected to be, partnered (Parsons and Bales 1955).

In societies where the female revolution has progressed only partially we should, in contrast, observe an increase in the odds of permanent singlehood. This is where we should expect role disjuncture: while women increasingly invest in marketable skills and careers, male adaptation in the domestic sphere lags behind (Esping-Andersen and Billari 2015). Ambiguity regarding the proper role of women is likely to have repercussions for partnership formation. Women may refrain from partnering if it is seen as an obstacle to their career or as a potential source of marital tension and conflict (Bertrand, Kamenica, and Pan 2013). The prospects of a suboptimal life as a couple may accordingly bias women's choices in favor of singlehood. And this in turn will also affect men's partnering chances negatively.

We should, in contrast, expect to see a decline of lifelong singlehood in societies where adaptation to women's new roles is more advanced, be it in terms of gender attitudes or gender symmetry in the domestic sphere. A high level of gender egalitarianism is expected to lessen the penalties faced by men who increase their commitment in childrearing and to engage in traditionally female domestic activities (Goldscheider, Bernhardt, and Lappegård 2015; Sevilla-Sanz 2010). This should weaken the trade-offs between the home and the market for women, resulting in increased gains from partnering. And this should translate into better partnering chances for men too.

> *Hypothesis 2*: We expect to find an inverse U-shaped relationship between gender-egalitarian attitudes and permanent singlehood. Where either traditional or gender-egalitarian attitudes are dominant the probability of permanent singlehood will be comparatively low.

2.2 The educational gradient of lifelong singlehood

Research has documented a shift in the educational gradient of partnering in some societies but not in others. In the Nordic countries highly educated women are more likely to be in a union compared to their less-educated counterparts (Goldscheider, Turcotte, and Kopp 2001; Heard 2011; Thornton, Axinn, and Teachman 1995; Torr 2011). Better-educated men here are also as likely to remain single as the less-educated are (see Dykstra and Poortman 2010 for the Netherlands and Wiik and Dommermuth

2014 for Norway). However, in other countries the negative educational gradient of partnering appears to persist (Kalmijn 2013).

Within the multiple equilibrium framework, the educational gradient of partnering should be associated with differences in gender role attitudes. Where traditional gender norms dominate, one should observe a lower probability of being lifelong single for highly educated men – due primarily to their strong earnings prospects. A similar logic should apply for the low partnership prospects of low educated men. On the female side of the coin, in gender-traditional societies one should observe a similar partnering propensity across all levels of education. Here lower-educated women face a high economic price for singlehood, while higher-educated women mainly face a greater social price – remaining single will, in such a context, be regarded as deviant from the norm (DePaulo and Morris 2006).

In the early phases of the gender role transition, the educational gradient of lifelong singlehood for women is expected to shift. Where women's new role in the labor market is not accompanied by male adaptation in the domestic sphere, partnering will be seen as less attractive, in particular for career women. As a consequence, in such societies we should expect a greater likelihood of higher-educated women remaining single, both because they perceive the greatest family–work conflict and because they are better positioned to support themselves as singles. And since female employment implies less reliance on male income, the comparative marriage market disadvantage for low-educated men should decline. Hence, the educational gradient for men is expected to weaken.

Where gender egalitarianism has become the norm across the entire social spectrum, the educational differentials in partnering should narrow. In a context where virtually all married women are employed throughout their lifetime, men's chances of entering into a union will depend very much on their inclination to take on their fair share of household work (Sevilla-Sanz 2010). This in turn should diminish the negative educational gradient for men. And in this context the conventional rationale behind partnering should give way to a greater emphasis on prospective partner characteristics that may be deemed important for consumption maximization, social life, or other valued goals (Fernández, Guner, and Knowles 2005). Accordingly, men may increasingly compete for women with strong economic resources (Oppenheimer 1988; Oppenheimer and Lew 1995; Sweeney 2002; Schwartz 2010) and this should lessen the positive educational gradient of lifelong singlehood for women.

> *Hypothesis 3*: We hypothesize that better-educated women should have a comparatively high probability of being lifelong single in societies characterized by a medium level of gender egalitarianism. However, in countries at a very advanced stage of gender egalitarianism we should expect convergence in the odds

of being lifelong single across educational levels of women. Where gender egalitarianism approaches universal acceptance, we also expect to find better partnering opportunities for low educated men.

3. Data, variables, and methodology

We exploit European Social Survey (ESS) data for 2002, 2004, 2006, 2008, 2010, 2012, and 2014 waves, and European Value Study (EVS) data for 2008–2009. Since the sampling frame and the variables of interest are similar, we pool the two datasets. By doing so, we obtain larger national samples that allow us to make comparisons between subgroups broken down by individual characteristics, such as education and gender.[7]

We compare individuals who are or who have been in a coresidential partnership (marriage and/or cohabitation) with those who have never been partnered (defined as lifelong single). We split the sample by gender and estimate multilevel models. The data from both surveys have a hierarchical, multilevel structure. We consider two levels where individuals are nested within country–period combinations (i.e., level-two units).

We restrict our analysis to women and men aged 40–55 between 2002 and 2014. Since the time interval spans more than one decade we split it into two subperiods: 2002–2009 and 2010–2014.[8] This implies that for the first period respondents were born between 1947 and 1968 (the average being around 1958) and for the second between 1955 and 1974 (the average being around 1964). Our analysis is focused on EU countries but also includes Iceland, Norway, Switzerland, and Ukraine. For some countries we have data for only one period. Greece, Latvia, Lithuania, and Romania are not included for both periods due to missing information on key variables. In total we have 54 country–period combinations (see Table A-1 in the Appendix).

3.1 Dependent variable: Lifelong singlehood

The dependent variable identifies individuals who by age 40–55 have never lived in a coresidential union.[9] As in earlier studies, we choose age 40 as the threshold after which

[7] Since the lifelong single population is quite small, any detailed analysis requires very large sample sizes. For this reason we have pooled the two datasets. In Tables A-8 and A-9 we present results using only ESS.

[8] We are compelled to estimate with a period dummy rather than a continuous time specification since for many countries (Austria, Belgium, Denmark, France, Greece, Hungary, Iceland, Ireland, Italy, the Netherlands, Portugal, and Ukraine) we do not have more than one observation by period on (one or more) variables at the aggregate level.

[9] In the ESS Round 3 (2006) the question we use to construct our dependent variable defines this as no partnership experience lasting more than three months.

an individual is likely to remain single permanently (Dykstra and Poortman 2010). To obtain a more homogeneous population we exclude persons over the age of 55.

Lifelong singlehood status is identified by answers to questions such as "Could I ask about your current legal marital status?", "Have you ever lived with a partner without being married?", "Are you or have you ever been married?", and "Have you ever been divorced or had a civil union dissolved?" Our dependent variable assumes the value of 0 if the respondent is (or has been) in a partnership and the value of 1 if not. In total the pooled dataset includes 45,092 women and 38,887 men. The mean level of lifelong singlehood is 4.2% (n=1,887) for women and 7.3% (n=2,830) for men.[10]

A descriptive overview suggests a degree of country clustering (Figure 1). In one cluster we find the Mediterranean countries (Italy, Portugal, Spain, and Greece), with high rates of male and female singlehood. This is also the case for the Anglo-Saxon countries (especially Ireland), and Slovakia, Croatia, and Bulgaria. In contrast, the Nordic countries (Denmark, Sweden, Norway, and Iceland – but not Finland) and some Eastern European countries (Romania and Hungary) exhibit low rates for both men and women. Here, on average, the rate of lifelong singlehood for men is between 3.2% and 5.5% and for women between 1.5% and 2.7%. This group is followed by the majority of the continental European countries (Germany, France, Switzerland, Belgium, and Luxembourg), with medium levels – the male rate is between about 6% and 7% and the female rate between 3% and 4%. Yet another group, which includes Lithuania, Latvia, and Slovenia, is characterized by a gender mismatch of singlehood (high for women, low for men).

[10] We exclude ESS data on France (waves 2002 and 2004), Finland and Ireland (wave 2010), and the Czech Republic (wave 2012) because of the high percentage of missing values on our key variables.

Figure 1: Mean lifelong singlehood rates in Europe, ESS 2002–2014 and EVS 2008–2009, pooled dataset

a) Women

b) Men

3.2 Explanatory variables

At the individual level, our main explanatory variable is the respondent's level of education. For reasons of parsimony we distinguish three categories, using the International Standard Classification of Education (ISCED). The first represents lower secondary education or below (ISCED 0–2), the second represents upper secondary education (ISCED 3–4), and the third represents tertiary education (ISCED 5–6). The descriptive statistics in Table 1 show that roughly 23.3% of women and 21.2% of men fall into the first category; 49.8% of women and 54% of men into the second; and 26.9% of women and 24.8% of men into the third.

