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ABSTRACT

Social Norms, Labor Market Opportunities, and the Marriage Gap for Skilled Women*

In most of the developed world, skilled women marry at a lower rate than unskilled women. We document heterogeneity across countries in how the marriage gap for skilled women has evolved over time. As labor market opportunities for women have improved, the marriage gap has been growing in some countries but shrinking in others. We discuss the comparative statics of a theoretical model in which the (negative) social attitudes toward working women might contribute to the lower marriage rate of skilled women, and might also induce a non-monotonic relationship between their labor market prospects and their marriage outcomes. The model delivers predictions about how the marriage gap for skilled women should react to changes in their labor market opportunities across economies with more or less conservative attitudes toward working women. We verify the key predictions of this model in a panel of 26 developed countries, as well as in a panel of US states.

JEL Classification: J12, J16

Keywords: social norms, marriage gap, labor market opportunities

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* Research support from the Global Asia Institute JY Pillay Comparative Asia Research Centre Grant is gratefully acknowledged. We thank seminar participants at the NBER Summer Institute, 2015 SOLE/EALE Meetings, Hitotsubashi Summer Institute in Labor Economics, Harvard University, Hunter College, Uppsala University, and the 2016 ASSA Meetings for numerous helpful comments. Maria Dolores Palacios provided excellent research assistance.

1 Introduction

Marriage rates have been declining throughout most of the industrialized world. In 2010, one in five adults aged 35 to 44 in the US had never married, compared to about 7 percent in 1970 (Pew Research Center, 2014). The marriage rate in the EU-28 declined by close to 50 percent between 1965 and 2011, from 7.8 per 1,000 persons to 4.2 (Eurostat, 2015).[1] Similarly, the proportion of single women aged 35 to 39 has increased in East Asia (Jones and Gubhaju, 2009), reaching about one in five in Hong Kong and Japan by the mid to late 2000s compared to one in twenty, at most, in 1970. This overall decline in the marriage rate in the industrialized world has received widespread attention in the literature, and influential work has discussed a range of contributing factors such as improved access to birth control and abortion, labor-saving technological change in household production, greater ease of divorce, rising income inequality, and reduced gender discrimination and gender wage gaps in the labor market (see, among others, Blau and Kahn, 2000, Goldin and Katz, 2002, Gould and Paserman, 2003, Greenwood et al., 2005, Goldin, 2006, Rasul, 2006, Stevenson and Wolfers, 2007, Greenwood and Guner 2009, Gonzalez and Viitanen, 2009, Greenwood et al., 2016).

A somewhat more overlooked aspect of the discussion surrounding the overall decline in marriage has been how it has differentially affected skilled and unskilled women across the industrialized world. In the US, research has documented a reversal over time of the skilled-unskilled marriage gap, with college-educated women today being as likely, if not more likely, to get married relative to those without a college education (Isen and Stevenson, 2010, Pew Research Center, 2010). In contrast, a number of countries in East Asia have been grappling with the reverse phenomenon, with highly educated women today marrying at a particularly low rate relative to their less educated counterparts (Economist, 2011, Hwang, 2016). For example, 35 percent of college-educated women between the age 35 and 39 in Hong Kong remained single in 2011, and many of these women will likely remain childless given how rare out-of-wedlock births remain in most of Asia (OECD Family Database, 2012).[2]

In this paper, we start by systematically documenting the marriage gap between skilled and unskilled women today in a cross section of 26 developed countries, as well as the evolution of this marriage gap since the 1990s. While skilled women overall marry at a lower rate than unskilled ones, there is substantial heterogeneity across developed countries. Moreover, we show that the gap has been decreasing, and in some cases even reversing, in North America, most Nordic countries, and some parts of Western Europe. On the other hand, the gap has remained constant or widened

[1] `http://ec.europa.eu/eurostat/statistics-explained/index.php/Marriage_and_divorce_statistics`

[2] In 2012, the share of births outside of marriage was just over 2 percent in Korea and Japan, compared to the OECD average of 39 percent. The share of out-of-wedlock births in the US is about 40 percent (OECD Family Database, 2012).

in East Asian countries as well asin parts of Southern and Eastern Europe. This divergence in the educational marriage gap across developed countries has occurred despite consistent patterns of increased labor market opportunities for skilled women (and men) in all of these countries.

A closer look at the US experience over the longer term reveals a U-shaped relationship in the marriage gap between skilled and unskilled women (Figure 1, Panels A and B). In Panel A of Figure 1, we plot the difference in ever married rates between college and non-college educated women aged 40 to 44 by birth cohort. The relative marriage deficit experienced by skilled women increased between the early 1930s birth cohorts and the mid-1950s birth cohorts, during which it reached its maximum (about a 6 percentage point deficit). Since then, the skilled-unskilled gap in marriage rate has been rapidly shrinking, with a reversal of the gap first occuring among the cohorts born in the late 1960s. Panel B of Figure 1 plots, by birth cohort, the difference in the likelihood of having a family (which we define as having been ever married and having at least one child) between college and non-college educated women aged 40-44. Again, we see a clear U-shaped relationship. Between the early 1930s to the early 1950s birth cohorts skilled women were increasingly less likely to have a family compared to unskilled women. The difference has since then been shrinking, with a reversal of the gap first occurring among the cohorts born in the mid-1970s.

Our paper aims to provide a theoretical rationale for the heterogeneity in the educational gap in marriage rates across developed countries, the diverging patterns across countries as labor market opportunities for skilled women increase, and the U-shaped relationship documented above. Our model closely follows Fernandez, Fogli, and Olivetti (FFO, 2002, 2004). We abstract away from the rich intergenerational dynamics in FFO's model and instead focus on the implication of FFO's model for how women's educational investments affect their marriage probabilities. In this model, a marriage gap between skilled and unskilled women emerges endogenously as a consequence of skilled women's higher market wages and the different time allocation decisions these higher market wages generate. The key force in the model behind the emergence of this marriage gap is gender norms that generate spousal disagreement over the provision of the household public good (i.e., children). Because skilled women have higher wages, they provide less of that public good relative to unskilled women. This makes them less attractive to potential partners in the marriage market, at least for some values of the wage rate. Thus, a woman's education decision might potentially be associated with a trade-off between a higher return in the labor market and a lower marriage probability.

The predictions of the theoretical model further emphasize how the strength of the marriage/work trade-off faced by skilled women is a non-monotonic function of their economic opportunities. In particular, holding gender norms constant, the model predicts a U-shaped relationship between the marriage deficit experienced by skilled women and their market wage. Intuitively, at lower wage levels, the loss in public good consumption due to the wife working—the likelihood of which is increasing in her market wage—dominates the husband's gains due to the externality he experiences

from his wife's consumption. However, when the wife's market wage (possibly net of childcare costs) is high enough, she becomes increasingly more attractive relative to a non-working woman. Thus, assuming fixed or slow-moving social norms within a country, the model predicts that we should see that, as women's labor market opportunities increase, the marriage deficit experienced by skilled women first rises, reaches a peak, and then declines, eventually becoming a surplus.

The model also allows us to perform some comparative statics with respect to the strength of gender norms. Holding wages constant, the model predicts that the relative deficit skilled women experience in the marriage market is more severe in countries with more conservative gender norms. In addition, the model shows that the range of wages over which skilled women experience relatively lower marriage rates is much larger in countries with more conservative gender norms.

In the empirical section of the paper, we first take the key predictions of the theory to our panel of 26 developed countries. As predicted by the model, we find a strong positive relationship between the relative deficit skilled women experience in the marriage market and the degree of gender-related conservatism. We also show that the relationship between the skilled-unskilled gap in marriage rates and women's labor market opportunities appears to differ markedly across groups of countries in a way that is consistent with the prediction of a U-shaped relationship derived by the model, with increases in skilled women's wages decreasing their relative likelihood of marrying in more traditional countries but increasing this likelihood in countries with more equal gender norms. We demonstrate the robustness of these results to alternative definitions of a long-term and stable relationship between a man and a woman, such as definitions that include cohabitation or focus instead on fertility outcomes. We also show that the results are not driven solely by the East Asian countries and are robust to alternative measures of gender norms.

A final implication of the theory that we bring to the data is with respect to women's educational choice. Our model predicts that in more conservative countries, a lower fraction of women are willing to acquire higher education as they anticipate facing greater barriers in the marriage market if they become more skilled. This is exactly what we find: the share of females with tertiary education in our sample of developed countries is negatively related to the strength of the gender norms. Moreover, consistent with the underlying mechanism in the model, we find that a relatively higher share of women is educated in countries where the marriage market deficit for skilled women is smaller.

We also take the predictions of the theoretical model to a panel of US states covering the 1970 to 2010 period. One key benefit of this replication exercise is that the variation we exploit within a single country (the US) is less subject to the unobserved heterogeneity concerns that mire most cross-country analyses. Exploiting differences across 45 states in the strength of gender norms, we show that the key findings from the country panel carry through in the US state panel. The longer time series in the sample of US states also allows us to directly document the predicted U-shaped

relationship between the educational marriage gap and skilled women's wages over time, and to compare this relationship across states grouped by the relative conservativeness of their gender norms.

The rest of the paper is organized as follows. Section 2 discusses the related literature. Section 3 describes the data and presents some descriptive facts for the cross-country sample. Section 4 presents a static model of marriage, household decision making and education decisions. Section 5 lays out the empirical tests of the model and presents the results using the cross-country panel and the panel of US states. Section 6 concludes.

2 Related Literature

Our paper is related to a recent and growing macro labor literature that has examined the relationship between women's education and marriage. This literature has been broadly motivated by the desire to explain the US experience over the last 50 years or so, and in particular by these three main trends: the reversal of the gender gap in education, the decline in marriage rate, and the increased labor force participation of married women. A couple of papers have focused on the impact of improvement in the home production technology, which has asymmetrically benefited women as it requires them to spend less time at home. Chiappori et al. (2009) develop a theoretical equilibrium framework for the joint determination of educational choices and marriage patterns of men and women. They show how, under this framework, a decline in the amount of time women must spend in home production has increased their return from schooling within the marriage (as they can spend more time in the market). These increased marriage market returns, Chiappori et al. (2009) argue, can explain both increased investment in schooling among women relative to men, as well as increased marriage rates for educated women. Greenwood et al. (2016) develop and estimate a unified structural model of marriage and divorce (by education level), educational attainment, and married female labor force participation. They consider two sources of shock to explain changes in marriage rates and educational choices between 1960 and 2005 in the US: technological change in home production and changes in the wage structure. They conclude that technological progress, by eroding the value of labor at home, played a crucial role in the decline in marriage (as well as the rise of married women's labor force participation). While an increase in the college premium and decline in the gender wage gap also contributed to the decline in marriage (as singlehood has become more affordable), Greenwood et al. (2016) argue that these changes in the wage structure did not play as quantitatively important of a role as did the change in home production technology. Increases in the college premium were important drivers of rising educational attainment for both men and women, but women experienced an extra incentive to boost their education as technological change put greater emphasis on the value of spousal labor

in the market relative to the home. However, Greenwood et al. (2016) also show that their model, while directionally correct, does not do a great job at quantitatively matching the lower decline in the marriage rate among college-educated women between 1960 and 2005. Neither of these models appears immediately well suited to explain the divergent experiences in the educational marriage gap across industrialized countries and US states over time that motivate our study.

Another set of papers, also mainly motivated by the US experience, have focused on the role of female education as insurance against a bad marriage, and how changes in divorce laws (such as the switch from the consent divorce regime to a unilateral regime) may have impacted education choices and marriage patterns. Guvenen and Rendall (2015) build an equilibrium model of education, marriage (and divorce), and labor supply decisions that assumes that women bear a larger cost in case of divorce and document the protective role education can play for women under their framework, both by allowing women to be better able to survive a divorce and by also reducing the odds of their being trapped in a bad marriage. Using this model, they demonstrate how a move toward a unilateral divorce regime might explain the increased relative educational attainment for women, a rise in married women's labor supply, and a decline in the marriage rate. In a sample of 12 European countries, Guvenen and Rendall (2015) also show a positive correlation between changes in the relative college attainment rate of women between the 1960s and the 2000s and changes in divorce rates over the same time period.[3] Again, these models are not well suited to explain divergent patterns in the educational marriage gap across industrialized countries and US states.

Our paper is also part of a literature that has studied the correlation between gender norms and various socio-economic outcomes. Fortin (2005) uses data similar to ours (World Values Surveys and OECD data) to show a robust cross-country negative correlation between more conservative gender norms and female labor market outcomes (labor force participation and earnings relative to men). Bertrand et al. (2015), building on seminal work by Akerlof and Kranton (2000), present evidence that suggests that gender identity norms impact relative income within households, as well as marriage formation, the wife's labor force participation and earnings conditional on working, marriage satisfaction, likelihood of divorce, and the division of home production. Gimenez-Nadal, Molina, and Sevilla-Sanz (2012) develop a static partial equilibrium model of household formation in which social norms are modeled as a constraint on the allocation of household labor. The model predicts that more conservative gender norms will reduce the probability of forming a partnership, more so for the highly educated, who have the highest opportunity cost of time. Using the relative

[3]See also Fernandez and Wong (2014a, 2014b), who develop a quantitative life cycle model to explore the effects of change in divorce laws on marriage rates and female labor force participation. Unlike Guvenen and Rendall (2015), they do not endogenize the education response. They demonstrate how higher divorce risks such as those induced by a switch to a unilateral divorce regime increase married women's labor force participation and reduces their marriage rates.

participation of women versus men in household production at the country level as measure of social norms and data from seven European countries, they find that more conservative gender norms are negatively correlated with partnership formation, in particular for more educated women. They do not explore, theoretically or empirically, how this relationship changes as educated women's labor market opportunities increase. A few studies in this literature have discussed several mechanisms as to how social attitudes toward female work evolve as the education, work, and marriage decisions of women in one generation affect women's decisions in the next. For example, FFO (2004) assumes that sons of educated/working women have more egalitarian gender norms. If skilled women's earnings are sufficiently high so that men raised by educated/working mothers strictly prefer marrying an educated/working wife, an increase in the share of working mothers in one generation can lead to an increase in the share of educated/working women in the next generation because it improves their marriage prospects. Other mechanisms of changing social attitutes involve changes in women's beliefs about the effect of maternal employment on children stemming from the observation of the behaviors and outcomes of neighboring women (Fogli and Veldkamp, 2011), as well as changes in women's own sense of self (Fernandez, 2013). Hazan and Maoz (2002) present a model where going against traditional gender roles (i.e., if the wife works) costs a household a utility penalty whose strength depends on past rates of labor force participation of women. Our analysis abstracts from modeling such changes.

Our paper is also related to a small but growing literature that emphasizes how the interaction between economic development (and in particular, women's growing labor market opportunities) and social norms impacts marriage and fertility.[4] Hwang (2016) uses a variant of FFO's (2004) dynamic model of intergenerational transmission of gender attitudes to rationalize the decreasing marriage rates experienced by female college graduates in developed Asian economies. In Hwang's (2016) model, mothers' education affects their son's preferences: only men born to college educated mothers acquire nontraditional gender role attitudes. Thus, Hwang shows, in a society with very few college-educated mothers most men are traditional, and skilled women face a large marriage penalty. Another related paper is Kawaguchi and Lee (2017) who argue that the high demand for foreign brides in developed Asian economies is the consequence of improvements in women's economic status in countries characterized by very traditional gender roles. While both of these papers focus almost exclusively on rationalizing the recent East Asian experience, our paper takes a broader view and proposes a simple model that can reconcile the divergent marriage patterns observed in a large sample of developed countries.

Finally, our paper is closest in spirit to earlier work by Feyrer et al (2008), who propose that cross-country fertility patterns can be explained by the interaction between the increasing status of women in the workforce and their status in the household. Like us, Feyrer et al (2008) suggest

[4]Anderson and Bidner (2015) study such interaction in the developing country context, showing how women's rights over the dowry may deteriorate with economic development.

the possibility of a non-monotonic relationship between changes over time in the status of women in the workforce and an important social outcome (fertility, in their case) due to slow changing norms. At low levels of female wages, women specialize in household production and fertility is high. In the intermediate phase, women have more opportunities in the labor market but still shoulder the bulk of household production, resulting in much reduced fertility. Finally, as women's labor market opportunities further improve, men begin to share in the burden of child care at home and fertility is higher than in the intermediate phase. Our specific focus (differences in marriage market outcomes for skilled vs unskilled women and implications for women's educational choices) is obviously different and we propose a formal model to guide our thinking, but at the core, both Feyrer et al (2008) and our paper share an interest in exploring the implications of slow moving gender norms in the face of growing labor market opportunities for women.

3 Cross-Country Sample: Data Description and Descriptive Facts

Countries

The selection of countries is based on the following process. We start with the set of high-income countries (as classified by the World Bank) in Europe, Asia, and North America. From this set, we exclude very small countries (those with a population smaller than four million in 2015). Finally, we exclude countries (mainly Asian) for which micro wage data is not available. Our final sample consists of the following 26 developed countries: Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Hungary, Ireland, Italy, Japan, Korea, Netherland, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Taiwan, the UK, and the US.

Gender Norms

We use two main sources of data to measure cross-country differences in attitudes toward the role of women in society. The first dataset is the Integrated Values Survey (IVS), which is a harmonized dataset that covers both the European Value Survey (EVS) and the World Value Survey (WVS). This dataset provides a range of gender-related questions that were asked consistently across a broad set of countries. For our main analysis, we use the following question: "When jobs are scarce, men have more right to a job than women." The possible responses to the question are: agree, disagree or neither. We interpret agreement to this question as expressing the view that it is more important for men to be employed in the labor market relative to women. We chose this question as it provides us with the broadest coverage of countries. For each country, we focus on the responses of individuals aged 18 and older. Appendix Table 1 reports the average response to this question for each of the 26 countries in our sample for both 1990 and the latest available year,

as well as information on the region and sexism group (high, medium, and low) that each country belongs to.

While this variable clearly measures some degree of conservatism toward gender roles, one concern is that it does not directly contrast the specific gender roles that are central in our theoretical model below. The social norm in the model is based on the belief that a woman's primary sphere is in the home (provision of the household public good) while a man's primary sphere is in the labor market. To get at this norm more directly, we turn to a second data source, the International Social Science Program (ISSP). The ISSP is a cross-country collaboration that seeks to build on pre-existing social surveys such as the General Social Survey (GSS) to allow for cross-country comparisons of social trends. Each year, the ISSP rotates a set of topics. Our analysis draws on the questions in the 2002 and 2012 waves of the Family and Changing Gender Roles module. To complement our measure from the IVS, we use the following question from the ISSP: "A man's job is to earn money; a woman's job is to look after the home and family." Respondents indicate their agreement to this statement on a five-point scale: agree strongly, agree, neither agree nor disagree, disagree, or disagree strongly. We code the responses "agree" and "strongly agree" as indicating a greater degree of gender conservatism. The downside of relying on this question is that our sample is reduced by three countries.[5]

As expected, there is significant variation in these gender attitude measures across regions. On average, about a third of East Asians agree with both statements, but only between 3 to 9 percent of people in the Nordic countries do. Countries in Eastern Europe also appear quite conservative, particularly with regard to the ISSP measure. Canada and the United States, as well as parts Western Europe, seem to have more liberal gender norms compared to countries in Southern Europe. Across countries, the correlation between the average response to the IVS and ISSP questions is high (0.81).

In most countries, males are more likely to agree with the statements. Interestingly, though, the gender gap within a country is rarely larger than 5 percentage points.[6] Given that the differences in responses between males and females are not large (particularly in terms of the cross-country variation), we will focus for our main analysis on the average response to the questions across gender groups. Because of the relatively small sample sizes available for each country in the attitude surveys, focusing on the average response also allows us to construct a more precise measure of gender-related attitudes across countries. Nonetheless, the empirical results below are qualitatively similar if we rely only on male responses to the survey questions.[7]

[5]See Appendix Table 1 for the average response to this question for each country with ISSP data. Hong Kong, Greece, and Italy are excluded from the 2002 and 2012 ISSP samples.

[6]Country-level attitudes by gender are not presented in Appendix Table 1, but are available upon request.

[7]The cross-country correlation between our measure and one constructed by limiting the sample to males aged 30-60 is very high (0.95). All the cross-country results are robust to using the male measure.

Our empirical analysis exploits cross-country variation in gender norms in a panel data set exercise covering the period 1995-2010. In order to avoid reverse causation concerns, we use data from the 1990 IVS to construct our main sexism measure.[8] An important assumption is therefore that the cross-sectional variation observed in 1990 is persistent over time. Appendix Figure 1 presents the sexism index at the country level at two points in time: 1990 and the most recent year (varying from 2006 to 2012). The figure shows that while most countries have experienced a decline in the conservativeness of gender attitudes, the relative ranking of countries in terms of average responses to the gender-related attitude question has remained largely constant over time.[9] The Spearman rank correlation index between the two periods is high (0.86). We also note that conservative countries in 2010 are still very conservative: most countries in East Asia, Eastern Europe and Southern Europe are more sexist in 2010 than North America and the Nordic countries were 20 years before.[10]

Unfortunately, our ISSP-based measure cannot predate the period of our empirical analysis, as the sample of surveyed countries was too small in survey's early waves. Given that we use two years of data (2002 and 2012) to construct the country-specific aggregate measure of gender norms, we first remove the survey year effect by obtaining the residuals from a regression of the individual responses on a dummy for the 2012 survey year. We use the residuals from this regression to create a country-specific measure of "average" gender norms, which is simply the mean of the residual individual-level responses in a given country.

For ease of interpretation, we standardize the IVS and ISSP gender norm measures to have a mean zero and a standard deviation one in the sample of 26 countries.

Marriage Rates

Our marriage outcomes are based on individuals aged 35-44. This age range was chosen as a compromise between having data for the most recent cohort (individuals aged 35-44 in 2010) and observing completed first marriage decisions among individuals in each cohort. The coding of the marital status variable varies by data source and country.[11] In most countries, "married" individuals include either formal unions or registered partnerships.

Figure 2 documents the cross-country variation, as of 2010, in the skilled-unskilled marriage rate

[8] The question "When jobs are scarce, men have more right to a job than women" was not included in the first wave (1981-1984) of the survey.

[9] Due to data availability, we are unable to exploit within-country variation over time in gender norms. Note, however, that between-countries variation is much larger than within-country variation

[10] Furthermore, Fortin (2005) finds that gender norms measured by the response to the questions "Being a housewife is just as fulfilling as working for pay" and "A working mother can establish just as warm and secure a relationship with her children as a mother who does not work" have been more stable over time compared to the faster change suggested by answers to "Scarce jobs should go to men first."

[11] Details on the coding for each data source can be found in the Data Appendix.

gap for women and men.[12] We define the skilled-unskilled marriage rate gap among women (in the y-axis) as the difference between the fraction of women with tertiary education between 35 and 44 years old who were ever married and the fraction of women with less than tertiary education in the same age range who were ever married. Reported on the x-axis is the equivalent skilled-unskilled marriage rate gap among men. It is apparent from Figure 2 that, in the majority of the countries in our sample, more educated women marry at a lower rate than their less educated counterparts. In contrast, in the majority of countries, the marriage rate of more educated men is higher than the marriage rate of less educated men.

There are, however, some exceptions. In particular, in most Nordic countries (Norway, Sweden, and Finland), educated women marry at a higher rate than less educated ones; this is also the case in the US, the UK, Canada and Ireland. Also, skilled men marry at a lower rate than unskilled men in Italy, Austria, Spain, Switzerland, and Greece. Nonetheless, even in these cases, the skilled-unskilled marriage gap is always smaller in absolute value for males relative to females.

Figures 3A and 3B show how the skilled-unskilled marriage market gaps among women and men, respectively, have been evolving over time. In particular, we report the difference in marriage rates between skilled and unskilled individuals aged between 35 and 44 years at four points in time: 1995, 2000, 2005, and 2010. For these figures, we classify countries into six different groups based largely on geography.

In the US, Canada, the UK, and Ireland, while skilled women in the earliest cohort married at a lower rate than unskilled women in that same cohort, this gap diminished over time and had fully reversed in sign by the 2005 and 2010 cohorts (Figure 3A). A qualitatively similar picture emerges in other Western European countries – France, Germany, Belgium, the Netherlands, and Switzerland – with the exception of Austria, with declining skilled-unskilled gaps in female marriage rates even though these countries did not experienced a reversal of the gap by 2010. Most of the Nordic countries, with the exception of Denmark, have also experienced an overall decline over time in the probability of unskilled women marrying at a higher rate than skilled women. In fact, as of 2010, all of the Nordic countries, again with the exception of Denmark, are characterized by a higher marriage rate for skilled women relative to unskilled ones.

The patterns over time for East Asian countries are quite different. While more educated women married at a much lower rate than less educated ones in the earliest cohort, this gap has been largely growing over time. The only exception to this pattern is Hong Kong, where the skilled-unskilled marriage gap is slightly smaller (in absolute value) in the most recent cohort (women aged 35 to 44 in 2010) than in the first cohort (women aged 35 to 44 in 1995). Southern Europe and Eastern Europe are characterized by a relatively flat trend in the marriage rate gap between education

[12] Following the Eurostat education classification, we define skilled individuals as those who completed tertiary education (individuals who completed ISCED levels 5 or 6).

levels, with skilled women being less likely to get married throughout the sample period.

Figure 3B reports similar trends for the marriage rate of skilled men compared to unskilled men. As indicated above, in 2010, educated men married at a higher rate than their less educated counterparts in most countries in our sample. It is apparent from Figure 3B that this pattern was the norm in most countries throughout the sample period. There are, however, a few exceptions, especially in the earlier cohorts in Western and Southern Europe.

A comparison of the trends between men and women across various groups of countries is also interesting. The contrast between men and women over time in East Asia is particularly striking. While the probability of more educated women being married relative to less educated women has been declining over time in those countries (Figure 3A), the overall trend appears to move in the opposite direction among men, with educated men experiencing a higher relative marriage rate in the latest cohort than in the earliest cohort.

In Appendix Figures 2A and 2B, we present marriage rate trends separately by education group and gender. As observed, in most countries, marriage rates have trended downwards for both genders and education groups. Therefore, positive trends in the marriage rate of skilled women compared to unskilled women are explained by marriage rates for the skilled decreasing at a lower rate than marriage rates for the unskilled and not by absolute increases in the rates for skilled women. Potential causes of the overall decline in marriage rates across all groups and countries are the reduction in the gains from marriage brought about by technological innovations in the household sector (Greenwood, Guner, Kocharkov, and Santos, 2016), changes in divorce laws (Rasul, 2006 and Gonzalez and Viitanen, 2009) and the introduction of the pill (Goldin and Katz, 2002).[13]

Labor Market Outcomes

For each country and year, we construct various measures of labor market opportunities for skilled women aged 25 to 54. These measures include the average annual wages of high-skilled females, the gender wage gap by skill group, and the skilled-unskilled wage premium for males and females.[14] The wage sample is based on full-time workers, defined as those working 35 plus hours per week. For a small number of countries where workers' full-time status is not available, we use the average wages for all workers. To facilitate cross-country comparisons, we convert all the country-specific annual wage measures to 2000 US$ using the PPP conversion factors from the World Bank. Details

[13] Another explanation proposed in the literature to explain the US case is the increase in inequality (Gould and Paserman, 2003); however, it does not necessarily apply to other countries.

[14] Ideally, we would have liked to construct labor market conditions for individuals aged 35-44 in year t based on the labor market outcomes of those aged 25-54 in year $t-10$ as this might be closer to the labor market conditions that were prevalent when making marital status decisions. However, due to data limitations, this is not feasible, as this would entail a much smaller set of countries for our analysis. We do, however, use these more accurate measures in our US state panel exercise.

on the construction of the labor market variables can be found in the Data Appendix. We also use data on GDP per capita (PPP) from the World Bank as an alternative proxy for overall labor market conditions.

Table 1 presents the evolution of these labor market condition measures overtime by sexism level groups. Because not all countries have information for the whole period, we show changes between 1995 and 2010, 2000 and 2010, and 2005 and 2010, keeping the group of countries the same between the first and last years. A few key facts emerge from Table 1. First, and not surprisingly, both GDP per capita and skilled female wages have been increasing over time. This is true across all sexism level groups. While the increase in GDP per capita is muted between 2005 and 2010, probably due to the great recession, skilled women's wages also went up over this shorter time period. In contrast, we observe much smaller changes in the gender wage gaps over time and limited changes in the skill premiums. In other words, over the period under study, skilled women's labor market opportunities have been growing over time in our sample of developed countries at a rate that was not systematically different from the rate of growth of labor market opportunities of other groups in the economy.

4 Model of Marriage and Household Decision Making

The model setup closely follows FFO (2002, 2004). First, women choose whether to become skilled. Men and women then obtain a match at random in the marriage market. Given this match, they decide whether to marry because of the high match quality or stay single. Married agents decide non-cooperatively how to allocate their time between work and the household production of a public good (that is, children).[15] Single agents do not produce a household public good (that is, they remain childless) and simply consume their labor income.[16]

4.1 Household Decisions

We assume that men and women care equally about the public good (children) and their own private consumption but differ in the utility they gain from spillovers of the other spouse's private consumption, with men discounting it more than women, especially in more conservative countries.

[15]Household could act non-cooperatively if, for example, current decisions, such as location decisions for two-earner households, affect future bargaining power and there is limited commitment (Lundberg and Pollak, 2003) or if the husband and wife make contributions to separate public goods, i.e., "separate spheres," to which they have been assigned exclusive responsibility by socially prescribed gender roles (Lundberg and Pollak, 1993). Doepke and Tertilt (2017) discuss the comparative economic and policy implications of alternative, cooperative vs. non-cooperative, bargaining models of the household. We return to this issue in section 4.6.

[16]See FFO (2002, 2004) for an in-depth discussion of the more general case.

Specifically, following FFO (2002), when a man and a woman marry, each individual's welfare consists of the utility from her own private consumption $c_g, g = f, m$, some spillover α_g (smaller than 1) from the spouse's consumption, utility from consumption of a household public good b, and utility from the quality of the match as perceived by the agent, q. Each individual is endowed with one unit of time, which can be allocated between producing the household public good (t_g) and working in the market ($1 - t_g$). Market work hours are paid at rate w_g that varies by gender. Each agent's private consumption is equal to her earnings, which is the product of the time the agent spends working and her wages, i.e., $c_g = (1 - t_g)w_g$. Men and women are perfect substitutes in the production of the public good b. Given total time investment $T = t_f + t_m$, each agent obtains $b = Tn$ units of the public good. We interpret this good as children where n is the (fixed) number of children, and the total time investment T determines their quality.

Formally, the husband's and wife's utility are given by, respectively,

$$\begin{aligned} V_m^f(w_m, w_f, q_m) &= \max_{0 \le t_m \le 1} [(1 - t_m)w_m + \alpha_m(1 - t_f)w_f + \beta \log(t_m + t_f)n + q_{mf}], \\ V_f^m(w_f, w_m, q_f) &= \max_{0 \le t_f \le 1} [(1 - t_f)w_f + \alpha_f(1 - t_m)w_m + \beta \log(t_m + t_f)n + q_{fm}], \end{aligned} \tag{1}$$

where each spouse takes the labor supply decision of the other partner as given, $\beta > 0$, and $0 \le \alpha_g < 1$.

One possible interpretation of the assumed lower weight put on one's spouse's compared to one's own consumption ($0 \le \alpha_g < 1$) is that it reflects potential disagreement over consumption bundles (e.g., fancy cars vs. children's medical, clothing, and other expenditures); in this case, α_g represents the utility loss deriving from the spouse's ability to influence the final allocation of household income across different consumption bundles. Another interpretation is that individuals obtain utility from their career in a way that is proportional to its status as measured by wages; in this case, α_g represents the (lower) weight an individual puts on her spouse's career.

As indicated above, we also assume that α_g is lower for husbands than for wives ($\alpha_m < \alpha_f$), and especially so in societies that hold more conservative views about women's role. This assumption captures the idea that having a working/career wife challenges traditional views of gender roles within a household as well as undermines the husband's ability to solely dictate optimal household's allocation decisions.[17][18]

To flesh out the properties of the model that are relevant for our empirical analysis, we make several simplifying assumptions. We assume throughout that $w_m > w_f$ so that women have a comparative

[17] An alternative interpretation is that, in more traditional societies, a man may find it particularly demeaning to have a working wife because it signals his inability to provide for the family (Basu, 2006).

[18] Similar comparative statics result would be obtained if we simply added to the man's utility a penalty directly related to his wife's work but not her wages. See FFO (2004).

advantage in home production, irrespective of whom they are matched with. We also assume that $w_m > \beta$, implying $t_m = 0$, i.e., men work full time irrespective of their marital status. Given these assumptions, there are two possible cases for the wife's optimal time allocation decision: (i) $w_m > \beta \geq w_f$, in which case $t_f = 1$; (ii) $w_m > w_f > \beta$, so that $t_f = \beta/w_f$. In the first case, the wife does not work and instead dedicates herself full time to raising children while the husband works full time on the market. In the second case, the husband's situation is unchanged, but the wife works part time and raises children with the remainder of her time.

As shown in FFO (2002, 2004), the economic intuition for why the relationship between women's wage and marriage probability is non-monotonic in this model can be grasped from an analysis of the solution to the household's optimal time allocation problem and, specifically, an analysis of how the utility of a married man, V_m, varies as a function of his wife's wage.

First, let's consider how V_m varies with w_f when $w_f \leq \beta$, that is, for the case where the woman's wage is below the marginal utility from consumption of the public good. In this case, it is optimal from her standpoint to stay home once married and dedicate all her time to the production of the public good. Substituting from the first order condition, we get $V_m(w_f) = w_m + \beta \log n \equiv \overline{V}_m$, where $\overline{V}_m$ is the utility a married man receives if he marries a stay at home wife. The wife does not change her time allocation in response to an increase in w_f: she remains devoted full-time to household production. Consequently, there is no effect of an increase in w_f on the husband's utility. The husband's preferences are perfectly aligned with his wife's and there is no spousal disagreement. The gender norm does not bind.

Second, let's consider the case when $w_f > \beta$. It is now optimal from the wife's standpoint to split her time between working at home ($t_f = \frac{\beta}{w_f}$) and working on the market (its complement to one). Substituting from the first order conditions and rearranging, we obtain the difference in utility for men between marrying a working or a non-working wife:

$$V_m(w_f) - \overline{V}_m = \alpha_m(w_f - \beta) + \beta \log \frac{\beta}{w_f} \tag{2}$$

with

$$\frac{\partial(V_m - \overline{V}_m)}{\partial w_f} = \alpha_m - \frac{\beta}{w_f}. \tag{3}$$

Since $w_f > \beta$ in the case of a working wife, the second term on the right-hand side of equation (2) is negative. Thus, whether a man experiences a utility loss or a premium from having a working wife depends on the sign of $\alpha_m(w_f - \beta) + \beta \log \frac{\beta}{w_f}$. One can show that this difference is negative for $w_f \in (\beta, w_f^*(\alpha_m, \beta)]$ and positive for $w_f > w_f^*(\alpha_m, \beta)$, where $w_f^*(\alpha_m, \beta)$ is the the wage rate that makes the husband indifferent between a working wife and a stay-at-home wife (i.e., $V_m(w_f^*) = \overline{V_m}$).

Furthermore, it is to easy see that the husband's utility from marrying a working wife is non-monotonic in w_f. At relatively low levels of w_f, the positive externality that a husband receives from his wife's increased private consumption is not high enough to compensate for his utility loss coming from the lower production of the public good. His utility drops below the utility that he would obtain from having a nonworking wife. As w_f increases, the utility loss first increases, hitting a maximum when $w_f = \frac{\beta}{\alpha_m}$, that is, when the loss in production of the public good due to the wife working ($\frac{\beta}{w_f}$) is equal to the gain from the externality deriving from her consumption (α_m). Eventually, as w_f keeps on increasing, the utility loss from marrying a working wife will turn into a premium. That is, once $w_f > w_f^*(\alpha_m, \beta)$, the positive externality from the wife's private consumption dominates the utility loss in terms of public good consumption.

Figure 4 depicts the utility differential for different values of α_m (panel A) and β (panel B). Panel A reveals how the gender norm affects both the sign, size, and shape of the husband's utility loss from having a working wife as a function of her economic opportunities, w_f. The solid line shows the husband's utility differential when $\alpha = 1$, that is the case where there is no spousal disagreement about time allocation decisions. In this extreme case, the husband gains from having a working wife and this premium monotonically increases with the wife's wage. The three remaining lines plot the utility differential for alternative values of the gender norm, keeping the utility of public good consumption constant. In the most gender-equal society (the dashed dotted line) husband's and wife's preferences are more aligned. The range of w_f over which the husband of a working wife experiences a utility loss (relative to a housewife's husband) is relatively small, as the husband cares sufficiently about his wife's career: it takes a modest increase in w_f for the positive externality effect to dominate the loss in public good consumption. In the intermediate society (the short dash line), the utility loss experienced by the husband is always larger than in the more gender equal society and the utility differential is negative for a wider range of w_f: it takes a larger increase in wife's economic opportunities to compensate a husband for the wife's underprovision of the public good. Finally, in the most conservative society (the long dash line), men care so little about their wife's private consumption that the utility differential from having a working wife is always negative over the represented range of w_f: it takes a very large increase in the wife's wage for the penalty associated with having a working wife to turn into a premium.

Panel B shows how the utility differential varies for two societies that differ in terms of the value they place on household goods (e.g., time spent with children). We denote these values as β_L and β_H. The threshold wage making a woman indifferent between working and specializing in home production varies across societies with different β: holding gender norms constant, societies with higher preferences for home production have lower female participation because the wage rate at which married women decide to work is higher. The shape of the husband's utility loss as a function of his working wife's earnings across societies with different values of β mirrors what is obtained when comparing societies with different gender norms. It will thus be important as we empirically

test the predictions of the model in the following sections to verify that the heterogeneity we observe across countries and states with respect to gender norms is not masking correlated heterogeneity with respect to the value placed on the household public good.[19]

The utility of a married woman, V_f is monotonically increasing in her husband's wage w_m and her own wage w_f. When $w_f \leq \beta$, her utility when married depends only on her husband's wage, that is, $V_f(w_m) = \alpha_f w_m + \beta \log n$. When $w_f > \beta$, she works part-time and her utility is given by

$$V_f(w_f, w_m) = V_f(w_m) + (w_f - \beta) + \beta \log \frac{\beta}{w_f}. \tag{4}$$

It is clear from the above expressions that married women's utility increases in their husband's wage, irrespective of their work status. In other words, greater earning opportunities for men are associated with premiums both in the labor market and in the marriage market. Moreover, holding w_m constant, the net utility from being a working (relative to non-working) wife ($w_f > \beta$) is always positive and increasing in one's own wage.

4.2 Marriage Decision: Random Matching and Threshold Quality

Following FFO (2002, 2004), we assume that there are only two types of individuals, skilled S and unskilled U, for each sex. The matching process is modeled as a one-period random search in which the probability for a given individual of type i of meeting another individual of type j, for $i, j = S, U$ depends on the proportion of that type in the relevant population of the opposite sex. While we endogenize women's decisions to become skilled (see Section 4.5), we assume that the distribution of men's type in the population is given exogenously. We further assume that men's types are defined by their earnings, with $w_{mS} > w_{mU} > \beta$, and that gender role attitudes do not vary by education.[20] To simplify the analysis, we further assume that unskilled married women do not work (i.e., $w_{fU} \leq \beta$) while skilled married women allocate some time to labor market work (i.e., $w_{fS} > \beta$).[21] Another maintained assumption throughout the analysis is that women have a comparative advantage in home production irrespective of the match skill combination, that is,

[19] We tackle this issue in Section 5.2.

[20] This assumption is in keeping with the empirical finding that the cross-country variation in gender roles attitudes is much larger than the within-country/cross-skill variation. However, as we will briefly discuss below, this assumption can easily be relaxed.

[21] Empirical studies document intergenerational spillovers (in terms of children's human capital) of increases in the schooling of women (see, for example, Behrman et. al., 1999). The assumption that home productivity does not vary by skill level can be easily relaxed to allow skilled women to be more productive than unskilled women both at home and on the market. Assuming that $a_{f,S} > a_{f,U}$, where a is home productivity, the main change in the model would be that the utility of public good consumption in a fully specialized household, $\tilde{\beta}_i = -\beta \log n$, would vary by skill. That is, $\tilde{\beta}_i = -\beta \log a_{f,i} n$ for $i = S, U$.

$w_{mi} > w_{fj}$ for $i, j = S, U$.[22]

Matched individuals each obtain a random draw of match quality $q \in [-\infty, \infty]$ from a log-concave distribution and marry only if both agree to the match. In a departure from FFO (2002, 2004), we assume that when agents of the same skill type meet, they draw their match qualities from a better distribution (in the sense of first-order stochastic dominance); i.e., we assume that $F_{i=j}(q) \leq F_{i\neq j}(q)$ for any q on the support of the distribution of match quality. The homogamy assumption implies that a woman's investment in education is associated with both higher earnings and a higher probability of drawing a high-quality match to a high-wage (skilled) man.

Individuals decide whether to stay in a match (marry) and obtain married utility as in equation (1) or to remain single whereby their utility is simply given by $U(w_g) = w_g, g = f, m$. That is, there is no household public good (i.e., no children) nor any externality from another agent's consumption when an individual decides to remain single.[23] The reservation qualities, q^*, are set so that an individual is indifferent between marrying and staying single.

For men, this yields

$$q_m^* = \begin{cases} \tilde{\beta} & if \quad w_f < \beta \\ \tilde{\beta} - \alpha_m(w_f - \beta) - \beta \log \frac{\beta}{w_f} & if \quad w_f > \beta, \end{cases} \tag{5}$$

where $\tilde{\beta} = -\beta \log n$, with $\beta \log n$ representing the utility from the public good in a specialized household.

Under the assumption that $w_{fU} \leq \beta$ and $w_{fS} > \beta$, the first line of q_m^* is men's reservation quality if they meet an unskilled woman, whereas the second line is men's reservation quality when they meet a skilled woman. Note that male pickiness is invariant to female wages if the wages are below β, that is, for unskilled women. In addition, under our maintained assumption of skill-invariant α_m, the reservation quality of men does not depend on their own type.

The skilled-unskilled woman differential in male pickiness is then given by $q_{m,S}^* - q_{m,U}^* = -\alpha_m(w_f - \beta) - \beta \log \frac{\beta}{w_f}$. Based on this equation, the comparative statics results for the effect of an increase in female wages on men's reservation quality differential mirrors the analysis of married men's utility (Section 4.1). If $\beta < w_{fS} \leq w_f^*(\alpha_m, \beta)$, this differential is positive: men experience a utility loss from marrying a skilled working woman and therefore are pickier when they meet one. Moreover, the skilled-unskilled reservation quality differential over this interval has an inverted U-shape with

[22] Empirically, skilled women's earnings are greater than unskilled men's earnings in some countries. Our analysis can easily accomodate this case provided that women have higher home productivity than men, that is, $b = (a_m t_m + a_f t_f)n$ with $a_f > a_m$, and an unskilled man maintains the comparative advantage in market production over a skilled woman even if she holds the absolute advantage, that is, $\frac{w_{mU}}{a_m} \geq \frac{w_{fS}}{a_f}$.

[23] Similar qualitative comparative static results would be obtained if we assumed that individuals need to produce home goods, i.e., cleaning, cooking etc., irrespective of marital status.

a peak at $\frac{\beta}{\alpha_m}$. When $w_{fS} > w_f^*(\alpha_m, \beta)$, the differential becomes negative: men gain from having a working wife when her wage is high enough to compensate for the loss of public good production and they therefore become less picky toward skilled women. As discussed in the section below, this pattern drives the prediction of a U-shaped skilled-unskilled marriage differential as a function of skilled women's economic opportunities.

The comparative static exercise also shows that for any $w_{fS} > \beta$, the threshold quality for skilled women is decreasing in α_m and increasing is β.