Table 1: Description of the individual-level variables for women and men aged 40–55, ESS 2002–2014 and EVS 2008–2009, pooled data

	Women				Men			
	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
Lifelong (LL) singlehood								
Not LL single	95.82%				92.72%			
LL single	4.18%				7.28%			
Age	47.45	4.62	40.00	55.00	47.47	4.61	40.00	55.00
Education								
Lower sec. or below	23.28%				21.19%			
Upper sec.	49.80%				53.97%			
Tertiary	26.92%				24.84%			
Dataset								
ESS	86.24%				87.45%			
EVS	13.76%				12.55%			
Immigrant status								
Native	91.08%				91.32%			
Immigrant	8.92%				8.68%			
Religiosity								
Without religious background	36.38%				41.07%			
With religious background	63.62%				58.93%			
N	45,092				38,887			

As in Kalmijn (2013), our models control for age (a continuous variable), immigrant status, and religiosity. They control also for the data source (either ESS or EVS). All covariates refer to the time of the interview. Religiosity is a dummy variable that takes the value of 1 if the respondent reports being (or having been) a member of a particular religion or denomination. Immigrant status (also a dummy) indicates whether a person is foreign-born. We include a variable for the respective dataset because of

slight differences in the definition of lifelong singlehood between the EVS and ESS (see Table A-2).[11] All control variables were measured identically in the two datasets.

Table 2 shows the distribution of the independent variables for lifelong singlehood. Here we note a higher incidence of lifelong singlehood among low-educated men (11.4%) – almost twice the level of the highly educated. For women, it is higher for tertiary-educated (5.3%) than for other educational groups (4.5% for low-educated and 3.4% for medium-educated women). These distributions are very much in line with earlier studies (Blossfeld and Timm 2003).

Table 2: Distribution of independent variables by respondent's partnership status for women and men aged 40–55, ESS 2002–2014 and EVS 2008–2009, pooled data

	Women		Men	
	Not LL single	LL single	Not LL single	LL single
Education				
Lower sec. or below	95.5%	4.5%	88.6%	11.4%
Upper sec.	96.6%	3.4%	93.5%	6.5%
Tertiary	94.7%	5.3%	94.5%	5.5%
Dataset				
ESS	96.0%	4.0%	92.8%	7.2%
EVS	94.8%	5.2%	91.9%	8.1%
Immigrant status				
Native	95.7%	4.3%	92.4%	7.6%
Immigrant	96.5%	3.5%	96.0%	4.0%
Religiosity				
Without religious background	96.2%	3.8%	93.0%	7.0%
With religious background	95.6%	4.4%	92.5%	7.5%
Total	95.8%	4.2%	92.7%	7.3%

3.3 Macro variables

Since we primarily focus on between-country variability, we include indicators related to attitudinal and structural variations across countries, in particular those that help capture gender norms.

[11] In a preliminary analysis we also tested for the impact of other variables (living in an Eastern or Western European country and health status). To obtain a parsimonious model we have included only variables that have any significant impact on the probability of remaining single.

Following earlier research (Arpino, Esping-Andersen, and Pessin 2015), we use one indicator of gender equity attitudes, constructed from interviewee (aged 18–55) responses in two pooled surveys, the World Values Study and EVS. [12] The question was worded as follows: "When jobs are scarce, men should have more right to a job than women." The three possible responses were "disagree," "agree," and "neither agree nor disagree." We opt for this particular indicator because, as Seguino (2007) argues, it is the one attitudinal question which unambiguously taps into gender equity in the treatment of women and men (see also Davis and Greenstein 2009).

To construct this variable we first recorded individual responses in a dummy variable, in which "disagree" is coded as 1 (i.e., representing gender equity orientation), whereas the other two responses are coded as 0. We then calculated the percentage of respondents expressing gender-equitable attitudes for each country and for two periods, 1989–1998 and 1999–2009,[13] which roughly coincide with the time when our respondents were almost at peak partnering ages. We label the resulting variable as 'gender equity.'[14] In our models this variable is measured in both linear and quadratic form.[15]

Table 3 presents the incidence of gender equity across countries. One notes substantial cross-country variation (here the values are averaged over the two periods considered). In Scandinavia 90+% of respondents support gender equity; in Finland the level is somewhat lower (about 80%). The Nordic countries, and Denmark in particular, appear in this respect to have moved decisively toward gender-egalitarian value dominance – gender egalitarianism is close to universal (95%). Coincidentally, in Denmark (as in Sweden) the incidence of lifelong singlehood for women (around 1.5%) is exceptionally low.

Note that in some Eastern European countries, such as Romania and Ukraine, we also find very low levels of lifelong singlehood, notwithstanding comparatively low levels of support for gender equity (around 50%). This contrasts with the Mediterranean countries, which are characterized by high rates of lifelong singlehood and medium to low levels of gender equity. In some countries, such as Austria, Belgium, France, and Hungary, we observe substantial variation over time on this indicator.

[12] We refer to gender equity and not to gender equality since the theory we are testing predicts that fairness of treatment for women and men (gender equity) and not (necessarily) equality in outcomes in education or the labor market (gender equality) affects demographic behavior. For a more detailed discussion, see Arpino, Esping-Andersen, and Pessin (2015).

[13] In Tables A-12 and A-13 we show results of models using two restricted periods, 1989–1992 and 1993–1999.

[14] Although we use this variable to capture the degree to which gender egalitarianism has spread in any given society, we prefer to label it as 'gender equity' because it taps into notions of fairness. In Tables A-14 and A-15 we present the results of models using an alternative index based on three indicators of gender equity.

[15] In this paper we present graphs based on the results of the quadratic model only because of the better fit. The correlation matrix for all macro-level variables employed in our analysis is presented in Table A-3.

Table 3: Description of macro-level variables

	Gender equity	
	First period	**Second period**
Austria (AT)	49.21%	67.19%
Belgium (BE)	57.47%	80.85%
Bulgaria (BG)	47.23%	56.96%
Switzerland (CH)	60.83%	75.29%
Czech Republic (CZ)	45.60%	66.32%
Germany (DE)	67.03%	65.87%
Denmark (DK)	93.37%	95.58%
Estonia (EE)	52.35%	75.64%
Spain (ES)	67.72%	76.33%
Finland (FI)	76.74%	87.08%
France (FR)	63.22%	79.68%
United Kingdom (GB)	73.10%	81.15%
Greece (GR)	–	71.33%
Croatia (HR)	48.33%	80.52%
Hungary (HU)	52.50%	76.05%
Ireland (IE)	66.95%	78.94%
Iceland (IS)	93.11%	96.56%
Italy (IT)	53.51%	68.11%
Lithuania (LT)	–	66.11%
Latvia (LV)	54.22%	–
Netherlands (NL)	77.91%	88.58%
Norway (NO)	85.16%	93.62%
Poland (PL)	40.19%	59.02%
Portugal (PT)	59.95%	68.03%
Romania (RO)	41.83%	–
Sweden (SE)	92.79%	96.06%
Slovenia (SI)	63.11%	79.49%
Slovakia (SK)	37.92%	57.22%
Ukraine (UA)	47.57%	59.14%
Total	61.81%	75.80%

At the macro level we construct a variable representing the female–male ratio in tertiary education by birth cohort. This should help capture imbalances in the marriage market which in turn may influence partnering choices or constraints (Esteve, Garcia-Roman, and Permanyer 2012). A reversal of the traditional sex ratio in tertiary education may increase the likelihood of female singlehood. Utilizing Barro and Lee's (2013) data, we measure the gender ratio dividing the percentage of tertiary-educated

women over tertiary-educated men within each five-year birth cohort.[16] All country-level variables are standardized so that our results apply to the average country.

3.4 Method

We use multilevel models (Snijders and Bosker 1999) to examine the impact of education on the likelihood of remaining single and to get a better idea about the complex processes underlying marriage market choices at both individual and societal levels.

We distinguish two levels of analysis: individuals at level 1 and country–periods at level 2. [17] Since gender equity varies between countries and periods (the former being the most important source of variation), the second level in the multilevel analysis is constituted by the combination of country and period. If we do not allow the score of this indicator to vary across both country and period, we risk underestimating the standard errors. Hence, each country–period combination is a unit observation at the second level. Our random effects approach corrects standard errors for both sources of clustering.

Estimation is based on two-level logistic regression models (e.g., Rabe-Hesketh and Skrondal 2012). We present coefficients with their standard errors and the second-level standard deviation of the random effect. We standardize the variables at the aggregate level. Given that we include a cross-level interaction between level of education and gender equity, we allow the effect of education to vary across country–periods. We report results separately for men and women since we expect relevant gender differences with respect to the educational gradient.

We first estimate empty multilevel models, looking at the likelihood of being single without including any variable at either individual or aggregate level. Then we include only individual-level characteristics. In the third step we test a model with the equity indicator variable, controlling also for the sex ratio of higher educational attainment. In the final step we add interactions.

[16] As a robustness check we control also for the female graduation rate by country and cohort (see Tables A-10 and A-11).

[17] Due to the nature of the data, we did additional robustness checks using three levels: individuals, country–periods, and country (see Tables A-4–A-7).

4. Empirical results

The empty models in Tables 4 and 5 (Model 1) confirm that lifelong singlehood varies substantially across country–periods. Figure 2 explores this variation in more depth, showing the estimated residuals for all the units at the second level. For a substantial number of units the 95% confidence interval does not overlap with the horizontal line at zero (i.e., the second-level average). This indicates that units differ from each other, since the confidence intervals of estimated residuals represented by the bars are often above or below the zero line. This is the case for both men and women.

Panels a) and b) of Figure 2 indicate that there are a number of countries, such as Sweden and Denmark for women and Latvia and Denmark for men during the first decade of 21st century, in which individuals are significantly less likely to experience lifelong singlehood. The largest country-level residual for lifelong singlehood is found for women in Italy (in the first decade of 21st century) and for men in Ireland (during the second decade).

Figure 2: Caterpillar plot of random intercept predictions and 95% confidence intervals versus ranking

a) Women aged 40–55

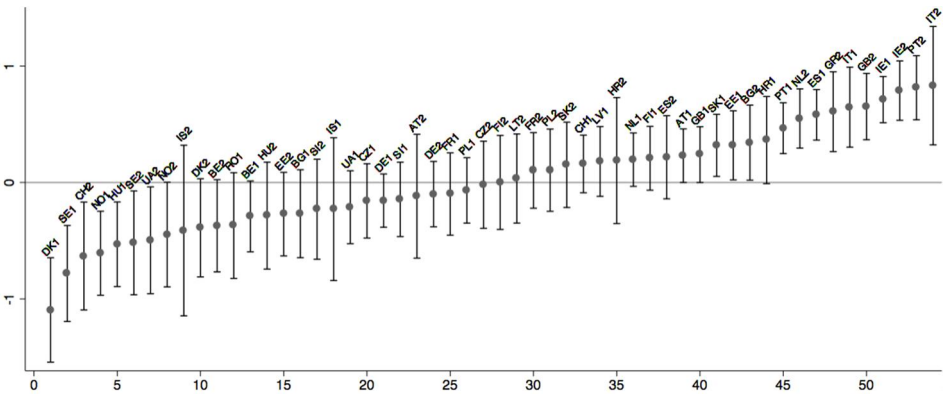
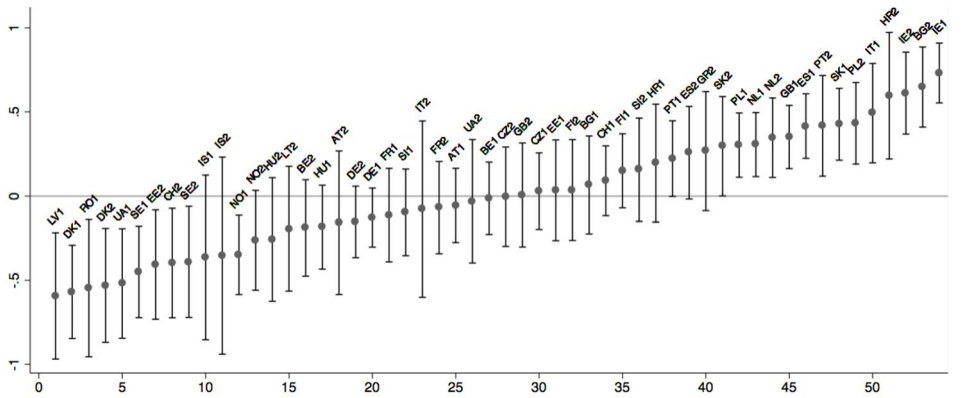


Figure 2: (Continued)

b) Men aged 40–55



4.1 The educational gradient of lifelong singlehood

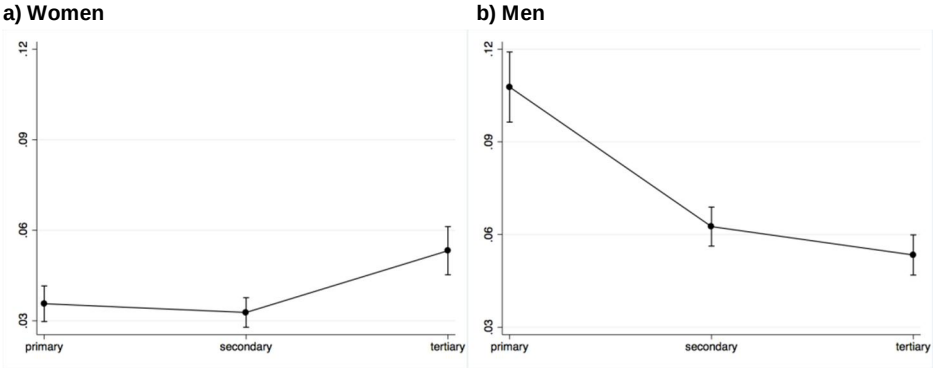
We first estimate the education effects across country–periods without the macro-level variables (Tables 4 and 5, Model 2). We subsequently present estimations that take into account the macro-level variables (Tables 4 and 5, Models 3 and 4). Finally, we include interactions for levels of education with the gender equity variable (Table 6 for women and Table 7 for men).

Tables 4 and 5 suggest that education has a strong effect in all model specifications, for men as well as for women. More specifically, the inclusion of the individual-level control variables confirms that the level of education is positively related to lifelong singlehood for women, while the opposite is true for men: that is, more highly educated men are less likely to remain lifelong unpartnered.

To facilitate interpretation, we plot the predicted probabilities by educational level in Figure 3. Beginning with women, the predicted probability of remaining lifelong single for those with tertiary education is the highest (about 5.5%). The predicted probability for the other educational groups is significantly lower (about 3.5% for those with medium or low levels of education).

We observe exactly the opposite for men. The highest predicted probability of lifelong singlehood is found among the low-educated (about 11%), while those with high and medium levels of education have a significantly smaller propensity (between about 5% and 6%). Our first hypothesis about the educational gradient of lifelong singlehood is therefore supported by our results.

Figure 3: Predicted probabilities of lifelong singlehood by education with 95% confidence intervals



We then estimate multilevel models to test hypothesis 2: that the probability of being lifelong single varies by the degree of diffusion of gender equity. Here we add characteristics at the country–period level to the baseline specification.

Model 3 in Tables 4 and 5 for women and men respectively show that the greater the diffusion of gender equity, the lower the likelihood of being lifelong single among both men and women. This holds also when we control for individual characteristics and for the female–male ratio of university graduates. However, as will be recalled, our hypothesis predicts an inverted U-shaped function. And indeed the estimations show a better fit when we additionally include a squared term of the gender equity variable. Model 4 in Tables 4 and 5 for women and men respectively show an odds ratio for the squared gender equity variable of 0.999 (with $p<0.01$ for women and $p<0.05$ for men). This suggests an initially positive relationship between the level of gender equity and the predicted probability of being lifelong single. But as gender egalitarianism approaches dominant status the relationship turns negative – among both men and women.

Table 4: Results of multilevel logistic regression of lifelong singlehood, women, odds ratios

	Model 1	Model 2	Model 3	Model 4
Educational level (Upper sec.: ref.)				
Lower sec. or below		1.091	1.094	1.090
		(0.072)	(0.072)	(0.072)
Tertiary		1.660***	1.666***	1.665***
		(0.095)	(0.096)	(0.096)
Dataset (ESS: ref.)		1.512***	1.493***	1.512***
		(0.114)	(0.113)	(0.114)
Immigrant (Native: ref.)		0.765***	0.767***	0.763***
		(0.070)	(0.070)	(0.070)
With religious background (Without: ref.)		1.162**	1.159**	1.160**
		(0.069)	(0.069)	(0.069)
Age		0.991*	0.994	0.994
		(0.005)	(0.006)	(0.006)
Sex ratio, graduates in tertiary education			1.121	1.125
			(0.090)	(0.088)
Gender equity			0.991*	0.993*
			(0.005)	(0.004)
Gender equity^2				0.999***
				(0.000)
Constant	0.040***	0.030***	0.026***	0.032***
	(0.003)	(0.008)	(0.008)	(0.010)
Level-2 standard deviation of random effect	0.476***	0.495***	0.481***	0.422***
	(0.056)	(0.059)	(0.057)	(0.051)
Observations	45,092	45,092	45,092	45,092
Number of groups	54	54	54	54

Notes: *** p<0.01, ** p<0.05, * p<0.1

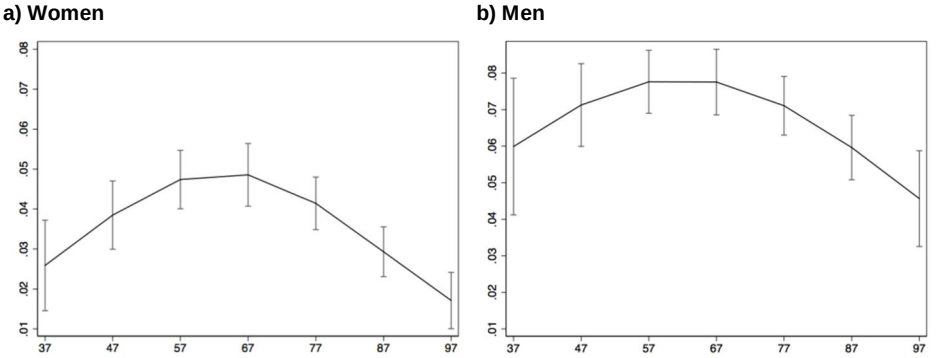
Table 5: Results of multilevel logistic regression of lifelong singlehood, men, odds ratios