For women, the same calculation yields

$$q_f^* = \begin{cases} \tilde{\beta} - (\alpha_f w_m - w_f) & if \quad w_f \leq \beta \\ \tilde{\beta} - (\alpha_f w_m - \beta) - \beta \log \frac{\beta}{w_f} & if \quad w_f > \beta. \end{cases} \tag{6}$$

Since we assume $w_f^U \leq \beta$ and $w_f^S > \beta$, the first line of q_f^* is the reservation quality of unskilled females, whereas the second line is that of skilled females. Skilled women will be pickier than unskilled women since they have a better outside option.[24] A woman's pickiness is always increasing in her own wage, irrespective of type, implying a lower marriage probability, coming from the woman's decision, as her economic opportunities improve. A woman's pickiness is decreasing in men's wages, implying that, because of their higher earnings, skilled men are generally more attractive in the marriage market. Note that if w_f and w_m grow at the same rate, leaving the gender wage gap unchanged, the net effect is to increase unskilled women's pickiness and decrease their marriage probability as long as $\alpha_f < 1$ (if $\alpha_f = 1$, the two effects cancel out, leaving unskilled women's pickiness unchanged). Skilled women's pickiness also increases as w_f and w_m grow at the same rate, provided that the spillover from their husband's consumption is lower than the net gain in the private good consumption, that is, $\alpha_f < \frac{\beta}{w_f}$.[25]

4.3 The Skilled-Unskilled Marriage Gap

Let's define $\Pi_{f,ij}$ to be the probability that, for a woman of type i meeting a man of type j, the random draw of the match quality q_{ij} lies above each partner's threshold. This probability is given by $\Pi_{f,ij} = \overline{F}_{i=j}(q_{m,i}^*)\overline{F}_{i=j}(q_{f,ij}^*)$ if she meets her own type and $\Pi_{f,i\neq j} = \overline{F}_{i\neq j}(q_{m,i}^*)\overline{F}_{i\neq j}(q_{f,ij}^*)$ if she meets the other type, where $\overline{F} = (1 - F)$ is the complementary cumulative distribution function.

The probability that a match is formed is given by the product of $\Pi_{f,ij}$ and the probability of meeting a man of type j in the population, $j = S, U$. Having defined π_m as the fraction of skilled

[24] Taking the difference between the two, we obtain $q_{fS}^* - q_{fU}^* = (\beta - w_{fU}) - \beta \log \frac{\beta}{w_f}$, which is always positive for $w_{fU} \leq \beta < w_{fS}$.

[25] See Model Appendix for a formal discussion of the comparative statics properties of q_f^* and q_m^*.

men in the population, the skilled-unskilled difference in marriage probability is then given by $\Pi_f^S - \Pi_f^U$, where

$$\Pi_f^S = \left[\pi_m \overline{F}_{i=j}(q^*_{f,SS})\overline{F}_{i=j}(q^*_{m,S}) + (1-\pi_m)\overline{F}_{i\neq j}(q^*_{f,SU})\overline{F}_{i\neq j}(q^*_{m,U})\right] \tag{7}$$

and

$$\Pi_f^U = \left[\pi_m \overline{F}_{i\neq j}(q^*_{f,US})\overline{F}_{i\neq j}(q^*_{m,U}) + (1-\pi_m)\overline{F}_{i=j}(q^*_{f,UU})\overline{F}_{i=j}(q^*_{m,U})\right] \tag{8}$$

are, respectively, the marriage probabilities of skilled and unskilled women.

Note that Π_f^U monotonically declines as women's economic opportunities w_f increase to a level where a single unskilled woman can live comfortably simply based on her own labor income (but still does not work if she marries). This is also true if men's economic opportunities are increasing contemporaneously (at the same or a lower rate), since men's pickiness does not depend on their own wage and the net effect on women's reservation quality of increasing w_m and w_f is positive (they become pickier).

On the other hand, the marriage probability for skilled women, Π_f^S, declines as their wage (w_{fS}) increases in the range $\beta < w_{fS} \leq \frac{\beta}{\alpha_m}$ and then starts increasing once $w_{f,S} > \frac{\beta}{\alpha_m}$, with an acceleration once $w_{f,S} > w_f^*(\alpha_m, \beta)$, when men strictly prefer skilled working women. Note again that men's pickiness does not depend on their own wage. Therefore, if both w_m and w_f grow at the same rate, leaving the gender gap unchanged, men's probability of marriage will change only as a function of w_f. Therefore, the overall comparative static would be the same as for the case where w_f increases 'in isolation,' except that the contribution to the marriage probability coming from skilled women's choices would be muted in the decreasing part of the U Shape (at low wage levels) and amplified in the increasing part of the U (i.e., at very high male and female wages).[26]

The marriage probabilities of skilled and unskilled women both increase if there are more skilled men around ($\pi_m$is higher) given that both types have a preference for higher wage men. However, given the homogamy assumption, the increase in marriage probability is largest for skilled women. Note that in its absence the two probabilities would increase by exactly the same amount in the baseline model, since we assumed that the gender norm (i.e., α_m) is skill invariant. Because men's gains from marriage do not depend on their own type (i.e., their wage) both skilled and unskilled men have exactly the same threshold quality in the baseline. This implies that, unless skilled men draw match quality from a 'better' distribution, the probability of accepting a match with a skilled woman is the same as that of unskilled men. A similar logic holds for women since preferences for higher-educated men also do not vary by women's education. It follows that, in the absence of

[26]See Model Appendix for a formal discussion.

homogamy, an increase in the share of skilled men would increase the marriage probability of skilled and unskilled women by exactly the same amount, leaving the marriage differential unchanged.

4.4 Comparative Statics

In order to illustrate the properties of the model that are relevant to our empirical analysis, we first analyze how the difference in marriage probability between skilled and unskilled women vary if we let all wages (e.g., $w_{g,i}$ for $g = f, m$ and $i = S, U$) in the economy grow at the same rate while maintaining the assumption that $w_{fU} \leq \beta$. This situation appears closest to the variation in labor market opportunities we observe in the country-level panel (see Table 1), with increases in skilled women's wages (and GDP per capita) but no systematic changes in the skill premiums or the gender wage gap. However, as discussed above, the same comparative static properties would apply if only women's earnings (both skilled and unskilled) grow or if we fix all other wages while letting only w_{fS} grow (which, theoretically, gives the strongest U-shaped pattern), as we observe in the analysis of US states (see Table 5).

Panel A in Figure 5 provides a graphical representation of the marriage penalty for skilled women for three different values of α_m— high, medium and low—having fixed the unskilled and skilled wages in the shaded areas denoted with U and S (or U' and S'), respectively. The running variable is assumed to be skilled men's wages $w_{mS} = w$ and we assume that $w_{mU} = \phi w$, $w_{fS} = \pi w$, and $w_{fU} = \phi\pi w$, where ϕ is the unskilled/skilled earnings ratio and π is the female/male earnings ratio (that is, \phi and \pi are both less than one).

For a given value of α_m, the marriage differential is U shaped, mirroring the behavior of men's threshold qualities.[27][28] For values of $w_{f,S}$ below β (i.e., skilled women are also stay-at-home wives), the difference in marriage probabilities is negative because skilled women have better outside options. For values of $w_{f,S}$ lying in the interval $(\beta, w_f^*(\alpha_m, \beta)]$, all the terms in (7) that define a woman's marriage probability, are lower for skilled women. The skilled-unskilled marriage gap is U shaped in this range. It first increases as men's threshold quality for a skilled woman increases, then declines for $\frac{\beta}{\alpha} < w_{f,S} \leq w_f^*(\alpha_m, \beta))$. Finally, if $w_{f,S}$ is above $w_f^*(\alpha_m, \beta)$, both types of men prefer skilled women. In this range, the marriage penalty will eventually turn into a premium.[29] The marriage gap is always smallest in the least conservative economy ($\alpha_{m,H}$) and largest in the

[27] Note that, for $w_{fU} \leq \beta$, the shape of the skilled-unskilled marriage differential depends exclusively on the behavior of the derivative of Π_f^S with respect to w_{fS}.

[28] The skilled-unskilled difference in marriage probability would continue to be U-shaped as w_{fU} grows above β (i.e., unskilled women also work part-time), reaching a low at $w_{fU} = \beta$. If we allow skilled women's *home* productivity to be larger than that of unskilled women, then there is a range of wages $w_{fS} > w_{fU} > \beta$ where the marriage probability of skilled women declines faster than that of unskilled women (that is, the trough of the skilled-unskilled U-shaped marriage probability differential is above β.)

[29] See Model Appendix for a formal analysis.

most conservative economy ($\alpha_{m,L}$). The comparison of the three curves in the figure also reveals that while for the $\alpha_{m,H}$ and $\alpha_{m,M}$ economies the gap can eventually turn into a premium, it is unlikely that in the $\alpha_{m,L}$ economy women's economic opportunities will ever be high enough to compensate husbands for their working wives' underprovision of the public good.

The figure also shows how an increase in w_{fS} might have very different consequences on the skilled-unskilled marriage differential depending on the country's prevailing gender norms. For example, suppose that economic opportunities increase so that w_{fU} and w_{fS} increase within the shaded areas U and S, respectively, while holding the skill premium constant. The skilled-unskilled marriage gap would decline in the most gender equal economy but increase in the remaining two economies, with the increase being largest in the most conservative one. Suppose instead that $w_{f,S}$ increases from a value in the shaded area S to a value in S' while w_{fU} increases by the same amount from a value in U to a value in U'. In this case we would observe the skilled-unskilled marriage gap turning into a marriage premium in economy H, still negative but decreasing in economy M, and negative and further increasing in economy L. In other words, the model also implies that, comparing three types of societies that differ in the conservativeness of their gender roles views from very liberal to very conservative, an increase in wages might at the same time increase the marriage penalty faced by skilled women in the more traditional society, leave the marriage penalty in the middle society mostly unchanged, and decrease it in the more gender equal society. This is the key prediction we will be testing in the cross-country data.

Panel B depicts the skill differential in marriage probabilities of men. The skill differential is always positive and increasing in$w$. Both types of women have a strict preference for skilled men because of their higher wage. In addition, given the homogamy assumption, skilled women have an even stronger preference for skilled men and will disproportionately reject unskilled men. Therefore, as w and the fraction of skilled women in the population increases, the marriage prospect of skilled men will become increasingly better than that of unskilled men. The higher the α, the steeper the gradient of the increase in the relative marriage probability of skilled men because of strict ranking of men's preferences for skilled/working women in the more gender-equal societies. However, as shown in the figure, the differences in skilled-unskilled marriage differential for men do not vary as much with the strength of the gender norm α_m as as they do for women.

4.5 Education Decision

Following FFO (2002, 2004), we assume that a woman faces an idiosyncratic (utility) cost of becoming skilled of γ, where γ is an iid random draw from a continuous cumulative distribution function $G(\gamma)$ with support $[0, \infty]$. Defining as $V^i(\theta) = \sum_{j=s,u} \Pi_{f,ij} V_i^j + \left(1 - \sum_{j=s,u} \Pi_{f,ij}\right) U(w_i)$ the expected utility of a woman of type $i = S, U$ as a function the model parameters $\theta =$

$(w_m, w_f, \alpha, \beta, \pi_m)$, women choose to become skilled if the cost of doing so is lower than the net utility gain, that is, if $\gamma \leq \left[V^S(\theta) - V^U(\theta)\right]$. The equilibrium share of skilled women π_f is the fraction of women whose cost of acquiring education is lower than this threshold, that is, $\pi_f = G\left(V^S(\theta) - V^U(\theta)\right)$.

If we compare two economies that differ by their gender roles, holding everything else constant, the expected utility of skilled relative to unskilled women would be larger in the less conservative economy. This implies that, holding everything else constant, the country with more equal gender norms should have a higher proportion of skilled women and a smaller skilled-unskilled marriage gap (see FFO, 2002, 2004 for a formal proof).

It is also the case that the expected utility of skilled relative to unskilled women increases with economic opportunities, by which we mean either an increase in GDP per capita that keeps the skill premium and the gender gap constant or an increase in w_{fS} at given levels of income per capita, which corresponds to a decline in the gender earnings ratios for the skilled.

Thus, a higher skilled wage or level of economic development is generally associated with an increase in the proportion of women who choose to become skilled. As we discussed above, at low levels of economic opportunities for skilled women the increase will be relatively small because of the stronger trade-off between the labor market return and the penalty coming from the higher rejection rates in the marriage market. However, the proportion of skilled women grows faster once the marriage penalty associated with the investment decision declines.

4.6 Model Extensions

We have made several simplifying assumptions in the above model with the objective of obtaining a rich set of comparative static exercises to guide our empirical analysis while maintaining a parsimonious theoretical representation. However, relaxing some of these simplifying assumptions would leave the main intuition unchanged.

First, while we do not formally solve for this case here, the model's key predictions are unaltered if we also allow for variation in gender norms by education. The main difference under such an additional assumption would be that the trade-off faced by skilled women would depend, even more strongly than in the current model, on the share of skilled men in the population.

Also, similar comparative statics could be generated under different assumptions on utility transferability or on the specific form of non-cooperative bargaining, as well as under a cooperative bargaining framework where gender norms, rather than comparative advantage, dictate task allocations along gender lines. This is illustrated in Browning, Chiappori, and Weiss (2014, Chapter 9). They discuss a simple model of women's investment in schooling and sorting in which, assuming

as in our paper that $w_{fU} \leq \beta < w_{fS}$, it may be costly for a high-wage woman to marry and have a child because she *must* spend some of her time on childcare, while this trade-off is not apparent for a low-wage woman. In this case, the marriage surplus to a high-wage woman is lower than that to a low-wage woman but, as in our model, this might not be the case if women's wages are high enough. This has consequences for sorting. In particular, for low values of the childcare time requirement, sorting will still be positive (high types marry each other). However, for high values of the childcare time requirement, this sorting will be negative because of the stronger incentive to rely on comparative advantage. Therefore, the cooperative model would also predict that as the childcare time requirement declines (because of the availability of cheap substitutes) and skilled female wages go up, sorting will increase. It also predicts, similarly to our model, that the stronger the norm (i.e., women's time input requirement in the production of childcare), the greater is women's under-investment in education (given the same fundamentals) relative to men's.

We also consider a version of the model where women can outsource home production activities. The simplest way to incorporate such outsourcing into the model, following the discussion in Doepke and Tertilt (2016), is to introduce a fixed cost that arises because of the need to take care of children when both household members work on the market. This is of course a simplification, as in reality this fixed cost is likely to be multidimensional in nature, entailing consumption costs (expenses for services), utility costs (inconvenience for scheduling activities, less family time with children), and time costs (transportation and other arrangements).

Formally, agent i's utility when married to agent j,V_i^j. would then be given by

$$V_i^j(w_i, w_j, q_i) = \max_{0 \leq t_i \leq 1} [(1 - t_i)w_i + \alpha_i(1 - t_j)w_j - \mu\psi + \beta \log(t_i + t_j)n + q_{ij}], \tag{9}$$

where μ is an indicator function equal 1 if $(1 - t_f)(1 - t_m) > 0$ and 0 if $(1 - t_f)(1 - t_m) = 0$ and ψ is the fixed cost the household incurs when both spouses work.

In this case, wife's equilibrium hours worked, conditional on working part-time, are unchanged, but the reservation wage is now given by $w_R(\beta, \psi)$, which is the implicit solution to $(w_f - \beta - \psi) + \beta \log \frac{\beta}{w_f} = 0$. The basic mechanism of the model is still at work. However, this modification can potentially dampen the effects, depending on the relative size of the gender norm and the fixed cost of outsourcing (specifically, whether α_m is smaller or larger than $\beta/(\beta + \psi)$). If α_m is very low (as it is in most conservative countries), then it is likely to be in a region of the parameter space where, as women's wage increases, the marriage probability of skilled working women declines. The opposite holds if α_m is close to 1 (gender equality). We will still observe the U shape when we are in the intermediate range for α_m. Cheap domestic labor, household appliances, and marketization are all forces that, by reducing the fixed cost of running a household, allow for the participation of women in the labor market at relatively lower wages, which strengthens the effects that give rise

to the U shape.

Finally, we also consider a version of the model where the production of the public good is a CES aggregator of the husband's and wife's time, $b = \left(t_f^{\sigma/(\sigma-1)} + t_m^{\sigma/(\sigma-1)}\right)^{(\sigma-1)/\sigma}$, where σ is the elasticity of substitution between the husband's and wife's time inputs. The solution to the household problem in this case implies that both the husband and the wife work at home and on the market. The time allocation is now a function of the gender earnings ratio, π. For home hours we have $t_f = \left(\frac{\beta}{w_f}\right)^{1/\sigma}\left(\frac{1}{1+\pi^{(\sigma-1)}}\right)^{1/\sigma}$ and $t_m = \left(\frac{\beta}{w_m}\right)^{1/\sigma}\left(\frac{\pi^{(\sigma^2-1)}}{1+\pi^{(\sigma-1)}}\right)^{1/\sigma}$. The solution implies that, as long as $w_f < w_m$, women generally work more hours than men at home and fewer in the labor market. However, an increase in π would decrease women's comparative advantage in home production, thus reducing women's home hours and increasing men's. This model would deliver a richer set of comparative statics results than the ones we highlight in the paper. In particular, under this alternative model, men's reservation qualities also depend on their own earnings and both sets of reservation qualities are a function of the gender gap. The richer model would allow for a more nuanced exploration of the different forces at play, but the gist of the analysis would would be unchanged, at least qualitatively.

5 Empirical Tests of the Model

5.1 Cross-Country Evidence

In this section we test the implications of our model using our panel of developed countries. As revealed in Table 1, the primary source of variation in labor market opportunities for skilled women in this panel comes from rising wages, with little systematic changes in the gender wage gap or skill premium. Given this, we use two measures of labor market opportunities for high-skilled women for this analysis: skilled women's real wages and GDP per capita. In a model in which all wages are a constant proportion of GDP (the first comparative statics case discussed in the theoretical section), the measures are interchangeable. One advantage of the GDP per capita measure is that it is less subject to measurement error. Indeed, measurement error is likely to arise in the wage data becasue it is drawn from numerous different, often small, surveys, sometimes covering different samples of workers (e.g., full-time vs. all workers). Additionally, wage information is not available in some years for some countries; hence, when we use the GDP per capita measure, we are able to include more observations in our regressions.

The first prediction of the theoretical model is that, all else equal, the skilled-unskilled marriage gap should be larger (in absolute value) in countries with more conservative gender attitudes. Suggestive evidence of such a relationship is presented in Figure 6 for the cohort of women who were between 35 and 44 years of age in 2010. Specifically, in the left panel of Figure 6, we graph the

relationship between the gap in marriage rates between high-skilled and. low-skilled women aged 35-44 in a country in 2010 and the IVS-based measure of gender role attitudes in that country. The figure clearly shows that countries that are more conservative according to this measure are also countries where educated women marry at especially lower compared to less educated women. In contrast, we see a weaker relationship for men (right panel of Figure 6).

Table 2 shows that this relationship is robust to controls. Our choice of controls is based on the model and the observed trends reported in Table 1. Specifically, we control for the share of males with a tertiary education, women's opportunities (using either GDP per capita or skilled women's wages), the gender wage gap, and the skill premium.[30] The baseline correlation corresponding to the left-hand panel of Figure 6 is reported in Column 1 of Table 2. The magnitude of the coefficient suggests that a one standard deviation increase in the sexism index increases the relative deficit in ever-married rates between high- and low-skilled women by 4 percentage points. Column 4 presents an alternative specification where countries are grouped into high, medium, and low sexism (see Appendix Table 1). We estimate that the gap in ever-married rates between high- and low- skilled women in low-sexism countries is 14 percentage points smaller than in high-sexism countries and 8 percentage points smaller than in mid-sexism countries. Columns 2, 3, 5, and 6 of Table 2 show robustness of these correlations to the labor market controls.

Columns 7 to 9 replicate the specification in Column 4 for the other three cohorts of women that we observe in our data, namely those aged 35 to 44 in 1995, 2000, and 2005. We see that the negative correlation between sexism and the relative marriage rate of skilled women also exists for earlier cohorts (especially when it comes to high sexism levels), although coefficients are of slightly smaller magnitude in 2000 and 1995 and at best significant at the 10 percent level for the mid-sexism group.[31]

Another prediction of our model is that the relative marriage outcomes of skilled women will be more strongly affected by the gender norms in their country relative to skilled men (see Figure 5). As shown in Figure 6, the correlation, while negative for both women and men, is much stronger for women. The remaining columns of Table 2 confirm this fact in a multivariate regression. Columns 10 and 11 of Table 2 replicate Columns 2 and 5, respectively, but use as an alternative dependent variable the difference in ever-married rates between skilled and unskilled men who were between 35 and 44 years old in 2010. As expected based on the visual inspection of the data in Figure

[30]The gender wage gap is measured by combining skilled and unskilled individuals; a unique skill premium is computed using men and women. All our results are robust to allowing the gender wage gap to vary by skill and the skill premium to vary by gender.

[31]Note that we do not include the set of controls in regressions 5 to 7 as it will reduce the degrees of freedom because of missing data on wages for earlier periods. If controls were included, the coefficient for high sexism would be negative and at least marginally significant for 2000 and 2005 and negative and large but not statistically significant for 1995. Note, however, that the regression with controls for 1995 has only 15 observations.

6, while the estimates on the sexism measure (either using the three categorical variables or the continuous index) are of the same sign as those for women, they are quantitatively smaller and, in the case of the continuous measure specification, not statistically significant.

Next, we turn to empirical tests of some of the more subtle predictions of the model regarding the heterogeneity across countries in the marriage gap as labor market conditions change. Specifically, our model predicts that increased labor market opportunities for skilled women will negatively impact their relative marriage rate, especially in countries with more conservative gender attitudes.

In Table 3, using the pooled sample of countries from 1995 to 2010, we regress the difference in ever-married rates for skilled vs. unskilled women on a proxy for skilled women's opportunities in the labor market: log*(GDP per capita)* (Columns 1-4) or log*(high-skilled female wages)* (Columns 5 and 6) and the interaction between the proxy for women's opportunities and country-level sexism. All regressions include country and year fixed effects, and standard errors are clustered at the country level. Models in Columns 1 and 3 do not include other controls, while models in other columns do. As these controls (share of males with a tertiary education, a measure of women's opportunities, the gender wage gap, and the skill premium) are chosen to approximate the comparative statics from the theoretical model, our preferred specifications include them.

All of our regression models (Columns 1 to 6) indicate that higher labor market opportunities for skilled women are generally associated with a decrease in the deficit they experience in the marriage market in low-sexism countries, but an increase in that deficit in high-sexism countries. For example, in Column 2, we see that a 10 percent increase in GDP per capita reduces the marriage market "penalty" for high-skilled women by 3 percentage points in low-sexism countries and by 1 percentage point in mid-sexism countries, but increases it by 1.2 percentage points ($2.9 - 0.41$) in high-sexism countries.[32] Similarly, the coefficient on the continous variable interacted with GDP per capita suggests that on average, for countries one standard deviation below the average sexism level, an increase in GDP per capita narrows the marriage gap, but for countries one standard deviation above the average sexism level (Columns 3 and 4), it widens it. Specifications using skilled women's wages suggest similar patterns, but magnitudes are smaller and the coefficient on the interaction term with the continous measure of norms is not statistically significant.[33]

To assess the magnitude of the coefficients, we apply the observed change by sexism group in GDP per capita and high-skilled female wages from 1995 to 2010 to our panel model estimates and compare those predictions with the observed change in the marriage gap. We find that our model explains bewteen 15 percent (using wages) and 35 percent (using GDP) of the observed increase in

[32] We can reject the null hypothesis that the coefficient on Log GDP per capita plus the coefficient on its interaction with the high sexism dummy is equal or larger than zero at the 10 percent level—the p-value is 0.06.

[33] We do have not enough power to statistically reject a flat or positive slope for high sexism countries in Column 5.

the marriage gap for the most conservative countries, and between 40 percent (using wages) and 100 percent (using GDP) of the decline observed in the least conservative countries.[34]

Finally, in the last two columns of Table 3, we replicate the analysis of Columns 2 and 4 but now use the skilled-unskilled gap in marriage rates among men as the dependent variable. While the point estimates on the interaction terms of interest are of the same sign as those in the regressions using the female sample, the magnitudes are in general smaller and, in the case of the continuous measure of sexism, not statistically significant. The sign and relative magnitude of the coefficients vis-a-vis the women's estimates are consistent with the model's prediction (see Figure 5), with the exception of a negative effect of an increase on GDP per capita on the skilled-unskilled marriage gap for males in high-sexism countries.

A final implication of our model that we can bring to the cross-country data is with respect to educational choice. Our model predicts that in more gender-conservative countries, a lower fraction of women will decide to become skilled, as educated women in those countries expect that they will face greater barriers in the marriage market.[35] This is exactly what we find in the country-level data. Figure 7 plots the gender gap in higher education between men and women who were between 35 and 44 in 2010 in each country as a function of the conservativeness of gender role attitudes in that country. We observe a strong negative relationship. The gender gap in education is smaller in Nordic countries and larger in East Asian countries.

Table 4 confirms this negative relationship between female educational attainment and the degree of conservatism of gender norms in a multivariate regression setting. All the regressions control for the share of males with a tertiary education. The basic relationship using the three sexism levels (Column 1) is robust to including controls for skilled women's labor market opportunities and the other labor market controls (Columns 2 and 3). The point estimates in Column 2 suggest that the share of females with tertiary education is about 10 percentage points lower in mid-sexism countries compared to low-sexism ones, and 13 percentage points lower in high-sexism countries compared to low-sexism ones. We obtain qualitatively similar results when we use the continuous sexism index in Columns 4 to 6.

In Column 7, we show that there is a strong positive correlation between the share of females with

[34] We obtain these numbers by applying the mean change in GDP per capita and wages by sexism group. We restrict the calculations to countries with data on wages in 1995. As an example, the observed mean change in GDP per capita for the high sexism group is 28 percent. When we multiply 0.28 by -0.032 (0.186-0.218) we get a predicted change in the gap of -0.009, which accounts for 35 percent of -0.026 (the observed mean change in the marriage gap for this group of countries).

[35] Given that women's education choice is an endogenous variable in our model, we do not control for it in our cross-sectional and panel data models of marriage gaps. When we do (see Appendix Tables 4 and 5), all our coefficients of interest are of the expected sign and statistically significant at at least the 10 percent level, although the magnitudes in the cross-sectional exercise are smaller.

higher education and the skilled-unskilled marriage gap for females. Hence, women's educational achievement is higher in those countries where skilled women marry at a rate that is closer to that of unskilled women. While certainly not definitive, this correlation is consistent with the mechanism that our model predicts links the gender gap in education to gender norms: the value for women to acquire education tends to be lower in more sexist countries because of the potential negative impact of additional education in the marriage market.

Finally, Columns 8 to 10 show that the strong relationship we find between sexist attitudes and female educational attainment for 2010 is also observed for the other years in our sample.

5.2 Robustness

α or β? As discussed in the theory section, cross-country differences in the value placed on the household good could also generate patterns similar to those we observed in the prior tables. This is potentially a concern for our analysis becuase if there is a strong positive correlation between such preferences for the household good and the strength of gender norms, our empirical findings so far might just be picking up on the value placed on the household good.

To assess this potential threat to our analysis, in Appendix Table 3 we investigate whether such a correlation exists across countries. To proxy for the value placed on the household good (β in our model), we compute the total household time devoted to the production of the public good. We rely on data from the 2012 International Social Survey Program (ISSP) and focus on the following questions: "How many hours spent on household work"; "How many hours spent on family members"; "How many hours spouse, partner spend on household work" and "How many hours spouse, partner spend on family members." We restrict the sample to individuals between 18 and 64 years of age with at least one own child living with them.[36]

Based on these questions, we construct the following variables (all measured in hours per week): total time spent by parents on total household production (household work + care for family members), total time spent by female parent, and total time spent by male parent. From this micro data, we then estimate, for each variable above, a country dummy based on regressing the variable on country fixed effects, number of children, a dummy for the presence of children under 5 years of age, household size, education and age of the respondent, and a dummy indicating if the respondent has a partner living in the household. In the final step, as reported in Appendix Table 3, we regress the estimated country dummies for each of the three variables above on the continuous index of sexism in each country. Appendix Figure 3 provides a visual inspection of this

[36]The 19 countries for which we have data to conduct this analysis are Austria, Canada, the Czech Republic, Denmark, Germany, Finland, France, Ireland, Japan, South Korea, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland, Taiwan, the UK, and the US.

analysis.

As is apparent from Appendix Table 3 and Appendix Figure 3, there is no systematic correlation between total (e.g., husband plus wife) time spent on household production and gender norms. Not surprisingly, gender norms correlate strongly with the distribution of time spend in household production between spouses: women do a greater share of the non-market work in more sexist countries. Finally, in Columns 1 and 2 of Appendix Table 4, we re-estimate the main specifications reported in Table 2, including the proxy for β (total time spent on household production) as a control. Reassuringly, the results remain unchanged. In sum, we find little support for the possibility that our results might be picking up on differential valuation of the public good across countries.

Cohabitation. Another concern with our analysis so far is that marriage might not be a core outcome of interest or, more precisely, it might be a poor proxy for the prevalence of long-term partnerships within a country. This could be especially problematic for countries where long-term cohabitation is common and couples live in a marriage-like relationship without actually entering a formal union. To account for this, we complement our analysis in Appendix Tables 4 and 5 with alternative dependent variables that might better capture the existence of such long-term partnerships. We construct an alternative measure of marriage that also includes cohabitation. We compute the skilled-unskilled gap in ever-married or currently cohabiting rates for women who are between 35 and 44 years old in 2010.[37] Unfortunately, cohabitation is only available in the EU-SILC and in the US CPS, and therefore this analysis must be restricted to the subset of European countries and the US and to a cross-sectional analysis.

Columns 5 and 6 of Appendix Table 4 replicate Columns 1 and 3 of Table 2, respectively, for this alternative measure of the skilled-unskilled gap in long-term partnerships. We see that more conservative gender norms reduce the likelihood of marriage or cohabitation for skilled women relative to unskilled women. In other words, our results in Table 2 do not appear too sensitive to the possible miscoding of some long-term partnerships – the coefficients are highly statistically significant but somewhat smaller in magnitude.[38]

Fertility. Yet another way to proxy for the existence of a long-term partnership between a man and a woman is to look for the presence of children. While fertility is an important outcome in itself, it is also measurable for a large number of countries and for a longer period of time than

[37] We cannot measure whether a person was cohabiting at some point in the past but is currently not. Results are similar if we use as our measure currently married or currently cohabitating.

[38] Unfortunately, we are not able to estimate a version of Table 3 for this outcome as this measure is not available for the earlier periods.

cohabitation. A weakness of fertility as a measure of partnership is that it also includes children who may have resulted from short-term and less stable relationships (e.g., teen pregnancy). Moreover, the likelihood of such fertility outside of a stable relationship might be more relevant in some countries than in others and, more importantly for us, differentially relevant across skill groups. With these caveats in mind, we construct a variable for fertility defined as a dummy variable that equals to 1 if a woman between 35 and 44 years of age lists an own child within her household.[39,40]

Columns 7 and 8 of Appendix Table 4 replicate Columns 2 and 5 of Table 2, respectively, using the skilled-unskilled gap in fertility among women as the outcome. We see that more conservative gender norms reduce the likelihood that skilled women as compared to less skilled women have children. Columns 5 and 6 of Appendix Table 5, which replicate Columns 2 and 4 of Table 3, also establish that our results in Table 3 generally continue to hold when we define the dependent variable of interest as the skilled-unskilled gap in fertility and use the high skilled female wage as a measure of women's opportunites: the relationship between the skilled-unskilled gap in fertility and labor market opportunities for skilled women is more negative in high-sexism countries.[41, 42] Note, however, that in Column 5 the coefficient of the interaction between GDP and the mid-sexism dummy is larger in absolute value than the coeffient of the interaction with high sexism.

Excluding East Asia. Another concern with our analysis is the extent to which our key results are solely driven by the East Asian experience. The findings in Columns (5) and (6) of Appendix Table 4 already establish that our findings in Table 3 are not driven by the East Asian countries, as we do not measure cohabitation in these countries and hence they are excluded from the robustness analysis in those columns of Appendix Table 4. Columns 1 and 2 of Appendix Table 5 also establish that our results in Table 3 are not entirely driven by East Asia. There, we replicate Columns 2 and 4 of Table 3, excluding the East Asian countries. We find that qualitatively similar patterns hold: the relationship between the skilled-unskilled gap in marriage rate and women's labor market opportunities becomes more negative as the sexism level in a country increases.

[39]In the EU-LFS, we derive this dummy from a variable that links children to their parents. The fertility measure for many European countries is available for 2005 and 2010 from both the LFS and the SILC. For some EU countries (mostly Nordic ones), fertility measures cannot be constructed using the LFS. Given the much larger samples of the LFS, our preferred specification uses the LFS measures when available and the SILC only when they are not.

[40]Given our age range of interest (35 to 44), we are likely to have measurement error for the older women in the range since their children are more likely to have left the household. Given education differences in age at first birth, the measurement error is likely to be larger for low-educated women.

[41]The variable linking mothers to children is included in the EU-LFS starting only in 1998; thus we do not have fertility measures for Europe in 1995. We do for other countries, so the panel covers 1995-2010 but has fewer observations in total Table 3 does.

[42]The coefficient of the interaction between the dummy for high sexism and the log of the female wage becomes highly statistically significant when we drop the top five countries with the highest teenage births. These countries are the US, the UK, and all East European countries but the Czech Republic.

Alternative Measure of Gender Norms. As discussed above, we also construct an alternative measure of the strength of gender norms within a country based on the answer to the following question in the ISSP: "A man's job is to earn money; a woman's to look after the home." While this question might arguably be more directly related to α in our theoretical model, we do not use this variable in our main analysis as answers to this question are available for a smaller set of countries.

In Collumns 9 and 10 of Appendix Table 4 and 7 and 8 of Appendix Table 5, we confirm that our core findings hold using this alternative measure. The skilled-unskilled gap in marriage rate is larger in more sexist countries, and more sexist countries experience a smaller decrease in the skilled-unskilled gap in marriage rates when labor market opportunities for skilled women increase. We note, however, that some of the estimated coefficients are not statistically significant.

5.3 Evidence from US States

While the main motivation of this paper is to provide a theoretical explanation (and empirical tests) for the divergent experiences over time across developed countries in the marriage market penalty for skilled women, the empirical tests that we have presented in the previous section can also be performed on a panel of US states. The first advantage of focusing on the US context is that there is considerably less unobserved heterogeneity across US states than across countries. Specifically, one may be concerned that unobserved differences across countries in our sample such as differential norms toward marriage and cohabitation, the availability of substitutes to household production, or other institutional or cultural differences may confound the observed relationship between the female skilled-unskilled gap in ever-married rates and gender norms. While we have attempted to address some of these issues directly in the robustness checks, showing that the results hold in the US sample where such unobserved differences are not expected to be as large would be reassuring and would reinforce the validity of our cross-country results. The second advantage of focusing on the US context is data availability – we can construct longer panels of all the key state-level variables that are required for our analysis and provide a cleaner mapping of labor market conditions at the time when individuals are making their marriage decisions. Since we combine the 1970 to 2000 US Census and the 2008 to 2011 American Community Survey data, our US state panel covers four decades, from 1970 to 2010.[43] As such, the US data allows us to address concerns about relatively small sample sizes in our cross-country analyses. However, this also comes at cost.

[43]For the US state-level analysis, we limit the sample to non-hispanic whites, since the marriage patterns by education for the minority groups (e.g., blacks and hispanics) have evolved quite differently over the time period of our analysis for reasons that may not be captured very well in our model e.g., higher incarceration rates of low-skilled black males, higher incidence of single-parenthood among the minority groups, etc. Therefore, to avoid conflating our analysis with issues relating to racial/ethnic differences in marriage patterns by education, we decided to focus on whites.

Compared to the cross-country analysis, there is less variation across states in the US than across developed countries in the key variable that drives our theory, the strength of gender norms.[44]

We use the 1977 to 2014 waves of the General Social Survey (GSS) to measure gender norms at the state level in the US.[45] We rely on the answers to the question "It is better if the man is the achiever outside the home and the woman takes care of home and family." Respondents indicate their agreement to this statement on a four-point scale–agree strongly, agree, disagree, and disagree strongly. We code the responses "agree strongly" and "agree", as indicating a greater degree of gender conservatism. Since the GSS did not include the "jobs scarce" question from the IVS that we used in the cross-country analysis, we focus on this specific question as it was most comparable to the ISSP question that was also used in the cross-country analysis. Moreover, this question appears closest in spirit to proxying for the gender roles that are central in the model, which is based on the belief that some may regard a woman's primary role to be in the home.

To combine the individual responses from different GSS waves into a single state-specific measure, we first regress the individual-level responses to the question on a full set of year dummies. Throughout, we use responses for all individuals aged 18 and older. Next, we use the residuals from this regression to create a measure of the average gender conservatism in a particular state, which is simply the mean across all years of the residual individual-level response in a given state. For ease of interpretation, for the main analysis, we standardized the state-level sexism measure to have a mean of zero and a standard deviation of one in the full sample of states. We are able to construct a state-level measure of sexism based on answers to this statement for 44 states and DC.[46] Appendix Table 6 provides some descriptive statistics of the sexism measure by state, as well as the classification of states into three sexism groups based on terciles of the standardized residual state-level sexism measure. An important assumption that underpins the use of a single state-level index over this period of time to proxy for gender norms is that there are persistent and stable differences in gender norms across states. In results available on request, we demonstrate that while average attitudes have become less conservative over time across all states,[47] the relative ranking of states in terms of the sexism index has remained relatively constant over time.[48]

[44]One might be concerned that selective internal migration might bias the results – in particular, that women who prefer to acquire education and reside in a sexist state might move to states that are more tolerant toward career women. In results available on request, we show that similar results are obtained if we limit the sample to only individuals who live in the same state that they were born in (i.e., non-internal migrants).

[45]The question is available in the 1977, 1985-1991, 1993, and every two years from 1994 to 2014 waves of the GSS.

[46]The six states that were not included in earlier waves of the GSS are Hawaii, Idaho, Maine, Nebraska, Nevada, and New Mexico.

[47]Consistent with the trends documented in Fernandez (2013).

[48]Specifically, using the procedure described above, we create two measures of the sexism index – the first based on an earlier time period (1977 to 1998) and the second based on a later time period (2000 to 2014). When we restrict the sample of states to those with at least 30 respondents in the early and late periods, the Spearman rank correlation between the "early" and "late" index is 0.75. The correlations between the overall (early + late) sexism

Table 5 presents the evolution of the labor market conditions faced by individuals at the time they make their marriage decisions, separated by sexism level groups. The wage measures are based on the sample of non-institutionalized salaried workers age 22 to 65 (i.e., excluding self-employed) who are not in school and reported working full time (35 or more hours per week). Similar to our results from the cross-country analysis, skilled female wages have been steadily increasing over time for all sexism groups. Given the longer period that we observe for the state-level analysis, we observe declining gender wage gaps for both skilled and unskilled workers and a generally increasing skilled wage premium for both men and women..[49] For the state-level analysis, we use the real wages of college-educated women to proxy for labor market opportunities for high-skilled women. Given the higher quality of the wage data in the US sample, as well as the fact that we observe declines in the gender wage gap and increases in the skill premium over the sample time period, we do not use the state-level GDP per capita as an alternative proxy for women's opportunities.[50]

To illustrate the extent of the cross-state variation in the skill gap in ever-married rates by gender in 2010, Figure 8 replicates Figure 2 for the US state-level analysis. We plot the difference in marriage rates between skilled and unskilled women in 2010 (y axis) against the difference in marriage rates between skilled and unskilled men in the same year (x axis). As of 2010, in all states except Missouri and Wyoming, skilled men marry at a higher rate than unskilled ones. While we observe no deficit for skilled women in the marriage market in 2010 in the US at the aggregate level, this statistic hides substantial variation across states, which we propose to explain through the lens of our theory. We also see that the majority of the data is below the 45-degree line. In other words, in the majority of states, skilled women experience a greater deficit in the marriage market compared to skilled men. In the figure, DC stands out as a clear outlier in the size of the marriage gaps for both women and men. For our subsequent analysis, we present results that include DC; however, we have also estimated specifications where we omit DC, and the results are very similar.[51]

Before turning to an examination of the relationship between the skill gap in marriage rates and the strength of gender norms at the state-level, we use the longer time-series data available for the panel of US states to provide some suggestive evidence of the theoretical prediction of a U-shaped relationship in the skill gap in marriage rates over time, particularly for areas with more conservative gender norms. Figure 9 graphs the trends in the skill gap in ever-married rates by sexism group from 1970 to 2010, relative to 1970. Specifically, we regress the female marriage gap on the interaction between each of the sexism group dummies and each of the year dummies,

and the "early" and "late" sexism indices are 0.92 and 0.93, respectively. This suggests that our main measure is indeed capturing stable rank differences in gender norms across states.

[49]Note that the decline in the college wage premium from 1970 to 1980 and the subsequent increase from 1980 to 2010 has been noted by other papers including Autor, Katz, and Kearney (2008) and Goldin and Katz (2007).

[50]This is because, unlike the case for the cross-country analysis, the assumption that all wages are a constant proportion of GDP is unlikely to hold in the sample of US states over the time period that we study.

[51]These results are available on request.

controlling for state fixed effects. The omitted category is 1970 for each sexism group. Panel A graphs the baseline coefficient estimates on the interaction terms for each sexism group and year relative to 1970 from a model with no additional controls. Panel B graphs the coefficient estimates from a similar model that includes controls for the share of males with a college degree in each state.

Consistent with the model, we observe that for the least sexist states, the skill marriage gap for women has been declining (in favor of skilled women) steadily since 1970. In contrast, for the most sexist states, there is evidence of a U-shaped relationship: the skill gap in ever-married rates widened in these states from 1970 to 1990 before declining from 1990 to 2010. States with medium levels of sexism experienced little change in the skill marriage gap between 1970 and 1990 and, similar to the pattern observed in high sexism states, a decline in the marriage gap from 1990 to 2010. The patterns observed in the raw data (panel A) and adjusting for the educational composition of men and women in the marriage market (panel B) are quite similar. Overall, these trends provide striking visual evidence that is consistent with the predictions of our model.

We now turn to replicating Tables 2 to 4 using state-level data. Table 6 mirrors Table 2 and estimates the correlation between the penalty that skilled women experience in the marriage market and the strength of gender norms in 2010 using data for the 45 states for which we can construct a sexism measure. The skilled-unskilled gap in marriage is more likely to be positive in low-sexism states and more likely to be negative in high-sexism states. The univariate correlation in Column 1 between the skilled-unskilled gap in marriage rates in 2010 and the high-sexism dummy is, if anything, strengthened when controls for high-skilled female wages and the share of males with tertiary education, as well as other state-specific controls such as quadratics in female low-skilled wages as well as wages for high-skilled and low-skilled males, are added. Note too, that the labor market controls are measured among individuals aged 22 to 65 in the preceding decade. This ensures that the labor market controls proxy for the relevant labor market conditions that individuals are likely to face when making their marriage decisions (when they are aged 25 to 34).[52] Columns (3) and (4) show that the relationship between the marriage gap by education among women and sexism is also robust to using the continuous measure of sexism.

In Appendix Table 7, we show that these results are robust to controlling for measures of household production (a proxy for β) as well as the share of females with college education.[53] Furthermore, the results are qualitatively similar when we use alternative proxies for long-term partnerships, such as the skilled-unskilled gap in fertility as well as marriages that include children.

[52]Due to data limitations, we were not able to construct the variables in the preceding time period in the cross-country analysis.

[53]Just like in the cross-country case, we do not find any systematic correlation across US states between total (e.g., husband plus wife) time spent on household production and sexism level (even though gender norms correlate in the expected direction with the allocation of that time between husband and wife). These results are available on request.

Columns 5 to 8 replicate Column 2 for the following years, respectively: 2000, 1990, 1980, and 1970. What is most remarkable about this analysis of the variation in the relationship over time is that the relationship appears to be most pronounced in the last three decades (1990 to 2010) but is not present in the earlier decades (1970 and 1980). Recall that one prediction of our model is that educated women will only start experiencing a decline in their relative marriage rate compared to less-educated ones when a) they become less appealing to men who dislike having a working wife and b) they become more picky in the marriage market as their labor market opportunities and utility if they remain single increase. When labor market opportunities for skilled women are relatively low, we would not expect to see large differences in their relative marriage rates based on the sexism of the environment. Hence, the lack of a relationship between our two key variables in the earlier decades (1970 and 1980) can be rationalized through the lens of our model.