	Model 1	Model 2	Model 3	Model 4
Educational level (Upper sec.: ref.)				
Lower sec. or below		1.814***	1.817***	1.807***
		(0.090)	(0.090)	(0.089)
Tertiary		0.844***	0.846***	0.846***
		(0.046)	(0.046)	(0.046)
Dataset (ESS: ref.)		1.224***	1.210***	1.218***
		(0.079)	(0.078)	(0.079)
Immigrant (Native: ref.)		0.495***	0.497***	0.495***
		(0.045)	(0.046)	(0.045)
With religious background (Without: ref.)		1.038	1.035	1.034
		(0.048)	(0.046)	(0.047)
Age		0.964***	0.966***	0.965***
		(0.004)	(0.005)	(0.005)
Sex ratio, graduates in tertiary education			1.053	1.056
			(0.081)	(0.080)
Gender equity			0.994*	0.995
			(0.003)	(0.003)
Gender equity^2				1.000**
				(0.000)
Constant	0.074***	0.303***	0.292***	0.321***
	(0.004)	(0.068)	(0.071)	(0.079)
Level-2 standard deviation of random effect	0.379***	0.333***	0.323***	0.305***
	(0.045)	(0.042)	(0.042)	(0.040)
Observations	38,887	38,887	38,887	38,887
Number of groups	54	54	54	54

Notes: *** p<0.01, ** p<0.05, * p<0.1

Figure 4 displays the predicted probabilities of lifelong singlehood corresponding to different levels of gender equity. In the left panel we take estimations from Table 4 and in the right panel from Table 5, where gender equity and its squared term are included as covariates. This allows us to predict the probability of lifelong singlehood corresponding to different levels of gender equity, ranging from about 40% to almost 100%. The inverted U-shaped relation between gender equity and singlehood is observed for both genders.

Figure 4: Predicted probabilities of lifelong singlehood by levels of gender equity with 95% confidence intervals



4.2 Interaction effects

Models 6 and 7 in Tables 6 and 7 report the interaction effects of education with the contextual variable. This serves to test hypothesis 3: whether the level of gender equity is particularly influential for highly educated women's and low-educated men's propensities to remain lifelong single.[18]

Here again we obtain a better fit with the inclusion of the squared term for gender equity. Focusing on women, Model 7 in Table 6 shows a statistically significant interaction effect between gender equity (squared) and education. Contrary to expectations, it turns out that gender equity (squared) is significant for all educational levels; the results confirm an inverse U-shaped impact of gender equity. The results are somewhat different for men (Model 7 in Table 7): As with women, we observe the inverted U-shaped effect for the medium- and highly educated men, but not for the low-educated ones.

[18] We conducted robustness checks by including the GDP measure, but this does not influence our results in any way. Results are available upon request.

Table 6: Results of multilevel logistic regression of lifelong singlehood with interaction effects, women, odds ratios

	Model 6	Model 7
Dataset (ESS: ref.)	1.497***	1.515***
	(0.114)	(0.115)
Immigrant (Native: ref.)	0.767***	0.762***
	(0.070)	(0.070)
With religious background (Without: ref.)	1.159**	1.160**
	(0.069)	(0.069)
Age	0.994	0.994
	(0.006)	(0.006)
Sex ratio, graduates in tertiary education	1.120	1.126
	(0.090)	(0.088)
Educational level (Upper sec.: ref.)		
Lower sec. or below	1.085	1.064
	(0.072)	(0.090)
Tertiary	1.657***	1.717***
	(0.095)	(0.129)
Gender equity	0.993	0.995
	(0.005)	(0.005)
Primary education × Gender equity	0.996	0.997
	(0.005)	(0.005)
Tertiary education × Gender equity	0.996	0.997
	(0.004)	(0.004)
Gender equity^2		0.999***
		(0.000)
Primary education × Gender equity^2		1.000
		(0.000)
Tertiary education × Gender equity^2		1.000
		(0.000)
Constant	0.023***	0.032***
	(0.008)	(0.010)
Level-2 standard deviation of random effect	0.480***	0.422***
	(0.057)	(0.051)
Observations	45,092	45,092
Number of groups	54	54

Notes: *** p<0.01, ** p<0.05

Table 7: Results of multilevel logistic regression of lifelong singlehood with interactions, men, odds ratios

	Model 6	Model 7
Dataset (ESS: ref.)	1.206***	1.217***
	0.078	0.079
Immigrant (Native: ref.)	0.498***	0.497***
	0.046	0.046
With religious background (Without: ref.)	1.029	1.028
	0.047	0.047
Age	0.965***	0.966***
	0.005	0.005
Sex ratio, graduates in tertiary education	1.054	1.061
	0.082	0.081
Educational level (Upper sec.: ref.)		
Lower sec. or below	1.814***	1.661***
	0.090	0.109
Tertiary	0.833***	0.847**
	0.046	0.061
Gender equity	0.996	0.996
	0.004	0.003
Primary education × Gender equity	0.990***	0.991***
	0.003	0.003
Tertiary education × Gender equity	1.004	1.005
	0.004	0.004
Gender equity^2		0.999***
		0.000
Primary education × Gender equity^2		1.000**
		0.000
Tertiary education × Gender equity^2		1.000
		0.000
Constant	0.293***	0.329***
	0.072	0.081
Level-2 standard deviation of random effect	0.331***	0.317***
	0.042	0.041
Observations	38,887	38,887
Number of groups	54	54

Notes: *** p<0.01, ** p<0.05

To facilitate interpretation, Figure 5 plots the predicted probabilities of remaining unpartnered for women by education across levels of gender equity. We note that the relationship between gender equity and singlehood is initially positive and then negative for all levels of education. Interestingly, if we focus on medium levels of

gender equity we observe a significant difference between the highly educated and those educated to low and medium levels. When gender equity assumes values close to the average, tertiary-educated women have a higher probability of remaining lifelong single (the predicted probability is about four percentage points higher) compared to the rest, while this is not the case for modest or high levels of gender equity. In other words, the effect of gender equity is consistent with the predictions of hypothesis 3.

This inverted U-shaped curve can be interpreted as follows: the predicted probability of being lifelong single increases, especially for higher-educated women, in countries positioned in the early stages of women's role change. But where support for gender equity has achieved dominant status the marriage market for highly educated women improves and, as a consequence, the probability of finding an acceptable match is higher.

Figure 5: Predicted probabilities of lifelong singlehood by education and levels of gender equity with 95% confidence intervals, women

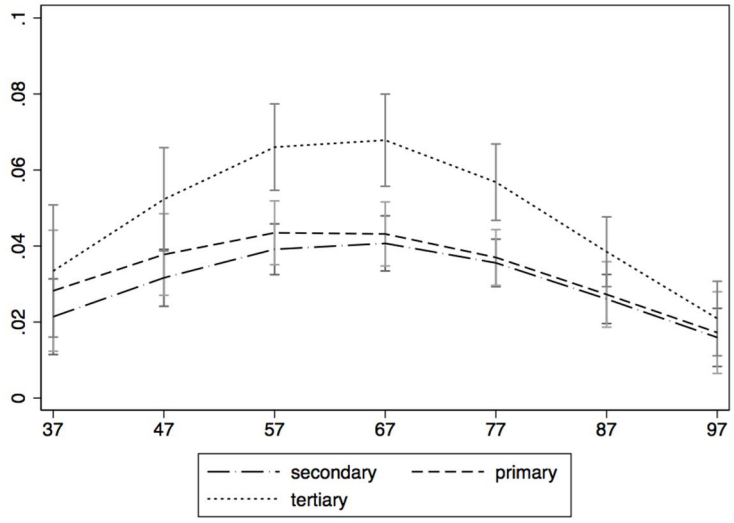
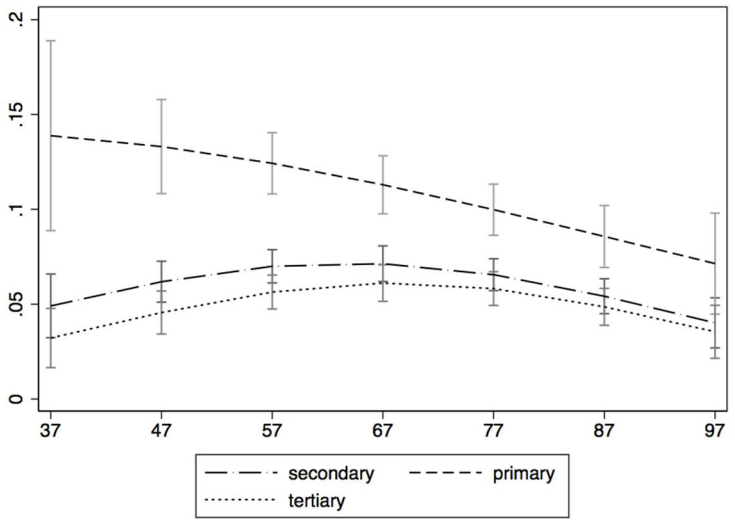


Figure 6 plots the predicted probability of lifelong singlehood by education and levels of gender equity for men (hypothesis 3). Here we observe that men educated to high and medium levels follow a pattern similar to that of women. This is not the case for low-educated men, who appear to have better chances of finding a partner where the level of gender equity is high. In other words, the higher the level of equity, the more likely it is for low-educated men to find a partner.