The two remaining columns of Table 6 replicate the analysis in Columns 2 and 4 for men. The coefficient estimate for high-sexism states for men is negative and about half the size of the corresponding estimate for women and not statistically significant, while the coefficient estimate for mid-sexism states for men is similar to that for women. In addition, the estimated relationship between the continuous measure of sexism and the male skilled-unskilled marriage gap is negative, albeit not statistically significant. We interpret these findings as suggestive of a weak negative relationship between state-level sexism and the skill gap in male marriage rates, which is in line with what the theory predicts.

Table 7 mirrors Table 3. In particular, we test for the finer prediction of our model: increases in labor market opportunities for skilled women are more likely to be associated with increases in their relative marriage rate in less sexist states but decreases in more sexist states. The analysis is performed on a 1970 to 2010 panel of US states. As indicated above, all the labor market variables (including high-skilled female wages) are measured in the prior decade to proxy for the labor market conditions that might have been most relevant at the time marriage market decisions were made. All regressions in Table 7 include state and year fixed effects, and standard errors are clustered at the state level.

Recall that the main prediction of the model we want to test in this table is that whether the relationship between the marriage market premium for skilled women and their labor market opportunities is mediated by the level of sexism in their place of residence. The evidence in Table 7 appears consistent with that in the country-level panel in Table 3. Specifically, we find that increases in the labor market opportunities for skilled women are associated with significantly larger declines in the marriage rates of skilled women relative to unskilled women in the more sexist states as compared to the least sexist states. Furthermore, consistent with the predictions of the theory, the point estimates in Column 1 of the top panel indicate that an increase in the labor market opportunities for skilled women is associated with higher relative marriage rates of skilled women in

low (0.055) and mid-sexism (0.055−0.038) states but lower relative marriage rates of skilled women in high-sexism states (0.055−0.066).[54] Column 2 shows that the patterns in Column 1 are robust to including a battery of time-varying state controls: the share of males with tertiary education and quadratics for the wages of low-skill women, low-skill men, and high-skill men. Note that unlike with the cross-country analysis, since both the gender wage gap and the skill premium have changed alongside the increase in high-skilled female wages, instead of controlling for the gender wage gap and the skill premium, here we include separate controls for the wages of each of the other groups of workers (i.e., low-skilled women as well as low-skilled and high-skilled men).

The first column in the lower panel shows a similar relationship when we use the continuous sexism measure. However, the magnitude of the coefficient on the interaction between high-skill women's wages and the continuous measure of sexism, while still negative, is smaller and not statistically significant. Appendix Table 8 shows that the overall patterns are largely similar when we control for the share of females with college education. The results also hold when we use skill gaps in fertility as well as marriages that include children as alternative outcome variables.

Finally,Column 3 of Table 7 replicates Column 2 for males. In line with the predictions of the theory, we observe that for all groups, increases in the labor market opportunities for skilled women are associated with increases in the relative likelihood of marriage among skilled men. Moreover, skilled men's relative marriage rates are relatively more negatively affected by higher labor market opportunities for women in more sexist states. Overall, consistent with the theory, the observed relationship is weaker for men as compared to women. Finally, as observed in the lower panel, this relationship is weaker and not statistically significant when we use the continuous sexism measure.

Table 8 tests the predictions of our model for women's educational outcomes. This table replicates in the US states context the analysis of Table 4 where we observed a negative correlation between sexism and women's educational attainment. The dependent variable is the share of women in a state between 35 and 44 years of age who have completed a college degree. Each regression is a cross-section of states at different points in time. All the regressions control for the share of men with a college degree in each state. Columns 1 to 5 present the results for the cohort of women aged 35 to 44 in 2010. In Column 1, we observe that the share of women who have completed a college degree is highest in low-sexism states. Column 2 shows that the coefficient on the dummy for high-sexism states is slightly more negative when we include the same set of state-level controls as in the previous table. The negative relationship between sexism and women's educational attainment is also robust to using the continuous sexism measure (Columns 3 and 4).

As we had observed in the cross-country data, in Column 5 we show that there is a positive relationship between the share of women who have completed a college degree in a state and the

[54]The p-value for the test that the slope for high-sexism states (0.055−0.066) is zero or positive is 0.388.

difference in marriage rate between high- and low- skilled women, consistent with the mechanism articulated in the theory. However, we note here that, unlike in the cross-country analysis, this relationship is not statistically significant.

The remaining columns of Table 8 replicate Column 2 for the other time periods: 2000, 1990, 1980, and 1970. While sometimes imprecise, the estimates suggest a negative correlation between sexism and female educational attainment from 1980 onward. Sexism does not appear to relate to women's educational outcomes for the 1970 cohort (e.g. women who were between 35 and 44 years old in 1970). Again, our theory provides a way to rationalize this pattern. The explanation we propose for why norms may lead to worse female educational outcomes in more sexist states is that women may actively choose to be less educated in those states because they anticipate having to pay a cost in the marriage market for the increased labor market opportunities that are available to skilled individuals. Assuming that in the earlier period, education was less likely to translate into greater labor market opportunities, then the relative sexism of the state was less likely to matter. Nonetheless, we can only conjecture as to whether this is indeed the correct explanation.

In summary, the state-level evidence appears largely consistent with the findings from the cross-country analysis. The fact that similar patterns are observed within a single-country context is reassuring and suggests that the cross-country patterns are unlikely to be driven entirely by unobserved heterogeneity.

6 Conclusion

We develop a simple theoretical model that helps to rationalize the relatively lower marriage rate of educated women through the lens of gender identity norms. The model can also provide an explanation as to why educated women's relative deficit in the marriage market reacts in opposite directions to improvements in their labor market opportunities in more vs. less gender conservative societies, and hence why women's educational choices in the face of growing labor market opportunities might depend on the strength of these gender norms as they balance labor and marriage markets considerations. We verify some of the key predictions of our model in both a panel of developed nations as well as a panel of US states.

The model we propose obviously abstracts from various relevant factors and could be enriched by future work. In particular, to emphasize how better labor market opportunities for skilled women interact with slower-moving social norms, we have taken the extreme perspective of fixed and exogenous gender role attitudes. A richer model would account for the fact that, even if slowly, gender role attitudes have been converging toward less conservative views, and would endogenize this process of change.

Our analysis has implications for the expected long-run trend of what is today a troubling phenomenon in many gender-conservative countries, and in particular East Asia and Southern Europe: the increasing singleness rate of college educated women. Given that non-traditional family structures and out-of-wedlock births continue to be quite rare in these societies (particularly in East Asia), this "flight from marriage" among highly-educated women is also likely to translate in a decline in fertility for this educational group, only reinforcing the already low fertility rate in this part of the world. The fact that highly-skilled women are disproportionately foregoing childbearing could also result in lower social returns to education in these societies, and it may further slow down the dynamics of adjustment of gender norms to the new labor market reality if only children of educated and/or working women develop more liberal gender attitudes (FFO, 2004).

Even if gender role attitudes do not change, or change very slowly, in East Asia, our analysis suggests that further improvements in the labor market opportunities for skilled women should ultimately improve their relative attractiveness in the marriage market. While predicting when this will happen is beyond the mainly qualitative nature of the exercise we have performed here, the fact that the marriage rate of educated women has caught up to (and in some cases surpassed) that of less educated women in more gender-equal societies should give East Asian and Southern European countries hope about the transitional nature of the phenomenon they are experiencing.

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7 Model Appendix

7.1 Marriage Market: Comparative Statics for Reservation Qualities

The reservation qualities, q^*, of males and females, are such as they are indifferent between marrying and staying single. That is, they solve $V_{g,ij} = U(w_i)$, where i indexes the skill type of a man if $g = m$ or the skill type of a woman if $g = f$, and similarly for j with $i, j = S, U$.

For men we have

$$q_m^* = \begin{cases} \tilde{\beta} & if \quad w_f \leq \beta \\ \tilde{\beta} - \alpha_m(w_f - \beta) - \beta \log \frac{\beta}{w_f} & if \quad w_f > \beta, \end{cases} \tag{10}$$

where $\tilde{\beta} = -\beta \log n$, with $\beta \log n$ representing the utility from the public good in a specialized household.

The partial derivatives are as follows: $\frac{\partial q_m^*}{\partial w_m} = 0$; $\frac{\partial q_m^*}{\partial w_f} = -\alpha_m + \frac{\beta}{w_f}$ if $w_f > \beta$ and equals 0 otherwise; $\frac{\partial q_m^*}{\partial \alpha_m} = \beta - w_f$ if $w_f > \beta$ and equals 0 otherwise.

- $\frac{\partial q_m^*}{\partial w_m} = 0$ follows from the assumption that $w_m > \beta$, implying that men always work independently of their marital status. Therefore their marriage reservation quality is not a function of men's wage.
- $\frac{\partial q_m^*}{\partial \alpha_m} = \beta - w_f$ if $w_f > \beta$ indicates that the more men value his wife's career and consumption (i.e., the higher $\alpha_m$is), the lower the threshold quality of the marriage market matching such that a man gets married.
- $\frac{\partial q_m^*}{\partial w_f} = -\alpha_m + \frac{\beta}{w_f}$ if $w_f > \beta$, in which case the effect of the woman's wage on the quality of the match required by men depends on the value of women's wage itself

$$\frac{\partial q_m^*}{\partial w_f} \begin{cases} > 0 \text{ if } \beta < w_f \leqslant \frac{\beta}{\alpha_m} \\ < 0 \text{ if } w_f > \frac{\beta}{\alpha_m}. \end{cases} \tag{11}$$

  This implies that, when $w_f > \beta$ (i.e., the wife devotes part of her time to market work), q_m^* increases with women's wage if $\beta/w_f \geqslant \alpha_m$, that is when the loss in production of the household public good due to the wife working is greater than the gain from the externality due to wife's consumption. Once w_f increase so that $\beta/w_f < \alpha_m$, q_m^* *decreases* in women's wage.

For women we have

$$q_f^* = \begin{cases} \tilde{\beta} - (\alpha_f w_m - w_f) & if \quad w_f \leq \beta \\ \tilde{\beta} - (\alpha_f w_m - \beta) - \beta \log \frac{\beta}{w_f} & if \quad w_f > \beta. \end{cases} \tag{12}$$

The partial derivatives are: $\frac{\partial q_f^*}{\partial w_m} = -\alpha_f$; $\frac{\partial q_f^*}{\partial w_f} = \frac{\beta}{w_f}$ if $w_f > \beta$ and equals 1 otherwise; $\frac{\partial q_f^*}{\partial \alpha_f} = -w_m$ for any w_f.

- $\frac{\partial q_f^*}{\partial w_m} = -\alpha_f$. Hence, women become less picky as male's wage increases.
- $\frac{\partial q_f^*}{\partial w_f} = \frac{\beta}{w_f}$ if $w_f > \beta$ and equals 1 otherwise. It implies that, for women who do not work, the required matching quality threshold increases 1:1 with their wage. For working women, the higher wage increases consumption either if they are single or married. However, the increase in consumption for working married women is lower than that for single women by a factor of β/w_f. In all cases, women with higher wages are always pickier than women with lower wages, independently of the range of w_f. Note that the same comparative static for women's threshold qualities apply whether women's wage increase in absolute value or relative to men.

One can see that if we rewrite women's wage as $w_f = \pi w_m$, where $\pi < 1$ is the female-male wage ratio.

- $\frac{\partial q_f^*}{\partial \alpha_f} = -w_m$ for any w_f.

Let's now denote $w_{g,i}$, $g = f, m$, $i = S, U$ as the labor market wage of agent of sex g and level of skill i, and $q^*_{g,ij}$ as the threshold quality of the marriage market matching required by an agent of sex g and skill level i matched with an opposite sex agent of type j. Since men's gender role attitudes do not vary by skill and do not depend on their own wage, the reservation qualities are the same across types. That is, $q^*_{m,ij} = q_{m,jj} = S, U$.

Our main case assumes that unskilled married women fully specialize in home production while skilled married women work. That is, $w_{f,U} < \beta < w_{f,S}$.

For men we have

$$q^*_{mU} - q^*_{mS} = \alpha_m(w_{f,S} - \beta) + \beta \log \frac{\beta}{w_{f,S}}. \tag{13}$$

Defining $w^*_f(\alpha_m, \beta)$ as the women's wage such that $q^*_{mU} = q^*_{mS}$ we have that,

$$q^*_{mU} - q^*_{mS} \begin{cases} \leq 0 \text{ for } w_{f,U} < \beta < w_{f,S} \leq w^*_f(\alpha_m, \beta) \\ > 0 \text{ for } w_{f,S} > w^*_f(\alpha_m, \beta). \end{cases} \tag{14}$$

q^*_m can be allowed to depend on male's type if $\alpha^S_m > \alpha^U_m$, that is, skilled men have less conservative attitudes toward gender roles and benefit more than unskilled men from their wife's consumption externality (a hypothesis that is supported by our data). The threshold quality when matched to an unskilled women is still skill-invariant since unskilled women do not work once they are matched, however for $w_{f,S} > \beta$ the threshold qualities would differ by men's type with the difference being given by

$$q^*_{m,SS} - q^*_{m,US} = -(\alpha^S_m - \alpha^U_m)(w_{f,S} - \beta). \tag{15}$$

This difference is always negative, implying that skilled men are less picky than unskilled men when matched to a skilled woman. This comparative statics implies that (as in FFO, 2004), the more skilled men are around, the smaller the skilled-unskilled marriage deficit is.

For women we have

$$q^*_{fS} - q^*_{fU} = (\beta - w_{f,U}) - \beta \log \frac{\beta}{w_{f,S}}. \tag{16}$$

This difference is always positive, implying that skilled women are always pickier than unskilled women.

The threshold matching quality required by skilled and unskilled women depends on male's wage as well. Assuming $w_{m,S} > w_{m,U} > \beta$, we have that for $i = S, U$

$$q^*_{f,iS} - q^*_{f,iU} = -\alpha_f(w_{m,S} - w_{m,U}) < 0. \tag{17}$$

This means that all women prefer skilled men. Also, rewriting $w_{m,U} = \phi w_{m,S}$, $\phi \in (0,1)$,

$$q^*_{fiS} - q^*_{fiU} = -\alpha_f(1-\phi)w_{m,S} < 0. \tag{18}$$

How much pickier women are toward unskilled men is increasing in the skill premium $(1-\phi)$ and in $w_{m,S}$. If both $w_{m,S}$ and $(1-\phi)$ increase, then unskilled men face much more pickiness from the female side of the marriage market.

Suppose instead that both skilled and unskilled women work, $w_{f,S} > w_{f,U} > \beta$. In this case

$$q^*_{mS} - q^*_{mU} = -\alpha_m(w_{f,S} - w_{f,U}) + \beta \log \frac{w_{f,S}}{w_{f,U}} \tag{19}$$

and

$$q^*_{fS} - q^*_{fU} = \beta \log \frac{w_{f,S}}{w_{f,U}}. \tag{20}$$

We now consider gender differentials in the threshold quality of the marriage market matching required by an individual of sex g and skill level i to get married with an individual of the opposite sex and skill level j. We maintain the assumptions that $w_{f,U} < \beta < w_{f,S}$, $w_m > \beta$ and $w_m > w_f$. Then:

$$q^*_m - q^*_f = \begin{cases} -(w_f - \alpha_f w_m) \text{ if } w_f \leq \beta \\ -\alpha_m(w_f - \beta) - (\beta - \alpha_f w_m) \text{ if } w_f > \beta. \end{cases} \tag{21}$$

If $w_f \leq \beta$, women require higher matching quality than men if their wage when single is larger than how much they value their husband's consumption and career. If $w_f > \beta$, men are pickier than women if $\alpha_m < \frac{\alpha_f w_m - \beta}{w_f - \beta}$, and this condition is more likely to hold if men have more conservative gender roles attitudes (i.e., low α_m), the gender wage gap is larger, and the spillover from husband's private consumption is higher (α_f is higher).

7.2 Marriage Market: Marriage Probabilities

Let's define $\Pi_{f,ij}$ to be the probability that, for a woman of type i meeting a man of type j, the random draw of the match quality $q_{g,ij}$ lies above each partner's threshold. This is given by $\Pi_{f,ij} = \overline{F}_{i=j}(q^*_{m,i})\overline{F}_{i=j}(q^*_{f,ij})$ if she meets her own type and $\Pi_{f,i\neq j} = \overline{F}_{i\neq j}(q^*_{m,i})\overline{F}_{i\neq j}(q^*_{f,ij})$ if she meets the other type, where $\overline{F} = (1-F)$ is the complementary cumulative distribution function. We assume that $F_{i=j}(.)$ dominates $F_{i\neq j}(.)$ by First Order Stochastic Dominance. That is, the probability that a random quality draw is lower than q^* is higher when two individuals of different skill level match. Intuitively, it means that any man (woman) is more likely to be willing to accept a marriage market matching with a similarly skilled woman (man).

The probability that a match is formed is given by the product of $\Pi_{f,ij}$ times the probability of meeting a man of type j in the population, $j = S, U$. Having defined π_m as the fraction of skilled men in the population, the skilled-unskilled difference in marriage probability is then given by $\Pi^S_f - \Pi^U_f$, where

$$\Pi^S_f = \left[\pi_m \overline{F}_{i=j}(q^*_{f,SS})\overline{F}_{i=j}(q^*_{m,S}) + (1-\pi_m)\overline{F}_{i\neq j}(q^*_{f,SU})\overline{F}_{i\neq j}(q^*_{m,S})\right] \tag{13}$$

and

$$\Pi^U_f = \left[\pi_m \overline{F}_{i\neq j}(q^*_{f,US})\overline{F}_{i\neq j}(q^*_{m,U}) + (1-\pi_m)\overline{F}_{i=j}(q^*_{f,UU})\overline{F}_{i=j}(q^*_{m,U})\right] \tag{14}$$

are, respectively, the marriage probabilities of skilled and unskilled women. Comparative statics results for the marriage probability will depend on the comparative statics of q^*, its differences across types and the properties of the distribution of match quality, which we assume to be log-concave. This implies, among the other things, that the ratio $\frac{f(x)}{\overline{F}(x)}$ is monotonically increasing in x. The uniform, normal, exponential, logistic. and extreme value distributions all have log-concave density function. Note that long-concave distributions also have the monotone likelihood ratio property, which implies monotone hazard rates and first order stochastic dominance, properties that we use for our comparative statics. See Bagnoli and Bergstrom (2005) for an in-depth discussion of log-concave distributions and their many applications in economics.

First, we consider how changes in w_f affect marriage probabilities of skilled vs. unskilled women. Recall that $q^*_{m,U} = \tilde{\beta}$ and $\frac{\partial q^*_f}{\partial w_f} = 1$ for $w_f < \beta$, which means that the derivative of Π^U_f relative to w_f is given by

$$\frac{\partial \Pi^U_f}{\partial w_f} = -\left[\pi_m f_{i\neq j}(q^*_{f,US})\bar{F}_{i\neq j}(\tilde{\beta}) + (1-\pi_m) f_{i=j}(q^*_{f,UU})\bar{F}_{i=j}(\tilde{\beta})\right] < 0. \tag{22}$$

That is, the probability of marriage of unskilled women is monotonically decreasing in w_f for $w_f < \beta$.

Conversely, the probability of marriage for unskilled women is monotonically increasing in w_m . This is because

$$\frac{\partial \Pi_f^U}{\partial w_m} = \alpha_f \left[\pi_m f_{i\neq j}(\bar{q^*_{fUS}}) F_{i\neq j}(\tilde{\beta}) + (1-\pi_m) f_{i=j}(\bar{q^*_{f,UU}}) F_{i=j}(\tilde{\beta}) \right] > 0. \tag{23}$$

Note that a decrease in w_f accompanied by a rise in w_m by the same amount will cause Π_f^U to fall, because $\alpha_f < 1$.

The marriage gap between unskilled and skilled women is decreasing in α_m^i, where $i = S, U$. As skilled or unskilled men become less conservative with respect to gender roles, $q^*_{m,iS}$ decreases, thus reducing the marriage penalty for high wage women ($w_{f,S} > \beta$). If both α_m^i and $w_{f,S}$ increase, then skilled women's marriage prospects ameliorate even more.

Next we study how the skilled women's marriage probability varies with $x = w_f, w_m, \alpha_m$. The derivative of Π_f^S with respect to x is given by

$$\begin{aligned}\frac{\partial \Pi_f^S}{\partial x} = {} & \pi_m \left[-f_{i=j}(q^*_{f,SS}) \bar{F}_{i=j}(q^*_{m,S}) \frac{\partial q^*_{f,SS}}{\partial x} - \bar{F}_{i=j}(q^*_{f,SS}) f_{i=j}(q^*_{m,S}) \frac{\partial q^*_{m,S}}{\partial x} \right] + \\ & + (1-\pi_m) \left[-f_{i\neq j}(q^*_{f,SU}) \bar{F}_{i\neq j}(q^*_{m,S}) \frac{\partial q^*_{f,SU}}{\partial x} - \bar{F}_{i\neq j}(q^*_{f,SU}) f_{i\neq j}(q^*_{m,S}) \frac{\partial q^*_{m,S}}{\partial x} \right]. \end{aligned} \tag{24}$$

Recall that $\frac{\partial q^*_{f,SS}}{\partial w_f} = \frac{\partial q^*_{f,SU}}{\partial w_f} = \frac{\beta}{w_f}$, $\frac{\partial q^*_{f,SS}}{\partial w_m} = \frac{\partial q^*_{f,SU}}{\partial w_f} = -\alpha_f$, $\frac{\partial q_{m,S}}{\partial w_f} = \left(\frac{\beta}{w_f} - \alpha_m \right)$ and $\frac{\partial q^*_{m,S}}{\partial w_m} = 0$. That is, for both men and women, the relationship between q^* and w_f and w_m is invariant to men's type. Therefore, defining $\frac{\partial q^*_{f,SS}}{\partial x} = \frac{\partial q^*_{f,SU}}{\partial x} = \frac{\partial q^*_f}{\partial x}$, we can rewrite the above equation as

$$\begin{aligned}\frac{\partial \Pi_f^S}{\partial x} = {} & - \frac{\partial q^*_f}{\partial x} \left[\pi_m f_{i=j}(q^*_{f,SS}) \bar{F}_{i=j}(q^*_{m,S}) + (1-\pi_m) f_{i\neq j}(q^*_{f,SU}) \bar{F}_{i\neq j}(q^*_{m,S}) \right] + \\ & - \frac{\partial q^*_{m,S}}{\partial x} \left[\pi_m f_{i=j}(q^*_{m,S}) \bar{F}_{i=j}(q_{f,SS}) + (1-\pi_m) f_{i\neq j}(q^*_{m,S}) \bar{F}_{i\neq j}(q^*_{f,SU}) \right]. \end{aligned} \tag{25}$$

For $x = w_m$, the second term on the right-hand side of the equation is 0, and it is immediate to see that the marriage probability for skilled women monotonically increases in w_m, that is

$$\frac{\partial \Pi_f^S}{\partial w_m} = \alpha_f \frac{\partial q^*_f}{\partial w_m} \left[\pi_m f_{i=j}(q^*_{f,SS}) \bar{F}_{i=j}(q^*_{m,S}) + (1-\pi_m) f_{i\neq j}(q^*_{f,SU}) \bar{F}_{i\neq j}(q^*_{m,S}) \right] > 0. \tag{26}$$

For $x = w_f$, we must consider different intervals of women's wages. Observe that

$$\frac{\partial \Pi_f^S}{\partial w_f} = -\frac{\beta}{w_f}\left[\pi_m f_{i=j}(q^*_{f,SS})\bar{F}_{i=j}(q^*_{m,S}) + (1-\pi_m) f_{i\neq j}(q^*_{f,SU})\bar{F}_{i\neq j}(q^*_{m,S})\right] + \\ -\left(\frac{\beta}{w_f} - \alpha_m\right)\left[\pi_m f_{i=j}(q^*_{m,S})\bar{F}_{i=j}(q_{f,SS}) + (1-\pi_m) f_{i\neq j}(q^*_{m,S})\bar{F}_{i\neq j}(q^*_{f,SU})\right]. \tag{27}$$

For $\beta < w_f \leq \frac{\beta}{\alpha_m}$, $\frac{\partial \Pi_f^S}{\partial w_f} < 0$, the marriage probability of skilled women falls monotonically in women's wages. For $w_f > \frac{\beta}{\alpha_m}$ and re-arranging the terms in equation 27 (above) the marriage probability for skilled women increases iff:

$$\alpha_m\left[\pi_m f_{i=j}(q^*_{m,S})\bar{F}_{i=j}(q_{f,SS}) + (1-\pi_m) f_{i\neq j}(q^*_{m,S})\bar{F}_{i\neq j}(q^*_{f,SU})\right] \\ > \\ \frac{\beta}{w_f}\left\{\pi_m\left(\frac{f_{i=j}(q^*_{f,SS})}{\bar{F}_{i=j}(q^*_{f,SS})} - \frac{f_{i=j}(q^*_{m,S})}{\bar{F}_{i=j}(q^*_{m,S})}\right)\bar{F}_{i=j}(q^*_{f,SS})\bar{F}_{i=j}(q^*_{m,S})\right\} + \\ \frac{\beta}{w_f}\left\{(1-\pi_m)\left(\frac{f_{i\neq j}(q^*_{f,SU})}{\bar{F}_{i\neq j}(q^*_{f,SU})} - \frac{f_{i\neq j}(q^*_{m,S})}{\bar{F}_{i\neq j}(q^*_{m,S})}\right)\bar{F}_{i\neq j}(q^*_{f,SU})\bar{F}_{i\neq j}(q^*_{m,S})\right\} \tag{28}$$

This is always true, since the term in brackets is always negative for $w_f > \frac{\beta}{\alpha_m}$, given $q^*_{f,SS} < q^*_{m,S}$ and $q^*_{f,SU} < q^*_{m,S}$ and the log-concavity assumption for F, which implies that the hazard rate $\frac{f(x)}{F(x)}$ is increasing in x. Therefore, the skilled women marriage probability exhibits a U-shaped pattern. It decreases for $\beta < w_f \leq \frac{\beta}{\alpha_m}$ and increases for $w_f > \frac{\beta}{\alpha_m}$.

The skilled-unskilled difference in marriage probability will therefore initially widen when women's wage is relatively low (i.e., for $\beta < w_f \leq \frac{\beta}{\alpha_m}$) and then increase for sufficiently high value of skilled women's female wages (i.e., $w_f > \frac{\beta}{\alpha_m}$), eventually turning into a surplus when $w_f > w^*$.

This can be gathered directly from the comparison of equations (13) and (14) defining women's marriage probabilities by skill, $\Pi_f^j, j = S, U$, and keeping in mind the comparative statics of the reservation qualities.

Next we assess the impact of an increase in α_m on the marriage gap between skilled and unskilled women. All else being equal, an increase in the positive spillover from women's consumption leads to a decrease in the marriage gap and in particular to a rise in the marriage probability of skilled women, while the marriage probability of unskilled women remains unaffected ($\partial \Pi_f^U / \partial \alpha_m = 0$). Taking the derivative of Π_f^S with respect to α_m we obtain:\

$$\frac{\partial \Pi_f^S}{\partial \alpha_m} = (w_{f,S} - \beta)\left[\pi_m \bar{F}_{i=j}(q^*_{f,SS}) f_{i=j}(q^*_{m,SS}) + (1-\pi_m)\bar{F}_{i\neq j}(q^*_{f,SU}) f_{i\neq j}(q^*_{m,US})\right] > 0, \tag{29}$$

which is always positive for $w_{f,S} > \beta$.

Finally, it is immediate to see that both $\frac{\partial \Pi_f^i}{\partial \pi_m} > 0, i = S, U$, that is, the marriage probability of unskilled and skilled women increases with the share of skilled men in the population, though the increase is larger for skilled women because of the homogamy assumption.

We now consider marriage probabilities for men. For skilled men, the marriage probability is

$$\begin{aligned}\Pi_m^S &= \pi_f \int_{q^*_{m,SS}}^{\infty} \int_{q^*_{f,SS}}^{\infty} dF dF + (1-\pi_f) \int_{q^*_{m,SU}}^{\infty} \int_{q^*_{fUS}}^{\infty} dF_{i\neq j} dF_{i\neq j} \\ &= \pi_f \bar{F}_{i=j}(q_{m,SS}) \bar{F}_{i=j}(q_{f,SS}) + (1-\pi_f) \bar{F}_{i\neq j}(q_{m,SU}) \bar{F}_{i\neq j}(q_{fUS}). \end{aligned} \tag{30}$$

Analogously, the probability of marriage for unskilled men is

$$\begin{aligned}\Pi_m^U &= \pi_f \int_{q^*_{m,US}}^{\infty} \int_{q^*_{f,SU}}^{\infty} dF_{i\neq j} dF_{i\neq j} + (1-\pi_f) \int_{q^*_{m,UU}}^{\infty} \int_{q^*_{fUU}}^{\infty} dF_{i=j} dF_{i=j} \\ &= \pi_f \bar{F}_{i\neq j}(q_{m,US}) \bar{F}_{i\neq j}(q_{f,SU}) + (1-\pi_f) \bar{F}_{i=j}(q_{m,UU}) \bar{F}_{i=j}(q_{fUU}). \end{aligned} \tag{31}$$

The probabilities of marriage for men will react to changes in wages. In particular, changes in $w_{m,S}$ will move the marriage probabilities of skilled and unskilled men in the same direction.

$$\begin{aligned}\frac{\partial \Pi_m^S}{\partial w_{m,S}} &= \pi_f \alpha_f \bar{F}_{i=j}(q^*_{m,SS}) f(q^*_{f,SS}) + (1-\pi_f) \alpha_f \bar{F}_{i\neq j}(q^*_{m,SU}) f_{i\neq j}(q^*_{fUS}) > 0 \\ \frac{\partial \Pi_m^U}{\partial w_{m,S}} &= \pi_f \phi \alpha_f \bar{F}_{i\neq j}(q^*_{m,US}) g(q^*_{f,SU}) + (1-\pi_f) \phi \alpha_f \bar{F}_{i=j}(q^*_{m,UU}) f(q^*_{fUU}) > 0. \end{aligned} \tag{32}$$

This is intuitive since, in absence of an increase in the skill premium $(1-\phi)$, the increase in men's wage will rise earnings for both skilled and unskilled men, leaving the marriage probability differential unaltered. An increase in the skill premium (a decrease in ϕ) for a given wage rate w_m will lower the marriage probability of unskilled men even further relative to skilled men, that is

$$\frac{\partial \Pi_m^U}{\partial \phi} = \alpha_f w_m \left[\pi_f \bar{F}_{i\neq j}(q^*_{,US}) f_{i\neq j}(q^*_{f,SU}) + (1-\pi_f) \bar{F}_{i=j}(q^*_{m,UU}) f_{i=j}(q^*_{f,UU}) \right] > 0, \tag{33}$$

thus inducing an increase in the marriage gap between skilled and unskilled men.

We are now interested in observing how marriage probabilities of men react to changes in α_m. Since α_m represents the strength of the contribution of the wife's consumption to married men's utility,

we interpret it as a measure of gender equality beliefs among men. We want to compare countries with different levels of gender equality attitudes.

Taking derivatives of Π_m^S and Π_m^U with respect to α_m, we obtain

$$\frac{\partial \Pi_m^S}{\partial \alpha_m} = \pi_f \left[\alpha_m f_{i=j}(q^*_{m,SS}) \bar{F}_{i=j}(q^*_{f,SS})\right] > 0 \tag{34}$$

$$\frac{\partial \Pi_m^U}{\partial \alpha_m} = \pi_f \left[\alpha_m f_{i\neq j}(q^*_{m,US}) \bar{F}_{i\neq j}(q^*_{f,SU})\right] > 0. \tag{35}$$

This implies that, all else being equal, the probability of marriage for skilled and unskilled men is higher in countries whose male citizens share more gender equal beliefs.

Interestingly, the marriage gap between skilled and unskilled men is increasing in α_m. This is intuitive since, for a given share of skilled (thus working) women, the latter are more likely to be willing to marry similarly skilled men. Consequently, as men become more friendly toward working women, this change in attitudes will benefit skilled men disproportionately more than it benefits unskilled men.

To see this point, observe that the $\frac{\partial\left(\Pi_m^S - \Pi_m^U\right)}{\partial \alpha_m} > 0$ iff

$$f_{i=j}(q^*_{m,SS}) \bar{F}_{i=j}(q^*_{f,SS}) > f_{i\neq j}(q^*_{m,US}) \bar{F}_{i\neq j}(q^*_{f,SU}) \tag{36}$$

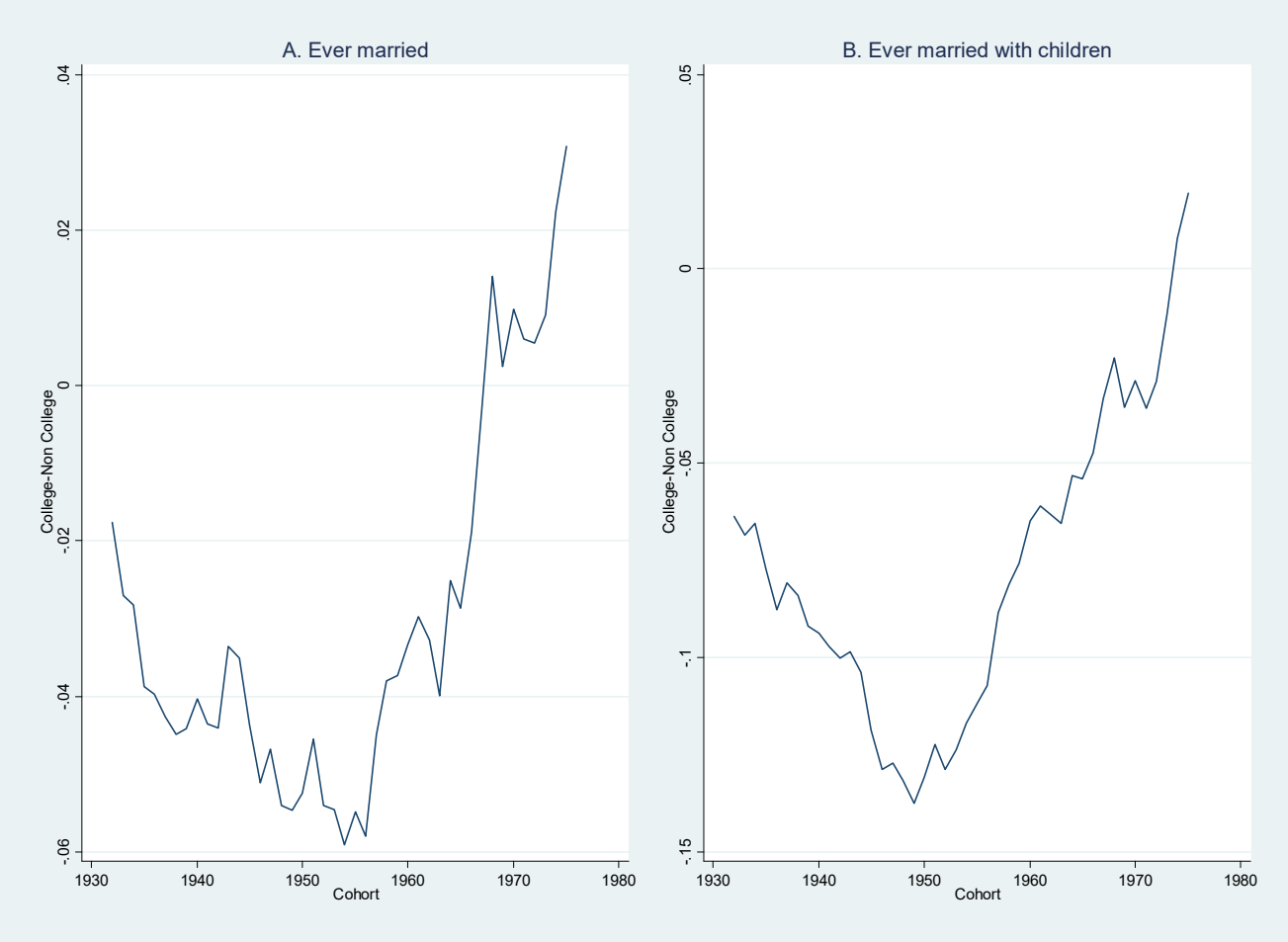
Dividing and multiplying the left hand side by $\bar{F}_{i=j}(q^*_{m,SS})$ and the right hand side by $\bar{F}_{i\neq j}(q^*_{m,US})$, we can rewrite equation 36 as

$$h_{i=j}(q^*_{m,SS}) \bar{F}_{i=j}(q^*_{m,SS}) \bar{F}_{i=j}(q^*_{f,SS}) > h_{i\neq j}(q^*_{m,US}) \bar{F}_{i\neq j}(q^*_{f,SU}) \bar{F}_{i\neq j}(q^*_{f,SU}). \tag{37}$$

Where the hazard rate $h(q^*_{m,SS}) = f(q^*_{m,SS})/[\bar{F}(q^*_{m,SS})]$ is the rate at which the event that a skilled man wishes to marry a skilled woman occurs and $h(q^*_{m,US}) = f(q^*_{m,US})/[\bar{F}(q^*_{m,US})]$ is the rate at which the event that an unskilled man wishes to marry a skilled woman occurs.

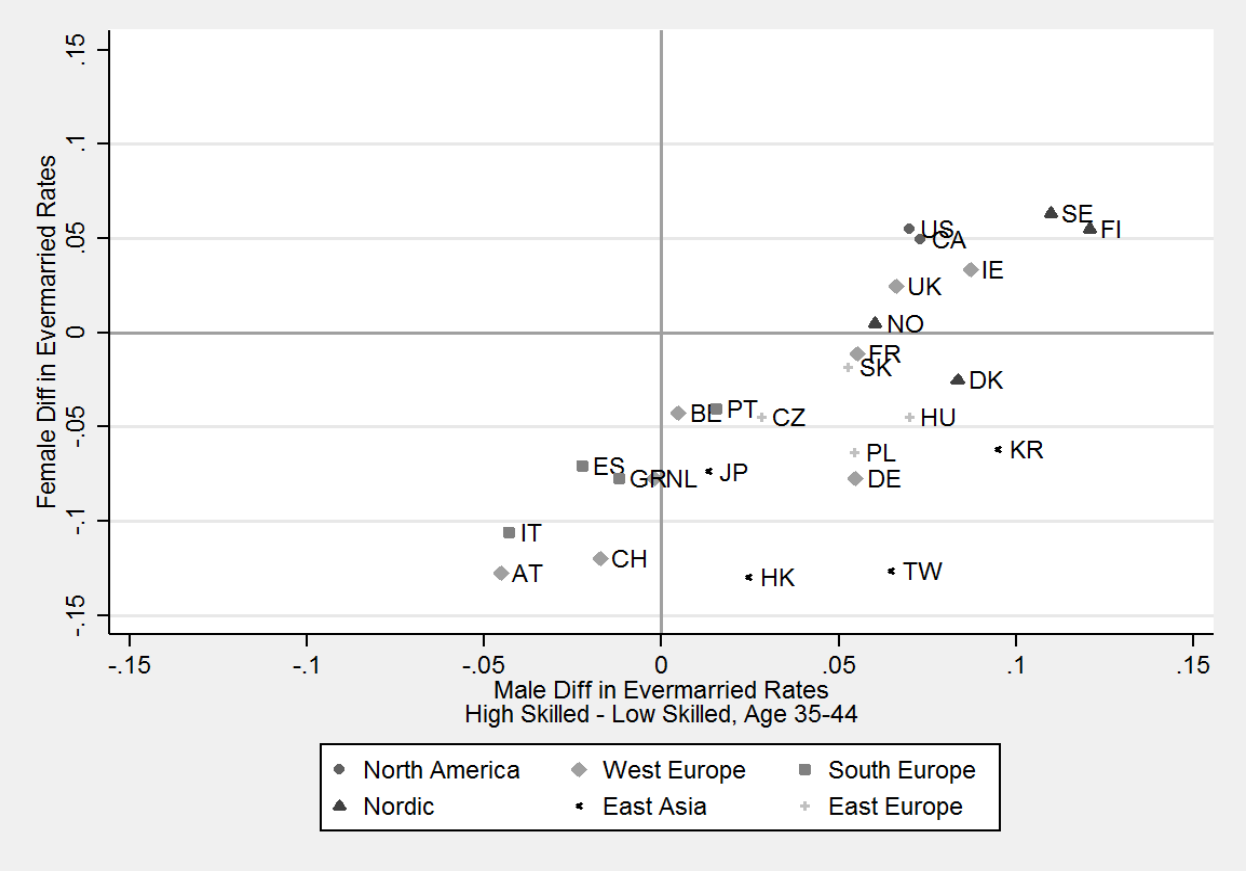
Let's drop the homogamy and assume that $F_{i=j} = F_{i\neq j} = F$. Then $q^*_{f,SS} < q^*_{f,SU}$ implies $\bar{F}(q^*_{f,SS}) > \bar{F}(q^*_{f,SU})$. Also, $q^*_{m,SS} = q^*_{m,US}$ implies $\bar{F}(q^*_{m,SS}) = \bar{F}(q^*_{m,US})$ and $h(q^*_{m,SS}) = h(q^*_{m,US})$. It follows that the marriage gap between skilled and unskilled men monotonically increases in α_m. This result also goes through under the homogamy assumption with the qualification that when $w_{f,S}$ is relatively low the skilled-unskilled difference is roughly constant.

Figure 1. Differences in Marriage Rates by Skill (College-Non College) across Cohorts, USA Females, 40-44



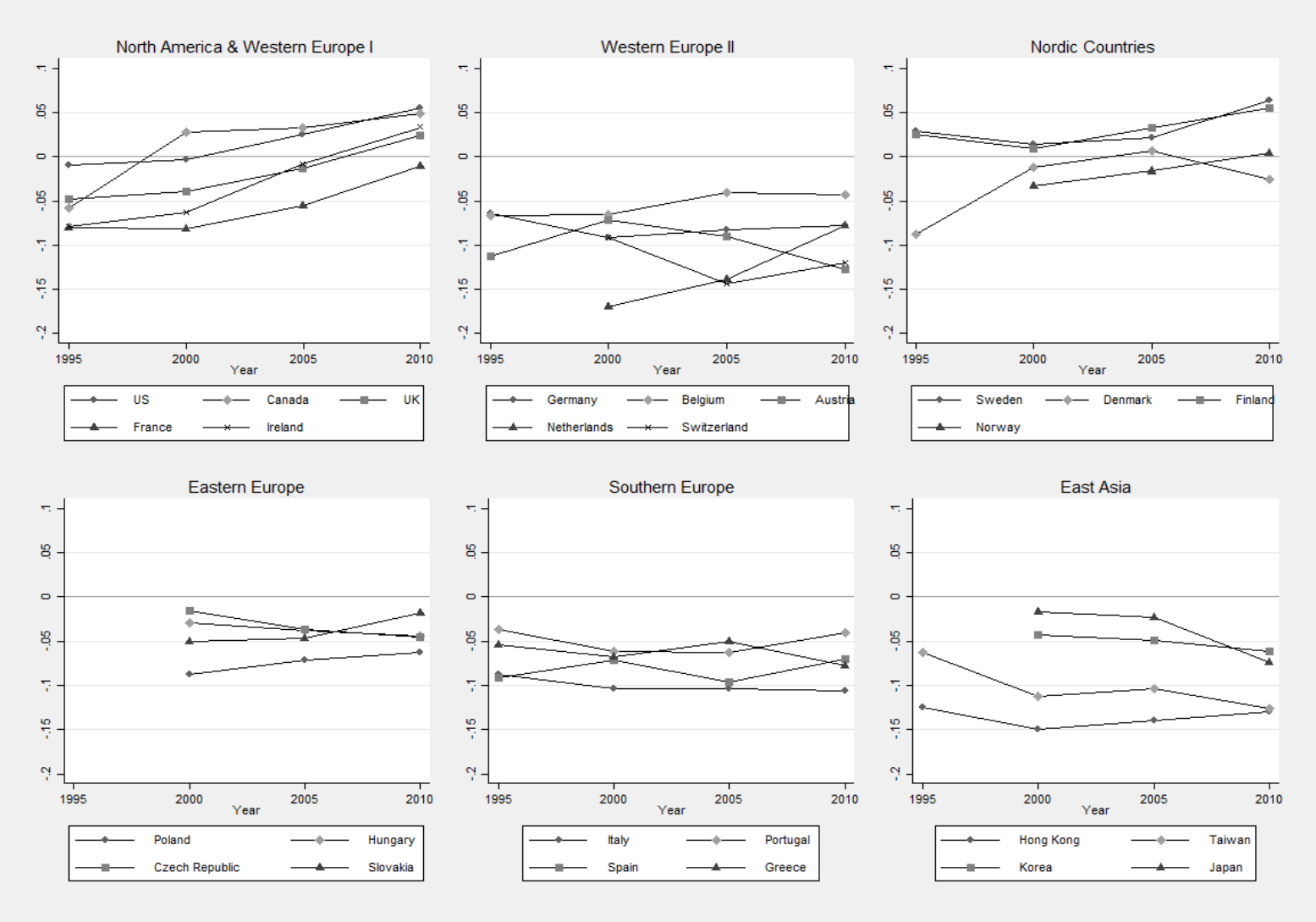
Note: The data come from the June CPS and the sample is restricted to women age 40-44 years old. The figure shows five year moving averages of the difference in ever married rates (Panel A) or ever married rates with children (Panel B) between college and non-college women.