Figure 6: Predicted probabilities of lifelong singlehood by education and levels of gender equity with 95% confidence intervals, men



5. Additional robustness checks

We include a number of additional checks to further assess the robustness of our results. We first examine whether the exclusion of the EVS data affects our results. As reported in Tables A-8 and A-9, this is not the case – although some coefficients become less statistically significant.

Secondly, we check whether our findings change when adding an aggregate variable, the female graduation rate, which may be an important predictor of the probability of lifelong singlehood. Inclusion of this control does not change our original results (see Tables A-10 and A-11).

We then add a robustness check by altering the period breakdowns of the gender equity variables (to 1989–1992 and 1993–1999 instead of 1989–1999 and 2000–2010). This implies that we are tapping into gender equity attitudes when most of the respondents were in their first union, namely aged 20–45 (or on average in their early 30s). Due to data limitations, we cannot capture the conditions when they were in their early 20s, which, as previous research shows, would better coincide with first union formation (see Billari and Liefbroer 2010). As reported in Tables A-12 and A-13, even

if our analysis focuses on a restricted number of countries, our results are not affected by this alternative time specification.

And finally we test the quality of the gender equity variable by constructing an index based on three items on gender-related attitudes available in the data that were chosen because they form part of the first component (with the higher relative weight in the total variance: more than 70% of the total) of a principal component analysis (PCA).

The first is the same item that was used in the previous analysis and refers to the following statement: "When jobs are scarce, men should have more right to a job than women," recoding individual responses in a dummy variable in which "disagree" is coded as 1, whereas the other responses are coded as 0. The second item refers to the statement, "A preschool child is likely to suffer if his or her mother works" (recoded as the first). The third is based on the following statement: "A job is all right but what most women really want is a home and children" (also recoded as the first). We then constructed a combined index based on the average (by country and period) of the estimated percentages for the three indicators. One limitation of the data related to this combined index is a somewhat smaller sample (50 instead of 54 country–periods). As reported in Tables A-14 and A-15, results using this index turn out to be very similar to the ones based solely on the first indicator – but with one exception: namely that the U-shaped relationship here is clearly driven by higher-educated women.

6. Conclusions and discussion

Lifelong singlehood may account for a minority within the overall household mix. But to the extent that variations across time and countries help us understand evolving partnering dynamics it has significant analytical potential.

Opting out of partnerships is no doubt motivated by a host of idiosyncratic factors that are very difficult to nail down using the kind of data that is available to us. Our starting point, however, is the surprising degree of variation in its prevalence across countries, since the probability of being single is five times higher in Ireland than it is in Denmark. What explains cross-country variation in the individual probability of being lifelong single?

In the quest for an explanation, this study has drawn on recent theoretical attempts to explain the demographic consequences of the ongoing revolution in women's roles, in particular the multiple equilibrium approach developed by Esping-Andersen and Billari (2015) and the work of Goldscheider, Bernhardt, and Lappegård (2015). In a nutshell, the multiple equilibrium model would suggest that lifelong singlehood is rare where traditional gender norms prevail. In societies where women's role change has accelerated but gender norms have failed to adapt, partnering chances are expected to

be lower. But where gender egalitarianism has gained firm normative acceptance across the population we should observe a return to significantly lower rates of lifelong singlehood. The dynamics are initially driven by the erosion of the traditional male-breadwinner family. In its wake we are likely to encounter a pervasive degree of normative uncertainty and confusion. A new and stable equilibrium will, in this theoretical framework, emerge once gender-egalitarian norms have effectively permeated society.

We hypothesized that these dynamics would unfold differently by gender according to levels of education. It was of course higher-educated women who spearheaded the female revolution, opting for lifelong careers (Bertrand, Kamenica, and Pan 2013). And, unsurprisingly, it was also this section of the population that was in the vanguard of rising couple instability, divorce, and fertility decline. But it is within this very same social group that we should expect new gender-egalitarian values to first take hold. Accordingly, we hypothesized inverse U-shaped dynamics of lifelong singlehood that should be most marked for higher-educated women.

On the male side of the coin, we expected a similar trend, but also a linear negative effect of the diffusion of gender egalitarianism on the odds of being never partnered for low-educated men. The theoretical reasoning is that women in gender-egalitarian societies may prioritize characteristics of potential partners other than their breadwinning capacity. Given the increased career commitment of women and the associated command of economic resources, women may be more inclined to value men in terms of the degree to which they adhere to gender egalitarianism (see also Anderson and Kohler 2015).

It is arguably our inability to trace such dynamics over a longer historical time period that constitutes the most important limitation of this study. Our second-best option was to exploit variations in the cross-section of contemporary European nations (although the time period we could analyze did indeed reveal significant shifts in a number of countries). This said, we believe that the evidence demonstrates quite clearly that the odds of being lifelong single peak within those societies where traditional gender values have waned but gender egalitarianism remains poorly diffused.

As noted, differences across levels of education are of central importance in testing the (inverse) U-shaped dynamics. We hypothesized that highly educated women would be especially likely to opt for singlehood in an unstable equilibrium, that is, where there is widespread normative confusion about proper gender roles. As we expected, we found higher levels of partnering for the higher-educated where gender egalitarianism becomes normatively dominant. This scenario was also confirmed in our analysis, but with one important rider – namely that the same obtains for all women.

For low-educated men we find that in counties characterized by greater support for gender equity their likelihood of lifelong singlehood is lower. This last result is

particularly interesting because it seems to partly contrast with the traditional perspective according to which low-status and low-income men are penalized in the marriage market (Oppenheimer 1997). Even if this penalization persists also in gender-egalitarian societies, it is relatively weaker, implying that men's economic resources have become less important for their partnering chances.

There is obviously no law of nature that dictates that all societies will eventually settle into a new, stable gender-egalitarian equilibrium – and thereby possibly reap dividends. In fact, recent research on the situation in the United States concludes that the female revolution may have stalled midway (Cotter, Hermesen, and Vanneman 2011; England 2010). What's more, the embrace of gender-egalitarian attitudes does not necessarily imply a concomitant adoption of egalitarian practices within the partnership. In this sense, the progress toward gender egalitarianism in couple arrangements may be comparatively slower than the diffusion of values and preferences in favor of gender symmetry in paid and unpaid work within couples. And the inability to adopt gender-egalitarian couple arrangements may arrest the consolidation of a new stable equilibrium. Here the country-specific institutional context may play a key role. The adoption of gender-egalitarian practices is likely to advance further in societies with strong welfare state support for families, such as high-quality childcare.

Our inability to trace these institutional dynamics over many decades and cohorts is, as noted, a major limitation. Indeed, this is arguably a sine qua non if we aim to fully test the validity of the inverted-U thesis. One promising next step would be to exploit very long national panel datasets, such as the German Socio-Economic Panel (SOEP) or the Panel Study of Income Dynamics (PSID), or alternatively data which reconstructs life histories for different birth cohorts, such as the Generations and Gender Surveys, nested in different institutional contexts.

7. Acknowledgments

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Appendix

Table A-1: Structure of the data: individuals aged 40–55 by gender, pooled data from ESS and EVS

	Women		Men	
	First period	Second period	First period	Second period
AT	1,494	276	1,177	253
BE	1,312	765	1,200	729
BG	777	644	564	558
CH	1,362	659	1,186	646
CZ	1,046	635	1,023	580
DE	2,154	1,323	2,047	1,384
DK	1,118	668	1,112	660
EE	794	881	542	653
ES	1,230	569	1,067	549
FI	1,041	517	992	541
FR	781	786	735	731
GB	1,357	644	1,178	516
GR	–	441	–	295
HR	446	198	321	192
HU	1,097	486	1,000	419
IE	1,332	732	985	545
IS	194	109	194	90
IT	423	134	383	117
LT	–	572	–	387
LV	875	–	535	–
NL	1,547	900	1,197	720
NO	1,199	597	1,312	717
PL	1,279	644	1,190	632
PT	1,345	606	887	395
RO	541	–	407	–
SE	1,021	654	1,041	620
SI	1,031	550	864	461
SK	1,004	567	841	450
UA	1,141	594	722	345
Total	28,941	16,151	24,702	14,185