Figure 2. Cross-country Variation in the Marriage Gap in 2010 by Gender



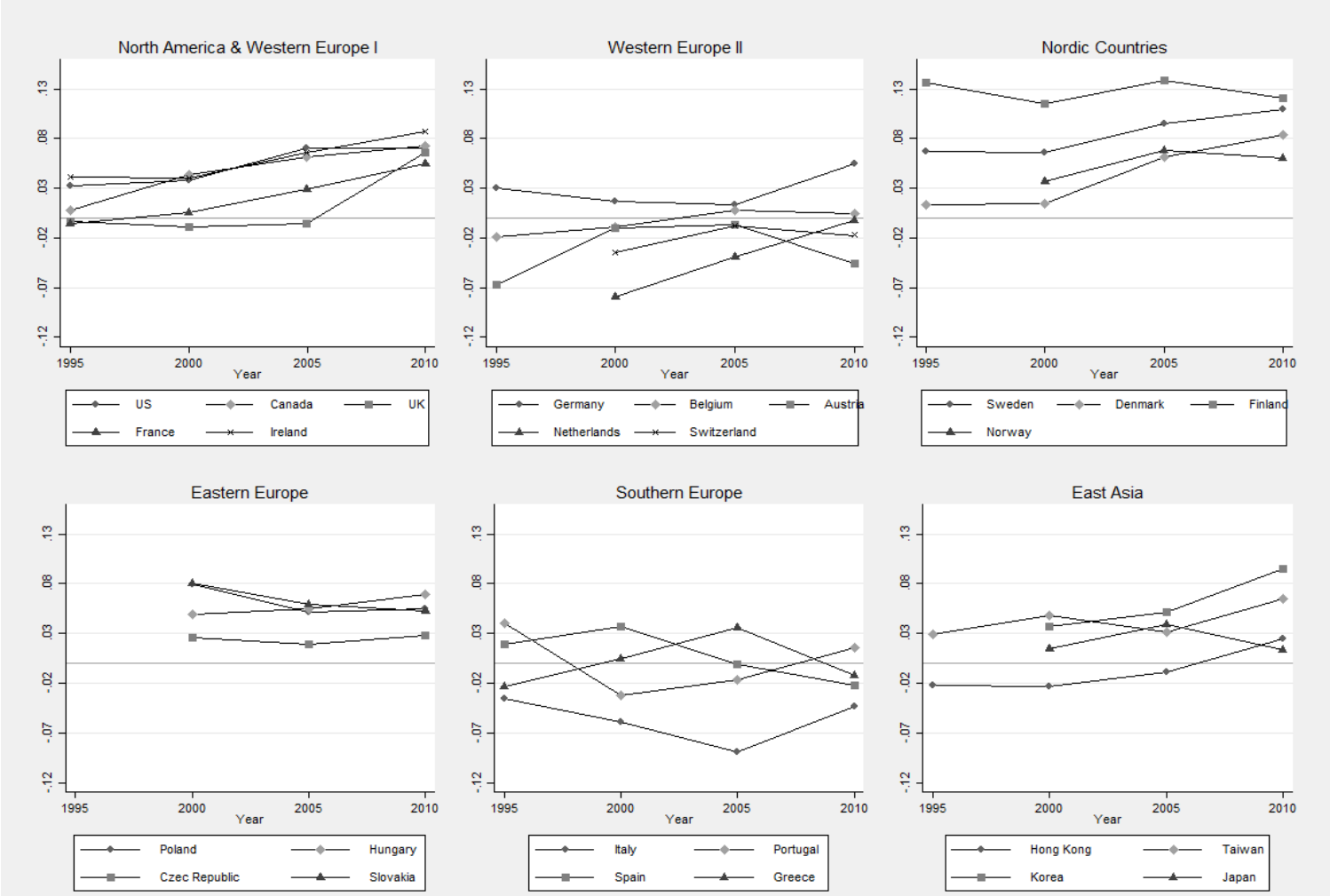
Note: The skilled-unskilled marriage rate gap among women (y axis) is defined as the difference between the fraction of women with a tertiary education between 35 and 44 years old who were ever married and the fraction of women with less than a tertiary education in the same age range who were ever married. Reported on the x axis is the equivalent skilled-unskilled marriage rate gap among men. Refer to Appendix Table 2 for the data sources used to construct the marriage gaps for each country.

Figure 3A. Difference in Ever Married Rates (High Skilled - Low Skilled) from 1995 to 2010 by Country
Females, 35-44



Note: See Appendix Table 2 for a description of the data sources. The figure shows the trends in the skilled-unskilled difference in ever married rates for females aged 35-44 from 1995 to 2010 for each of the 26 countries in our sample.

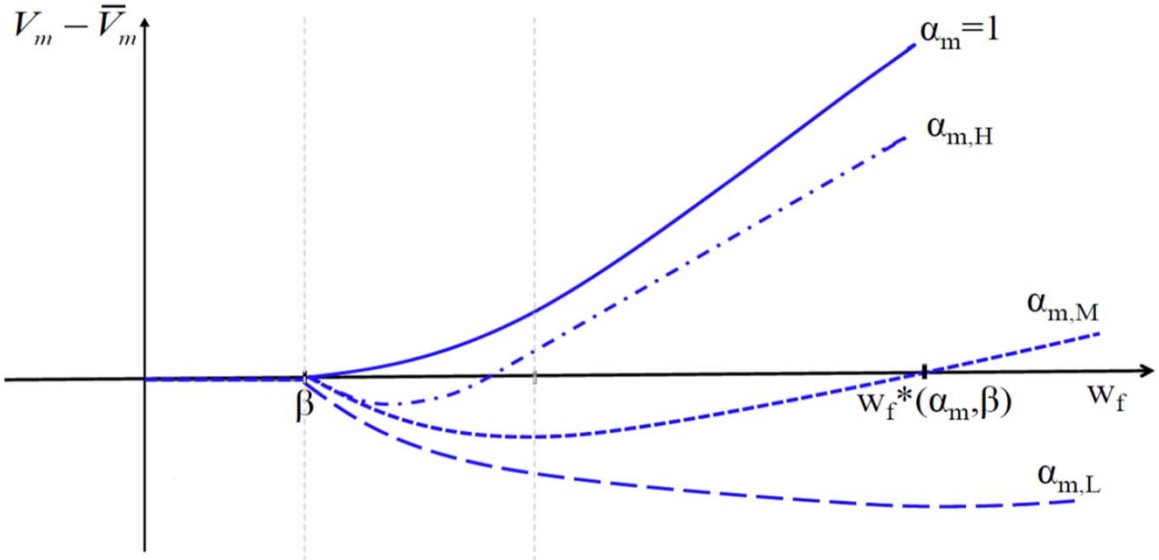
Figure 3B. Difference in Ever Married Rates (High Skilled - Low Skilled) from 1995 to 2010 by Country Males, 35-44



Note: See Appendix Table 2 for a description of the data sources. The figure shows the trends in the skilled-unskilled difference in ever married rates for males aged 35-44 from 1995 to 2010 for each of the 26 countries in our sample.

Figure 4: Husband's Utility Differential from Marrying a Working Woman as a Function of Wife's Wage

A. Different values of α



B. Different values of β

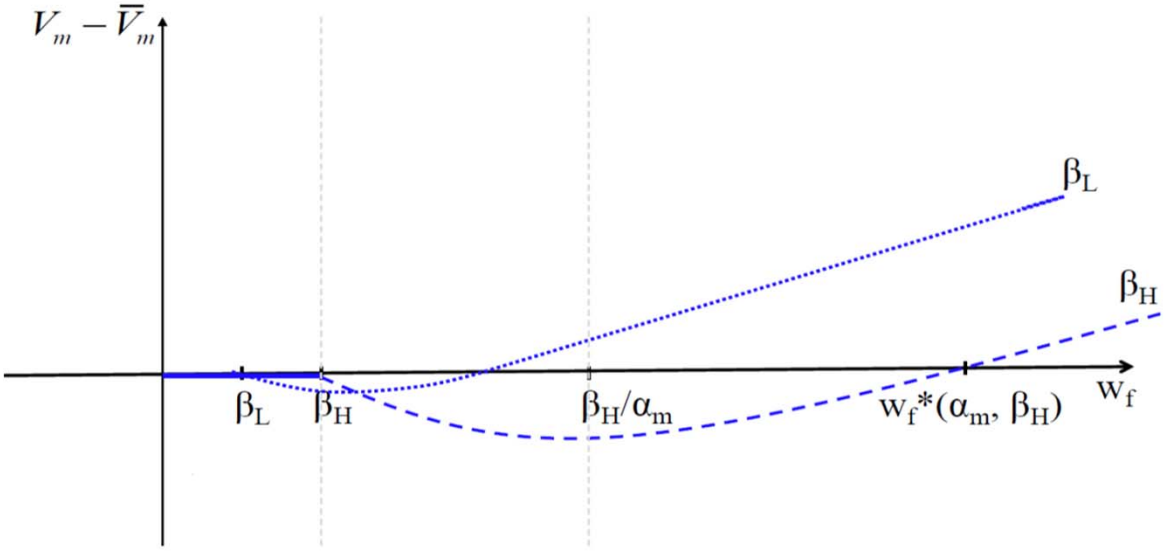
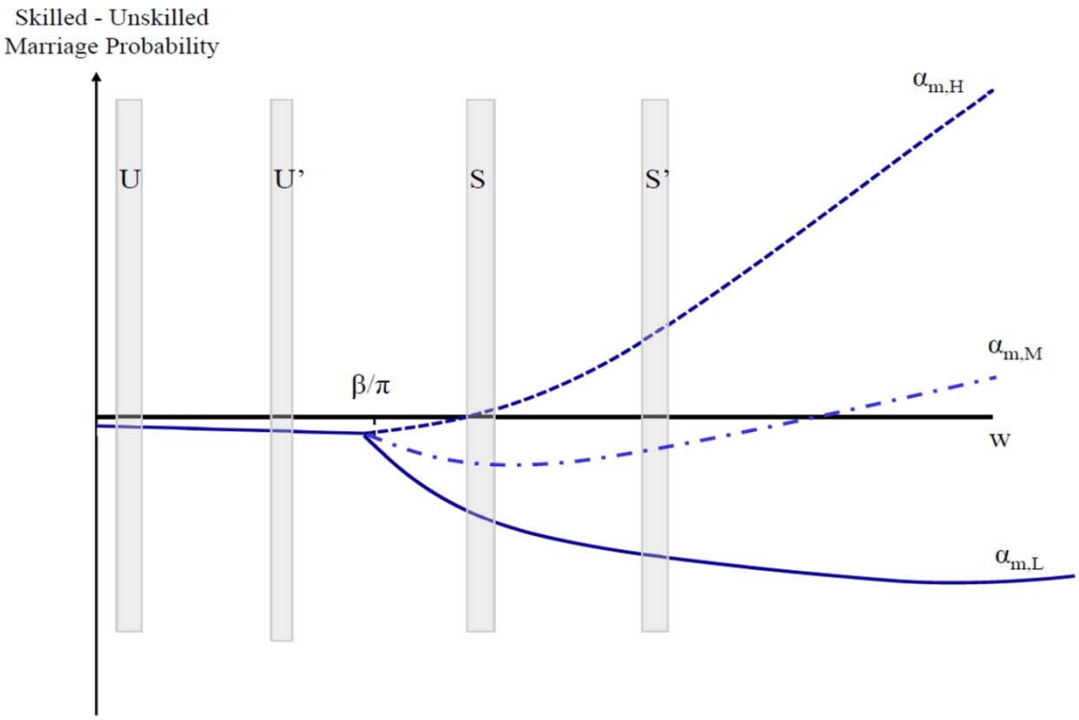
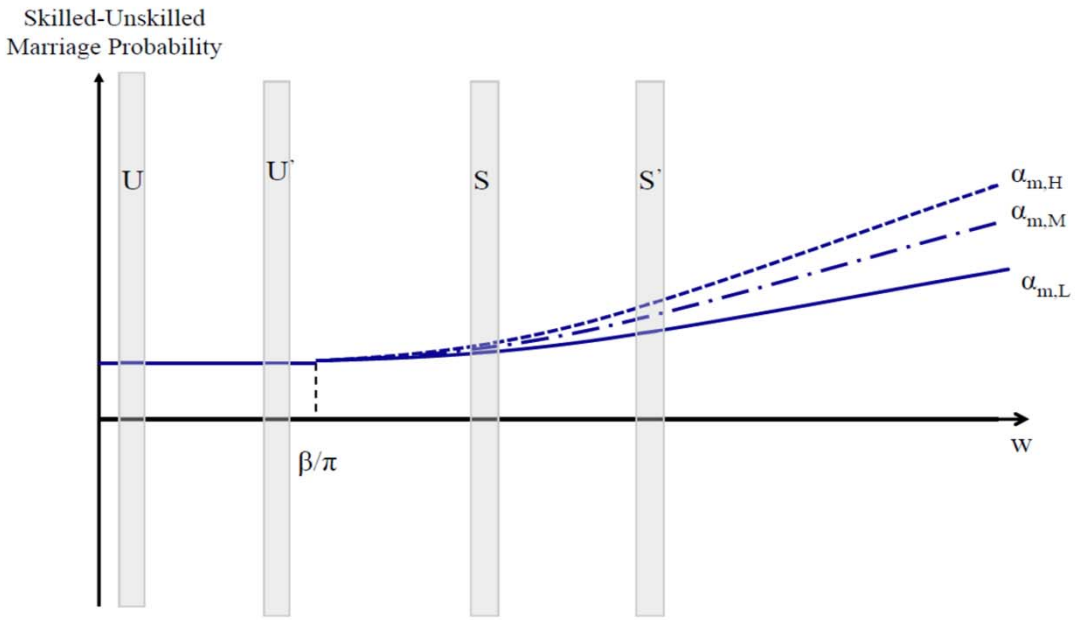


Figure 5: Marriage Gaps as a Function of Wage and Gender Norms

A. Female Marriage Gap

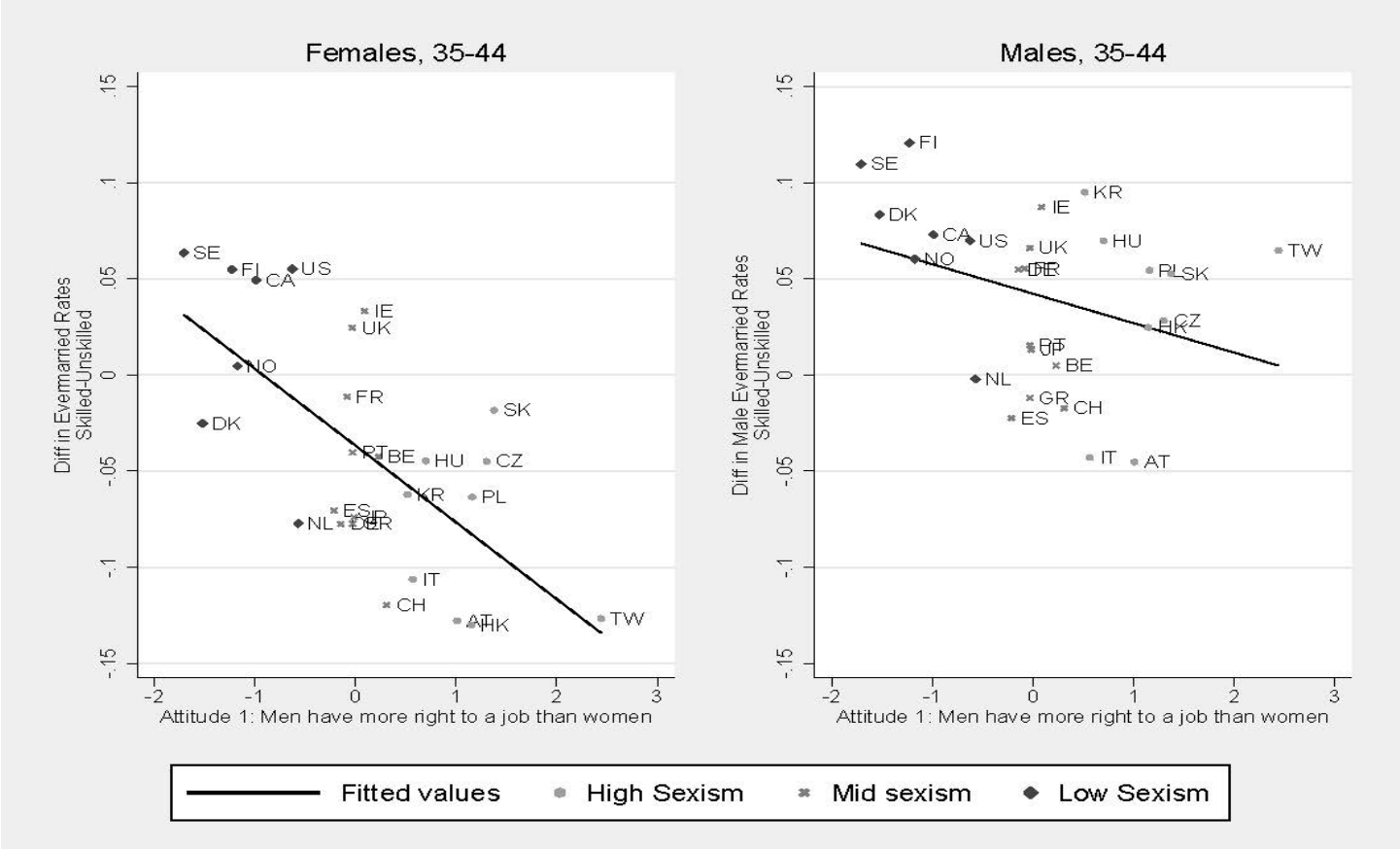


B. Male Marriage Gap



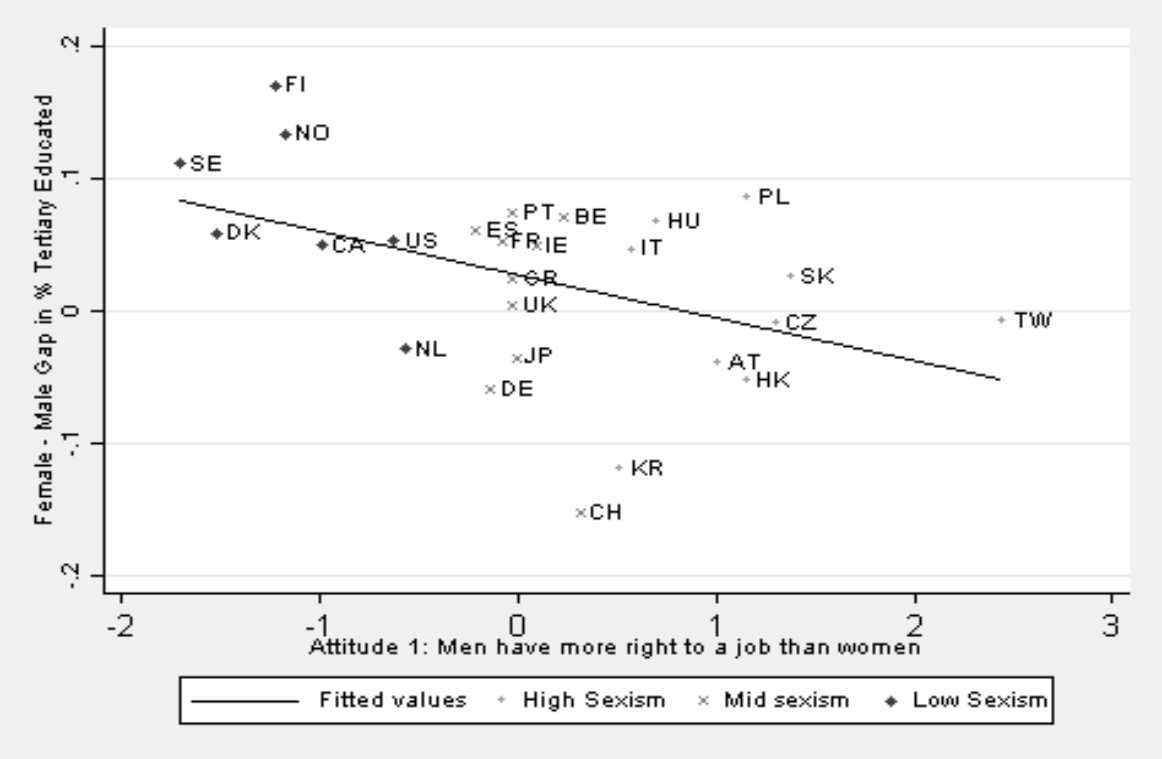
Notes: w is the wage rate for skilled men, π is the female/male wage ratio. Skilled women's wage is $w_{fs}=\pi w$, unskilled men's wage $w_{mu}=\phi w$ and unskilled women's wage rate $w_{fU}=\pi\phi w$.