Table A-2: Questions used to define lifelong singlehood

Questions	ESS Round 1	ESS Round 2	ESS Round 3	ESS Round 4	ESS5 Round 5	ESS Round 6	ESS Round 7	EVS 2008–2009
Could I ask about your current legal marital status? Which of the descriptions on this card applies to you? Married, separated, divorced, widowed, never married, refusal, don't know, no answer	X	X						
Could I ask about your current legal marital status? Which of the descriptions on this card applies to you? Married, in a civil partnership, separated (still legally married), separated (still in a civil partnership), divorced, widowed, formerly in a civil partnership now dissolved, formerly in a civil partnership died, never married and never in a civil partnership, refusal, don't know, no answer			X	X				
Could I ask about your current legal marital status? Which of the descriptions on this card applies to you? Legally married, in a legally registered union, legally separated, legally divorced/civil divorced, widowed, none of these (never married or in a legally registered civil union), refusal, don't know, no answer					X	X	X	
Have you ever lived with a spouse or partner for three months or more?			X					
Have you ever lived with a partner without being married?	X	X	X	X				
Have you ever lived with a partner without being married to them?					X	X	X	
Are you currently living with your husband/wife?	X	X						
Are you currently living with your husband/wife/civil partner?			X	X				
Are you currently living with a partner?	X	X	X	X				
Are you currently living with your husband/wife/ partner?					X	X	X	
Have you ever been divorced?	X	X	X	X				
Have you ever been divorced/had a civil union dissolved?					X	X	X	
Are you or have you ever been married?			X					
What is your current legal marital status? Other missing question not asked, not applicable, no answer, don't know, married, registered partnership, widowed, divorced, separated, never married and never registered partnership								X
Did you live together with your partner before your marriage or before the registration of your partnership?								X
Do you live with a partner?								X
Did you live with a partner before?								X
Were you married to this partner or did you have a registered partnership with this partner?								X
Who, apart from you, is living in this household? Partner, husband or wife?								X

Table A-3: Correlation matrix, macro variables

	Gender equity	Sex ratio in graduation
Gender equity		
Sex ratio in graduation	0.059	
Female graduation rate	0.316	0.262

Table A-4: Results of multilevel models with three levels (individual, country–periods, and country), women

	Model 1	Model 2	Model 3	Model 4
Educational level (Upper sec.: ref.)				
Lower sec. or below		1.076	1.077	1.078
		(0.071)	(0.071)	(0.071)
Tertiary		1.661***	1.662***	1.660***
		(0.095)	(0.095)	(0.095)
Dataset (ESS: ref.)		1.482***	1.471***	1.490***
		(0.111)	(0.111)	(0.113)
Immigrant (Native: ref.)		0.768***	0.767***	0.766***
		(0.070)	(0.070)	(0.070)
With religious background (Without: ref.)		1.154**	1.154**	1.156**
		(0.069)	(0.069)	(0.069)
Age		0.991*	0.995	0.995
		(0.005)	(0.006)	(0.006)
Sex ratio, graduates in tertiary education			1.142	1.133
			(0.092)	(0.090)
Gender equity			0.996	0.994
			(0.004)	(0.004)
Gender equity^2				0.999**
				(0.000)
Constant	0.041***	0.031***	0.026***	0.030***
	(0.004)	(0.009)	(0.008)	(0.009)
Level-2 standard deviation of random effect	0.215***	0.237***	0.237***	0.280***
	(0.055)	(0.055)	(0.058)	(0.065)
Level-3 standard deviation of random effect	0.422***	0.438***	0.425***	0.320***
	(0.073)	(0.077)	(0.079)	(0.083)
Observations	45,092	45,092	45,092	45,092
Number of groups (level 2)	54	54	54	54
Number of groups (level 3)	29	29	29	29

Notes: *** p<0.01, ** p<0.05, * p<0.1

Table A-5: Results of multilevel models with three levels (individual, country–periods, and country), men

	Model 1	Model 2	Model 3	Model 4
Educational level (Upper sec.: ref.)				
Lower sec. or below		1.805***	1.805***	1.797***
		(0.089)	(0.089)	(0.089)
Tertiary		0.845***	0.846***	0.844***
		(0.046)	(0.046)	(0.046)
Dataset (ESS: ref.)		1.208***	1.201***	1.207***
		(0.076)	(0.077)	(0.078)
Immigrant (Native: ref.)		0.496***	0.497***	0.497***
		(0.046)	(0.046)	(0.046)
With religious background (Without: ref.)		1.033	1.032	1.032
		(0.048)	(0.048)	(0.048)
Age		0.964***	0.966***	0.966***
		(0.004)	(0.005)	(0.005)
Sex ratio, graduates in tertiary education			1.092	1.085
			(0.087)	(0.086)
Gender equity			0.998	0.997
			(0.003)	(0.003)
Gender equity^2				1.000
				(0.000)
Constant	0.0733***	0.305***	0.275***	0.298***
	(0.005)	(0.070)	(0.069)	(0.075)
Level-2 standard deviation of random effect	0.142***	0.136***	0.133***	0.152***
	(0.048)	(0.049)	(0.051)	(0.053)
Level-3 standard deviation of random effect	0.361***	0.320***	0.319***	0.282***
	(0.06)	(0.060)	(0.062)	(0.063)
Observations	38,887	38,887	38,887	38,887
Number of groups	54	54	54	54
Number of groups	29	29	29	29

Notes: *** p<0.01

Table A-6: Results of multilevel models with three levels (individual, country–periods, and country), interactions, women

	Model 6	Model 7
Dataset (ESS: ref.)	1.474***	1.493***
	(0.112)	(0.113)
Immigrant (Native: ref.)	0.768***	0.765***
	(0.070)	(0.070)
With religious background (Without: ref.)	1.154**	1.156**
	(0.069)	(0.069)
Age	0.995	0.995
	(0.006)	(0.006)
Sex ratio, graduates in tertiary education	1.142	1.133
	(0.092)	(0.090)
Educational level (Upper sec.: ref.)		
Lower sec. or below	1.068	1.048
	(0.071)	(0.089)
Tertiary	1.652***	1.703***
	(0.095)	(0.128)
Gender equity	0.999	0.996
	(0.005)	(0.005)
Primary education × Gender equity	0.995	0.997
	(0.005)	(0.005)
Tertiary education × Gender equity	0.996	0.997
	(0.004)	(0.004)
Gender equity^2		0.999**
		(0.000)
Primary education × Gender equity^2		1.000
		(0.000)
Tertiary education × Gender equity^2		1.000
		(0.000)
Constant	0.026***	0.030***
	(0.008)	(0.010)
Level-2 standard deviation of random effect	0.236***	0.279***
	(0.058)	(0.065)
Level-3 standard deviation of random effect	0.424***	0.321***
	(0.078)	(0.084)
Observations	45,092	45,092
Number of groups	54	54
Number of groups	29	29

Notes: *** p<0.01, ** p<0.05

Table A-7: Results of multilevel models with three levels (individual, country–periods, and country), interactions, men

	Model 6	Model 7
Dataset (ESS: ref.)	1.198***	1.206***
	(0.077)	(0.078)
Immigrant (Native: ref.)	0.498***	0.499***
	(0.046)	(0.046)
With religious background (Without: ref.)	1.027	1.026
	(0.047)	(0.047)
Age	0.967***	0.966***
	(0.005)	(0.005)
Sex ratio, graduates in tertiary education	1.101	1.094
	(0.089)	(0.088)
Educational level (Upper sec.: ref.)		
Lower sec. or below	1.802***	1.653***
	(0.089)	(0.108)
Tertiary	0.831***	0.835**
	(0.046)	(0.060)
Gender equity	1.000	0.998
	(0.003)	(0.003)
Primary education × Gender equity	0.990***	0.991***
	(0.003)	(0.003)
Tertiary education × Gender equity	1.004	1.005
	(0.004)	(0.004)
Gender equity^2		1.000*
		(0.000)
Primary education × Gender equity^2		1.000**
		(0.000)
Tertiary education × Gender equity^2		1.000
		(0.000)
Constant	0.273***	0.299***
	(0.068)	(0.076)
Level-2 standard deviation of random effect	0.132***	0.154***
	(0.051)	(0.053)
Level-3 standard deviation of random effect	0.330***	0.297***
	(0.063)	(0.065)
Observations	38,887	38,887
Number of groups	54	54
Number of groups	29	29

Notes: *** p<0.01, ** p<0.05, * p<0.1

Table A-8: Results of multilevel logistic regression of lifelong singlehood on respondent's educational level, individual characteristics, and country-level variables, women and men, odds ratios (only ESS)

	Women				Men			
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Educational level (Upper sec.: ref.)								
Lower sec. or below		1.116	1.119	1.114		1.842***	1.846***	1.836***
		(0.081)	(0.081)	(0.081)		(0.098)	(0.098)	(0.098)
Tertiary		1.706***	1.712***	1.711***		0.861**	0.864**	0.863**
		(0.107)	(0.107)	(0.107)		(0.050)	(0.051)	(0.051)
Immigrant (Native: ref.)		0.812**	0.813**	0.808**		0.490***	0.492***	0.491***
		(0.079)	(0.079)	(0.079)		(0.048)	(0.048)	(0.048)
With religious background (Without: ref.)		1.184**	1.178**	1.179**		1.050	1.046	1.045
		(0.078)	(0.078)	(0.077)		(0.052)	(0.051)	(0.051)
Age		0.991	0.994	0.994		0.964***	0.965***	0.965***
		(0.006)	(0.006)	(0.006)		(0.004)	(0.005)	(0.005)
Sex ratio, graduates in tertiary education			1.108	1.115			1.072	1.076
			(0.091)	(0.089)			(0.086)	(0.085)
Gender equity			0.993	0.992*			0.995	0.995*
			(0.005)	(0.004)			(0.003)	(0.003)
Gender equity^2				0.999***				1.000**
				(0.000)				(0.000)
Constant	0.038***	0.044***	0.038***	0.047***	0,0402***	0.0302***	0.0261***	0.0321***
	(0.003)	(0.013)	(0.012)	(0.014)	(0.003)	(0.008)	(0.008)	(0.010)
Level-2 standard deviation of random effect	0.464***	0.470***	0.461***	0.408***	0.476***	0.495***	0.481***	0.422***
	(0.057)	(0.058)	(0.057)	(0.051)	(0.056)	(0.059)	(0.057)	(0.051)
Observations	38,887	38,887	38,887	38,887	34,007	34,007	34,007	34,007
Number of groups	54	54	54	54	54	54	54	54

Notes: *** p<0.01, ** p<0.05, * p<0.1

Table A-9: Results of multilevel logistic regression of lifelong singlehood on respondent's educational level and country-level interactions, women and men, odds ratios (only ESS)

	Women		Men	
	Model 6	**Model 7**	**Model 6**	**Model 7**
Immigrant (Native: ref.)	0.814**	0.807**	0.494***	0.492***
	(0.079)	(0.078)	(0.048)	(0.048)
With religious background (Without: ref.)	1.179**	1.180**	1.041	1.040
	(0.078)	(0.078)	(0.051)	(0.051)
Age	0.994	0.994	0.965***	0.965***
	(0.006)	(0.006)	(0.005)	(0.005)
Sex ratio, graduates in tertiary education	1.106	1.115	1.074	1.081
	(0.091)	(0.089)	(0.087)	(0.086)
Educational level (Upper sec.: ref.)				
Lower sec. or below	1.112	1.083	1.840***	1.700***
	(0.081)	(0.099)	(0.098)	(0.119)
Tertiary	1.705***	1.801***	0.851***	0.858**
	(0.107)	(0.145)	(0.050)	(0.066)
Gender equity	0.814**	0.807**	0.997	0.996
	(0.005)	(0.005)	(0.004)	(0.004)
Primary education × Gender equity	0.994	0.995	0.989***	0.990***
	(0.005)	(0.006)	(0.004)	(0.004)
Tertiary education × Gender equity	0.994	0.995	1.004	1.005
	(0.004)	(0.005)	(0.004)	(0.004)
Gender equity^2		0.999***		0.999**
		(0.000)		(0.000)
Primary education × Gender equity^2		1.000		1.000*
		(0.000)		(0.000)
Tertiary education × Gender equity^2		1.000		1.000
		(0.000)		(0.000)
Constant	0.039***	0.047***	0.350***	0.393***
	(0.012)	(0.014)	(0.086)	(0.098)
Level-2 standard deviation of random effect	0.460***	0.407***	0.333***	0.324***
	(0.057)	(0.051)	(0.044)	(0.043)
Observations	38,887	38,887	34,007	34,007
Number of groups	54	54	54	54

Notes: *** p<0.01, ** p<0.05, * p<0.1

Table A-10: Results of multilevel logistic regression of lifelong singlehood on respondent's educational level, individual characteristics, and country-level variables, women and men, odds ratios. Inclusion of the macro variable female graduated rate

	Women				Men			
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Educational level (Upper sec.: ref.)								
Lower sec. or below		1.091	1.093	1.087		1.814***	1.819***	1.808***
		(0.072)	(0.072)	(0.071)		(0.090)	(0.090)	(0.089)
Tertiary		1.660***	1.668***	1.667***		0.844***	0.847***	0.845***
		(0.095)	(0.096)	(0.096)		(0.046)	(0.046)	(0.046)
Dataset (ESS: ref.)		1.512***	1.493***	1.512***		1.224***	1.210***	1.218***
		(0.114)	(0.113)	(0.114)		(0.078)	(0.078)	(0.078)
Immigrant (Native: ref.)		0.765***	0.768***	0.765***		0.495***	0.496***	0.494***
		(0.070)	(0.070)	(0.0701)		(0.045)	(0.046)	(0.045)
With religious background (Without: ref.)		1.162**	1.159**	1.161**		1.038	1.035	1.034
		(0.069)	(0.069)	(0.0692)		(0.048)	(0.047)	(0.047)
Age		0.991*	0.992	0.992		0.964***	0.966***	0.966***
		(0.005)	(0.006)	(0.006)		(0.004)	(0.005)	(0.00501)
Sex ratio, graduates in tertiary education			1.125	1.132			1.047	1.051
			(0.090)	(0.088)			(0.0819)	(0.081)
Female graduated rate			0.996	0.994			1.003	1.002
			(0.007)	(0.007)			(0.006)	(0.005)
Gender equity			0.992*	0.992*			0.994*	0.994*
			(0.005)	(0.004)			(0.003)	(0.003)
Gender equity^2				0.999***				1.000**
				(0.000)				(0.000)
Constant	0.0402***	0.0302***	0.0282***	0.0358***	0.074***	0.306***	0.274***	0.307***
	(0.003)	(0.008)	(0.009)	(0.012)	(0.004)	(0.069)	(0.073)	(0.082)
Level-2 standard deviation of random effect	0.476***	0.495***	0.478***	0.417***	0.379***	0.333***	0.323***	0.305***
	(0.056)	(0.059)	(0.057)	(0.050)	(0.045)	(0.042)	(0.042)	(0.040)
Observations	45,092	45,092	45,092	45,092	38,887	38,887	38,887	38,887
Number of groups	54	54	54	54	54	54	54	54

Notes: *** p<0.01, ** p<0.05, * p<0.1

Table A-11: Results of multilevel logistic regression of lifelong singlehood on respondent's educational level and country-level interactions, women and men, odds ratios. Inclusion of the macro variable female graduated rate

	Women		Men	
	Model 6	**Model 7**	**Model 6**	**Model 7**
Dataset (ESS: ref.)	1.496***	1.514***	1.207***	1.217***
	(0.113)	(0.115)	(0.078)	(0.079)
Immigrant (Native: ref.)	0.768***	0.764***	0.497***	0.496***
	(0.070)	(0.070)	(0.046)	(0.045)
With religious background (Without: ref.)	1.160**	1.161**	1.029	1.028
	(0.069)	(0.069)	(0.047)	(0.047)
Age	0.992	0.992	0.967***	0.967***
	(0.006)	(0.006)	(0.005)	(0.005)
Sex ratio, graduates in tertiary education	1.125	1.133	1.046	1.055
	(0.090)	(0.088)	(0.083)	(0.082)
Female graduated rate	0.995	0.994	1.004	1.003
	(0.007)	(0.007)	(0.006)	(0.006)
Educational level (Upper sec.: ref.)				
Lower sec. or below	1.079	1.057	1.798***	1.649***
	(0.072)	(0.089)	(0.089)	(0.108)
Tertiary	1.652***	1.714***	0.836***	0.852**
	(0.096)	(0.128)	(0.046)	(0.061)
Gender equity	0.994	0.994	0.995	0.995
	(0.005)	(0.005)	(0.004)	(0.004)
Primary education × Gender equity	0.996	0.997	0.990***	0.992**
	(0.005)	(0.005)	(0.003)	(0.003)
Tertiary education × Gender equity	0.996	0.996	1.004	1.005
	(0.004)	(0.004)	(0.004)	(0.004)
Gender equity^2		0.999***		0.999***
		(0.000)		(0.000)
Primary education × Gender equity^2		1.000		1.000**
		(0.000)		(0.000)
Tertiary education × Gender equity^2		1.000		1.000
		(0.000)		(0.000)
Gender gap in equity				
Primary × Gender gap in equity				
Tertiary × Gender gap in equity				
Constant	0.027***	0.036***	0.273***	0.310***
	(0.009)	(0.012)	(0.073)	(0.084)
Level-2 standard deviation of random effect	0.477***	0.417***	0.330***	0.316***
	(0.056)	(0.050)	(0.042)	(0.041)
Observations	45,092	45,092	38,887	38,887
Number of groups	54	54	54	54

Notes: *** p<0.01, ** p<0.05

Table A-12: Results of multilevel logistic regression of lifelong singlehood on respondent's educational level, individual characteristics, and country-level variables, women and men, odds ratios. Change of periods for gender equity indicator, 1989–1992 and 1993–1999

	Women				Men			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Educational level (Upper sec.: ref.)								
Lower sec. or below		1.054	1.059	1.054		1.826***	1.839***	1.834***
		(0.072)	(0.072)	(0.072)		(0.092)	(0.093)	(0.093)
Tertiary		1.647***	1.657***	1.655***		0.857***	0.865**	0.864**
		(0.098)	(0.099)	(0.099)		(0.049)	(0.049)	(0.049)
Dataset (ESS: ref.)		1.544***	1.531***	1.543***		1.211***	1.196***	1.199***
		(0.123)	(0.122)	(0.123)		(0.081)	(0.080)	(0.081)
Immigrant (Native: ref.)		0.792**	0.794**	0.790**		0.516***	0.519***	0.518***
		(0.076)	(0.076)	(0.076)		(0.049)	(0.050)	(0.050)
With religious background (Without: ref.)		1.177***	1.173***	1.175***		1.030	1.026	1.026
		(0.073)	(0.072)	(0.073)		(0.048)	(0.048)	(0.048)
Age		0.992	0.996	0.996		0.966***	0.967***	0.967***
		(0.005)	(0.006)	(0.006)		(0.004)	(0.005)	(0.005)
Sex ratio, graduates in tertiary education			1.127	1.133			1.059	1.062
			(0.091)	(0.091)			(0.081)	(0.081)
Gender equity			0.990**	0.992*			0.990***	0.991***
			(0.005)	(0.005)			(0.003)	(0.003)
Gender equity^2				0.999***				1.000
				(0.000)				(0.000)
Constant	0.040***	0.028***	0.023***	0.027***	0.076***	0.290***	0.275***	0.285***
	(0.003)	(0.008)	(0.007)	(0.009)	(0.004)	(0.067)	(0.068)	(0.071)
Level-2 standard deviation of random effect	0.489***	0.508***	0.491***	0.456***	0.370***	0.319***	0.291***	0.289***
	(0.060)	(0.062)	(0.060)	(0.056)	(0.045)	(0.042)	(0.040)	(0.039)
Observations	41,602	41,602	41,602	41,602	36,251	36,251	36,251	36,251
Number of groups	50	50	50	50	50	50	50	50

Notes: *** p<0.01, ** p<0.05, * p<0.1

Table A-13: Results of multilevel logistic regression of lifelong singlehood on respondent's educational level and country-level interactions, women and men, odds ratios. Change of periods for gender equity indicator, 1989–1992 and 1993–1999

	Women		Men	
	Model 6	**Model 7**	**Model 6**	**Model 7**
Dataset (ESS: ref.)	1.536***	1.548***	1.193***	1.199***
	(0.122)	(0.123)	(0.080)	(0.081)
Immigrant (Native: ref.)	0.795**	0.790**	0.520***	0.520***
	(0.076)	(0.076)	(0.050)	(0.050)
With religious background (Without: ref.)	1.175***	1.177***	1.020	1.019
	(0.073)	(0.073)	(0.048)	(0.048)
Age	0.996	0.996	0.967***	0.967***
	(0.006)	(0.006)	(0.005)	(0.005)
Sex ratio, graduates in tertiary education	1.126	1.133	1.059	1.066
	(0.091)	(0.090)	(0.081)	(0.081)
Female graduated rate	1.536***	1.548***	1.193***	1.199***
	(0.122)	(0.123)	(0.080)	(0.081)
Educational level (Upper sec.: ref.)				
Lower sec. or below	1.053	1.046	1.829***	1.667***
	(0.072)	(0.090)	(0.093)	(0.109)
Tertiary	1.649***	1.693***	0.850***	0.863**
	(0.099)	(0.129)	(0.049)	(0.063)
Gender equity	0.992	0.994	0.992**	0.992**
	(0.005)	(0.005)	(0.003)	(0.004)
Primary education × Gender equity	0.998	0.998	0.990***	0.991***
	(0.005)	(0.005)	(0.003)	(0.003)
Tertiary education × Gender equity	0.995	0.996	1.003	1.004
	(0.004)	(0.004)	(0.004)	(0.004)
Gender equity^2		0.999**		1.000
		(0.000)		(0.000)
Primary education × Gender equity^2		1.000		1.000**
		(0.000)		(0.000)
Tertiary education × Gender equity^2		1.000		1.000
		(0.000)		(0.000)
Constant	0.024***	0.027***	0.278***	0.294***
	(0.007)	(0.009)	(0.069)	(0.074)
Level-2 standard deviation of random effect	0.488***	0.454***	0.299***	0.298***
	(0.059)	(0.056)	(0.040)	(0.040)
Observations	41,602	41,602	36,251	36,251
Number of groups	50	50	50	50

Notes: *** p<0.01, ** p<0.05

Table A-14: Results of multilevel logistic regression of lifelong singlehood on respondent's educational level, individual characteristics, and country-level variables, women and men, odds ratios. Inclusion of gender equity index

	Women				Men			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Educational level (Upper sec.: ref.)								
Lower sec. or below		1.059	1.061	1.059		1.836***	1.837***	1.831***
		(0.072)	(0.072)	(0.072)		(0.094)	(0.094)	(0.093)
Tertiary		1.643***	1.649***	1.651***		0.856***	0.858***	0.858***
		(0.098)	(0.099)	(0.099)		(0.049)	(0.049)	(0.049)
Dataset (ESS: ref.)		1.526***	1.510***	1.513***		1.202***	1.195***	1.196***
		(0.122)	(0.121)	(0.121)		(0.081)	(0.081)	(0.081)
Immigrant (Native: ref.)		0.792**	0.792**	0.792**		0.509***	0.510***	0.510***
		(0.077)	(0.077)	(0.077)		(0.050)	(0.050)	(0.050)
With religious background (Without: ref.)		1.181***	1.179***	1.178***		1.017	1.016	1.015
		(0.073)	(0.073)	(0.073)		(0.048)	(0.048)	(0.048)
Age		0.992	0.995	0.996		0.966***	0.968***	0.968***
		(0.005)	(0.006)	(0.006)		(0.004)	(0.005)	(0.005)
Sex ratio, graduates in tertiary education			1.134	1.146*			1.075	1.086
			(0.091)	(0.091)			(0.084)	(0.084)
Gender equity Index			0.994	0.994			0.997	0.998
			(0.004)	(0.004)			(0.003)	(0.003)
Gender equity Index^2				1.000**				1.000**
				(0.000)				(0.000)
Constant	0.041***	0.029***	0.024***	0.027***	0.0757***	0.291***	0.268***	0.287***
	(0.003)	(0.008)	(0.008)	(0.009)	(0.004)	(0.068)	(0.068)	(0.073)
Level-2 standard deviation of random effect	0.473***	0.493***	0.481***	0.454***	0.375***	0.330***	0.328***	0.314***
	(0.058)	(0.061)	(0.059)	(0.057)	(0.046)	(0.044)	(0.044)	(0.042)
Observations	41,122	41,122	41,122	41,122	35,617	35,617	35,617	35,617
Number of groups	50	50	50	50	50	50	50	50

Notes: *** p<0.01, ** p<0.05

Table A-15: Results of multilevel logistic regression of lifelong singlehood on respondent's educational level and country-level interactions, women and men, odds ratios. Inclusion of gender equity index

	Women		Men	
	Model 6	**Model 7**	**Model 6**	**Model 7**
Dataset (ESS: ref.)	1.513***	1.510***	1.189**	1.190**
	(0.121)	(0.121)	(0.081)	(0.081)
Immigrant (Native: ref.)	0.793**	0.788**	0.511***	0.512***
	(0.077)	(0.076)	(0.050)	(0.050)
With religious background (Without: ref.)	1.181***	1.180***	1.009	1.007
	(0.073)	(0.073)	(0.048)	(0.048)
Age	0.995	0.996	0.968***	0.968***
	(0.006)	(0.006)	(0.005)	(0.005)
Sex ratio, graduates in tertiary education	1.134	1.146*	1.075	1.089
	(0.091)	(0.091)	(0.085)	(0.085)
Female graduated rate	1.513***	1.510***	1.189**	1.190**
	(0.121)	(0.121)	(0.081)	(0.081)
Educational level (Upper sec.: ref.)				
Lower sec. or below	1.059	1.039	1.834***	1.621***
	(0.072)	(0.091)	(0.093)	(0.105)
Tertiary	1.648***	1.845***	0.835***	0.820***
	(0.099)	(0.142)	(0.049)	(0.060)
Gender equity index	0.994	0.996	1.000	1.000
	(0.005)	(0.005)	(0.003)	(0.003)
Primary education × Gender equity index	1.000	1.001	0.989***	0.991***
	(0.004)	(0.004)	(0.003)	(0.003)
Tertiary education × Gender equity index	0.998	0.997	1.003	1.004
	(0.004)	(0.004)	(0.004)	(0.004)
Gender equity index^2		1.000		1.000***
		(0.000)		(0.000)
Primary education × Gender equity index^2		1.000		1.000***
		(0.000)		(0.000)
Tertiary education × Gender equity index^2		1.000**		1.000
		(0.000)		(0.000)
Constant	0.025***	0.027***	0.270***	0.300***
	(0.008)	(0.008)	(0.069)	(0.077)
Level-2 standard deviation of random effect	0.479***	0.451***	0.342***	0.330***
	(0.059)	(0.057)	(0.045)	(0.044)
Observations	41,122	41,122	35,617	35,617
Number of groups	50	50	50	50

Note: *** p<0.01, ** p<0.05, * p<0.1