Figure 6. Correlation between Marriage Gaps and Social Norms by Gender in 2010



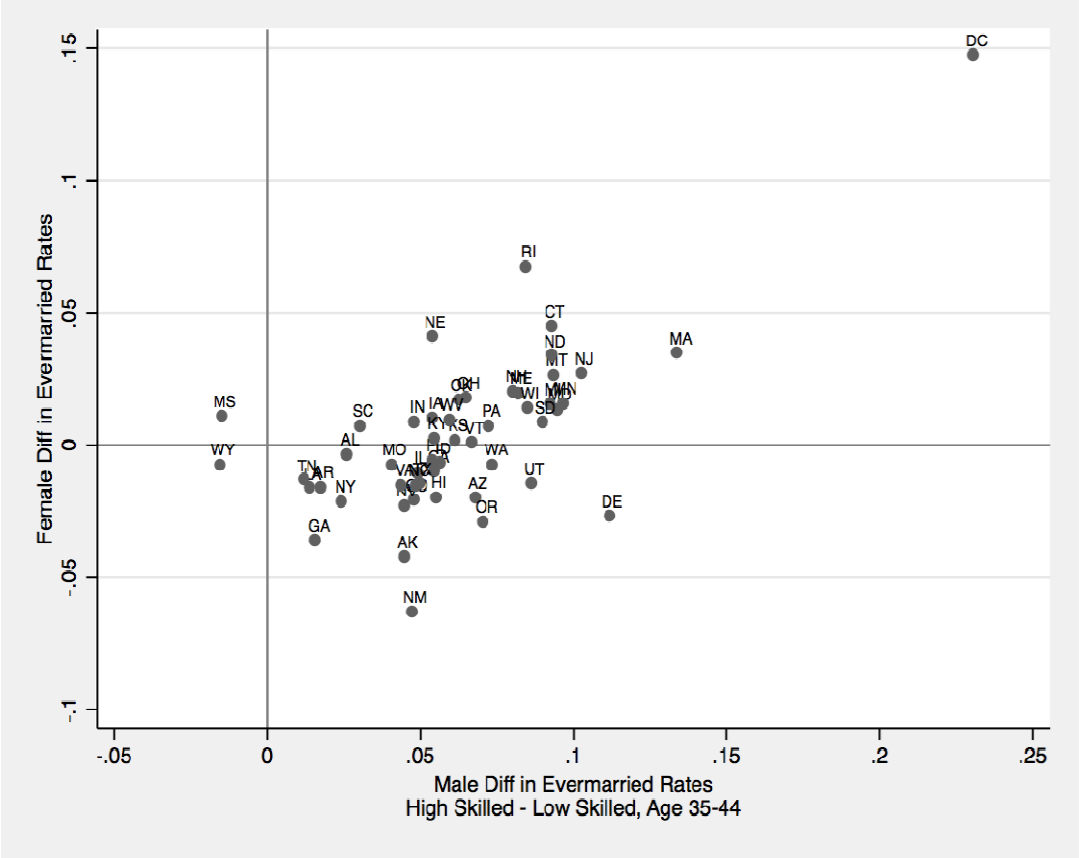
Notes: See Appendix Table 2 for a description of the data sources. The figure shows the cross-country relationship between the skilled-unskilled difference in ever married rates for females (left panel) and males (right panel) aged 35 to 44 and the IVS-based measure of gender attitudes.

Figure 7. Gender Gap (Female-Male) in Education and Gender Norms, 2010



Note: See Appendix Table 2 for a description of the data sources. The figure shows the cross-country relationship between the gender gap in tertiary education (defined as the female-male difference in the share with a tertiary education among those aged 35 to 44) and the IVS-based measure of gender attitudes.

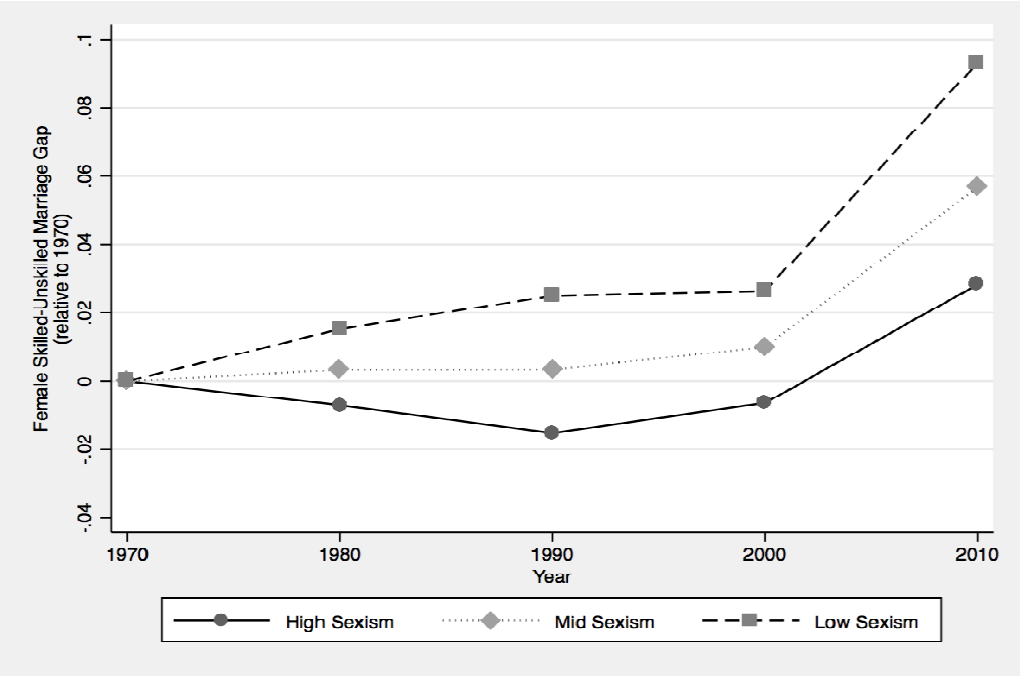
Figure 8. Cross-state Variation in the Marriage Gap in 2010 by Gender



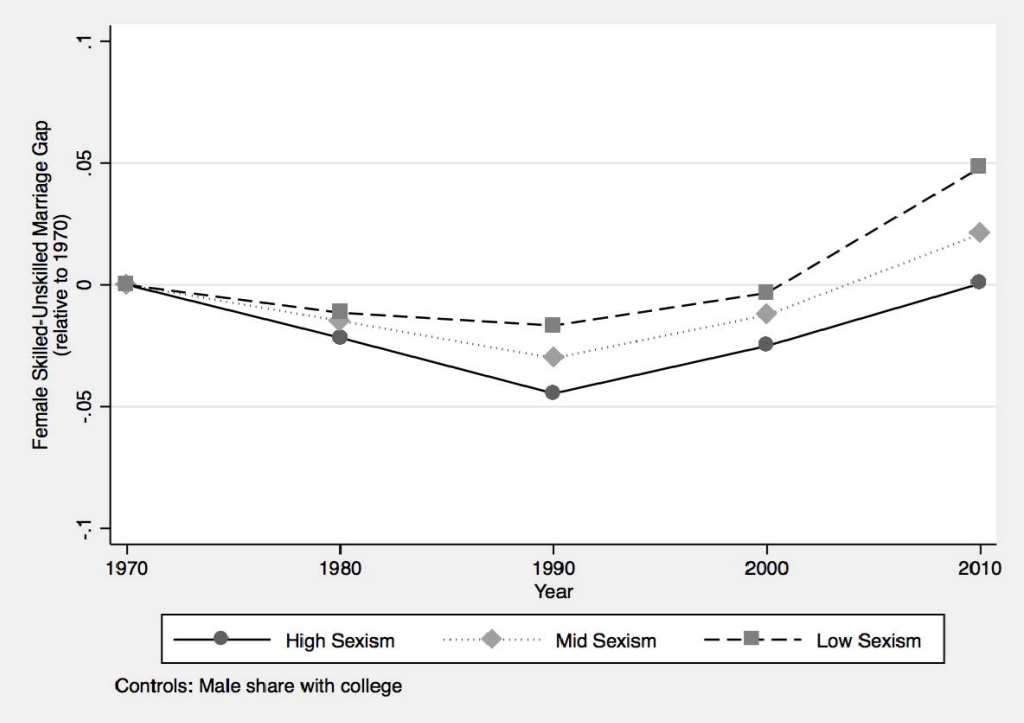
Note: The data is from the 1970 to 2000 US Census and the 2008 to 2011 ACS. The skilled-unskilled marriage gap among women (y axis) is defined as the difference between the fraction of women with a college degree between the ages of 35 to 44 that were ever married and the fraction of women with less than a college degere in the same age range that were ever-married. Reported on the x axis is the equivalent skilled-unskilled marriage gap among

Figure 9. Marriage Gaps by Sexism Group from 1970 to 2010: US States

A. No Controls



B. Controlling for male college shares



Note: The data is from the 1970 to 2000 US Census and the 2008 to 2011 ACS. There are 15 states in each sexism group (see Appendix Table 3 for the classification of US States in each sexism group). The figure plots the coefficient on the interaction between the sexism group dummy and the year dummy controlling for state fixed effects. The omitted category is 1970 for each sexism group. The top figure reports the raw, unadjusted trends in the skill gap in ever married rates for females age 35 to 44 from 1970 to 2010. The bottom figure reports the same trends, controlling for the share of males with a college degree in each state.

Table 1. Descriptive Statistics for Measures of Economic Opportunities and the Labor Market by Sexism Group

Panel 1995 - 2010 (16 countries)

	1995						2010					
		Wages	Gender Gap		Skill Premium			Wages	Gender Gap		Skill Premium	
	LGDP pc	High Edu Females	High Edu	Low Edu	Females	Males	LGDP pc	High Edu Females	High Edu	Low Edu	Females	Males
Low Sexism	10.41	10.15	-0.35	-0.30	0.32	0.37	10.68	10.39	-0.34	-0.22	0.29	0.41
Mid Sexism	10.22	10.08	-0.32	-0.25	0.44	0.51	10.48	10.32	-0.24	-0.21	0.43	0.45
High Sexism	10.29	10.21	-0.30	-0.28	0.49	0.50	10.57	10.35	-0.26	-0.22	0.49	0.53

Low sexism: DK, SE, NL, US; Mid sexism: BE, DE, ES, FR, GR, IE, PT, UK and High sexism:AT, HK, IT, KR, TW

Panel 2000 - 2010 (20 countries)

	2000						2010					
		Wages	Gender Gap		Skill Premium			Wages	Gender Gap		Skill Premium	
	LGDP pc	High Edu Females	High Edu	Low Edu	Females	Males	LGDP pc	High Edu Females	High Edu	Low Edu	Females	Males
Low Sexism	10.58	10.16	-0.29	-0.27	0.28	0.31	10.68	10.45	-0.30	-0.23	0.31	0.38
Mid Sexism	10.39	10.12	-0.35	-0.29	0.43	0.48	10.48	10.27	-0.28	-0.25	0.40	0.43
High Sexism	10.31	10.16	-0.34	-0.31	0.47	0.51	10.52	10.27	-0.28	-0.30	0.48	0.46

Low sexism: CA, DK, FI, SE, NL, US; Mid sexism: BE, DE, ES, FR, GR, IE, JP, PT, UK and High sexism:AT, HK, IT, KR, TW

Panel 2005 - 2010 (25 countries)

	2005						2010					
		Wages	Gender Gap		Skill Premium			Wages	Gender Gap		Skill Premium	
	LGDP pc	High Edu Females	High Edu	Low Edu	Females	Males	LGDP pc	High Edu Females	High Edu	Low Edu	Females	Males
Low Sexism	10.72	10.34	-0.34	-0.25	0.28	0.37	10.73	10.44	-0.32	-0.24	0.30	0.37
Mid Sexism	10.47	10.16	-0.30	-0.28	0.39	0.42	10.48	10.27	-0.28	-0.25	0.40	0.43
High Sexism	10.23	9.73	-0.32	-0.25	0.46	0.53	10.34	9.88	-0.32	-0.28	0.47	0.51

Low sexism: CA, DK, FI, SE, NL, NO, US; Mid sexism: BE, DE, ES, FR, GR, IE, JP, PT, UK and High sexism: AT, CZ, HK, HU, IT, KR, PL, SK, TW

Note: See Appendix Table 2 for the data sources for the cross-country data. The wages of high-educated females is the log average wage of full-time (working 35 or more hours per week) females age 25 to 54 with a tertiary education in each country. The gender gap is defined as the difference in log average wages among full-time females and males age 25 to 54 in each country for each skill group. The skill premium is defined as the difference in log average full-time wage among tertiary educated and non-tertiary educated men and women.The wage measures are in 2000 US dollars.

Table 2. Correlation between the Marriage Gap and Social Norms among Individuals age 35-44

	Dep Var. Difference in Ever Married Rates (High Skilled - Low Skilled)									
	A. Females								B. Males	
	Year=2010					2005*	2000	1995	Year=2010	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Attitude measure: Men have more right to a job than women (mean 0, var 1)	-0.040***	-0.047***	-0.048***							-0.018
	[0.008]	[0.012]	[0.010]							[0.012]
High Sexism Dummy				-0.135***	-0.127***	-0.103***	-0.086**	-0.070**	-0.058**	
				[0.034]	[0.031]	[0.031]	[0.032]	[0.029]	[0.026]	
Mid Sexism Dummy				-0.082**	-0.071**	-0.066**	-0.054*	-0.042	-0.066**	
				[0.031]	[0.030]	[0.030]	[0.026]	[0.029]	[0.027]	
Measure of Women's Opportunities	None	LGDP pc	L(HS F Wages)	LGDP pc	L(HS F Wages)	LGDP pc	LGDP pc	LGDP pc	LGDP pc	LGDP pc
Other Controls	No	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes
Observations	26	26	26	26	26	26	26	19	26	26
R-squared	0.421	0.466	0.485	0.512	0.502	0.298	0.190	0.228	0.618	0.597

Note: The unit of observation is country. Each column is a separate regression with the difference in ever married rates between high-skilled and low-skilled for females (Panel A) and males (Panel B) for each of the years indicated as the dependent variable. The high (mid) sexism dummy refers to the top (middle) tertile of countries in terms of conservativeness of gender norms as measured using the IVS. The attitude measure is the continuous measure of gender norms from the IVS standardized to have mean 0 and standard deviation 1 in the sample of 26 countries. Log(High-skilled female wage) is the log average wage of full-time (working 35 or more hours per week) females age 25 to 54 with a tertiary education in each country in 2000 US dollars. Other controls include the share of males in each country with tertiary education, the skill premium, and the gender gap. Robust standard errors are reported in brackets.*** p<0.01, ** p<0.05, * p<0.1. Significance levels are based on the t-distribution.

* We do not include other controls in Columns 7 to 9 because it will decrease substantially the number of observations given missing data on wages, in particular for 1995. Results for 2000 and 2005 but not for 1995 hold when controls are added. Note that observations go down to 15 for 1995.

Table 3. Marriage Gap and the Interaction between Social Norms and Women's Labor Market Opportunities

	Dep Var. Difference in Ever Married Rates (High Skilled - Low Skilled)							
	Females						Males	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LGDP pc	0.186**	0.289***	0.067	0.087			0.140**	0.029
	[0.087]	[0.100]	[0.057]	[0.061]			[0.060]	[0.035]
LGDP pc*High Sexism	-0.218***	-0.406***					-0.158**	
	[0.078]	[0.092]					[0.073]	
LGDP pc*Mid Sexism	-0.078	-0.185*					-0.122*	
	[0.085]	[0.101]					[0.059]	
LGDP pc*Sexism Index			-0.072**	-0.154***				-0.047
			[0.027]	[0.028]				[0.031]
L(HS F Wages)					0.103**	0.059		
					[0.039]	[0.036]		
L(HS F Wages)*High Sexism					-0.113**			
					[0.048]			
L(HS F Wages)*Mid Sexism					-0.033			
					[0.038]			
L(HS F Wages)*Sexism Index						-0.030		
						[0.027]		
Other Controls	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	97	86	97	86	86	86	86	86

Note: The unit of observation is country by year. The sample includes 26 countries across four time periods (1995, 2000, 2005, 2010). Each column within the panel is a separate regression with the difference in evermarried rates between high-skilled and low-skilled for females or males as the dependent variable. All regressions include year and country fixed effects. The number of observations in each column is fewer than 104 due to missing information on wages or marriage gaps for some countries in some years. The high (mid) sexism dummy refers to the top (middle) tertile of countries in terms of conservativeness of gender norms as measured using the IVS. The Sexism Index is the continuous measure of the conservatism of gender norms from the IVS standardized to have mean 0 and standard deviation 1 in the sample of 26 countries (higher values indicate countries with more conservative gender norms). Log(High-skill female wage) is the log average wage of full-time (working 35 or more hours per week) females age 25 to 54 with a tertiary education in each country in 2000 US dollars. Other controls include the share of males in each country with tertiary education, the skill premium, and the gender gap. Robust standard errors clustered at the country level are reported in brackets.*** p<0.01, ** p<0.05, * p<0.1.

Table 4. Correlation between Female Tertiary Attainment and Social Norms Across Countries

	Dep Var. Share of Females with Tertiary Education									
	Year=2010							2005	2000	1995
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
High Sexism Dummy	-0.106***	-0.133***	-0.138***					-0.150***	-0.141***	-0.098**
	[0.029]	[0.043]	[0.038]					[0.038]	[0.037]	[0.037]
Mid Sexism Dummy	-0.070**	-0.103**	-0.096**					-0.088**	-0.079**	-0.042
	[0.032]	[0.045]	[0.037]					[0.037]	[0.033]	[0.033]
Attitude measure: Men have more right to a job than women (mean 0, var 1)				-0.040**	-0.044**	-0.052***				
				[0.014]	[0.018]	[0.017]				
Diff. in Ever Married Rates (high-skill - low-skill) - Females							0.743***			
							[0.193]			
Share of Males with Tertiary Education	0.658***	0.779***	0.862***	0.687***	0.818***	0.936***	0.818***	0.557***	0.605***	0.546**
	[0.077]	[0.161]	[0.134]	[0.102]	[0.188]	[0.154]	[0.148]	[0.124]	[0.164]	[0.193]
Measure of Women's Opportunities	None	LGDP pc	L(HS F Wages)	None	LGDP pc	L(HS F Wages)	LGDP pc	LGDP pc	LGDP pc	LGDP pc
Other controls	No	Yes	Yes	No	Yes	Yes	Yes	No	No	No
Observations	26	26	26	26	26	26	26	26	26	19

Note: The unit of observation is country. Each column is a separate regression with the share of females with tertiary education in each time period (2010, 2005, 2000, 1995) as the dependent variable. The high (mid) sexism dummy refers to the top (middle) tertile of countries in terms of conservativeness of gender norms as measured using the IVS. The attitude measure is the continuous measure of gender norms from the IVS standardized to have mean 0 and standard deviation 1 in the sample of 26 countries. All regressions include a control for the share of men with tertiary education in each country. Other controls include the share of males in each country with tertiary education, the skill premium, and the gender gap. Robust standard errors are reported in brackets.*** p<0.01, ** p<0.05, * p<0.1. Significance levels are based on the t-distribution.

Table 5. Descriptive Statistics for Measures of Economic Opportunities and the Labor Market by Sexism Group, US States

	Wages	Gender Gap (Female-Male)		Skill Premium	
	High Edu Females	High Edu	Low Edu	Females	Males
		1960			
Low Sexism	9.805	-0.490	-0.574	0.293	0.209
Mid Sexism	9.792	-0.537	-0.627	0.307	0.217
High Sexism	9.685	-0.594	-0.624	0.342	0.313
		1970			
Low Sexism	10.248	-0.618	-0.665	0.398	0.350
Mid Sexism	10.242	-0.633	-0.676	0.414	0.371
High Sexism	10.152	-0.627	-0.673	0.470	0.425
		1980			
Low Sexism	10.241	-0.582	-0.553	0.265	0.294
Mid Sexism	10.226	-0.608	-0.620	0.284	0.272
High Sexism	10.165	-0.613	-0.616	0.331	0.328
		1990			
Low Sexism	10.551	-0.418	-0.386	0.390	0.422
Mid Sexism	10.514	-0.450	-0.443	0.440	0.447
High Sexism	10.421	-0.477	-0.449	0.463	0.491
		2000			
Low Sexism	10.700	-0.383	-0.295	0.382	0.471
Mid Sexism	10.691	-0.388	-0.365	0.454	0.478
High Sexism	10.596	-0.418	-0.382	0.474	0.511
		2010			
Low Sexism	10.830	-0.315	-0.256	0.441	0.499
Mid Sexism	10.803	-0.328	-0.285	0.496	0.539
High Sexism	10.702	-0.361	-0.317	0.501	0.545

Note: The data is from the 1960 to 2010 US Census. In the analysis, we use one decade lagged (t-10) measures of labor market conditions. Wages are computed for the sample of non-institutionalized salaried workers (i.e., excluding self-employed) who are not in school and who worked last year. The wages of high educated females (Column 1) is the log average wage of full-time (working 35 or more hours per week) females age 22 to 65 with a college degree in each state. The gender gap is defined as the difference in log average wages among full-time females and males aged 22 to 65 for each skill group. The skill premium is defined as the difference in log average full-time wages among college-educated and non-college educated men and women. States are divided into three sexism groups (low, mid, high) based on whether they fall in the top, middle, and lowest tertile of states in terms of conservativeness of gender norms as measured using the GSS. The sample is limited to 45 states due to data availability in the GSS. Low sexism states include: AK, CT, DC, IA, MD, MA, MI, MN, NH, NJ, ND, OR, RI, SD, VT; mid sexism states include: AZ, CA, CO, IL, IN, KS, MO, NY, OH, PA, SC, VA, WA, WI, WY; high sexism states include: AL, AR, DE, FL, GA, KY, LA, MS, MT, NC, OK, TN, TX, UT, WV.

Table 6. Correlation between the Marriage Penalty and Social Norms among Individuals age 35-44 across US States

	Dep Var. Difference in Ever Married Rates (High Skilled - Low Skilled)									
	A. Females								B. Males	
	Year=2010				2000	1990	1980	1970	Year=2010	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
High Sexism Dummy	-0.031**	-0.036***			-0.018**	-0.011*	0.021**	0.033	-0.017	
	[0.012]	[0.010]			[0.009]	[0.005]	[0.008]	[0.031]	[0.020]	
Mid Sexism Dummy	-0.029**	-0.020*			-0.017**	-0.005	0.011	0.009	-0.021*	
	[0.012]	[0.012]			[0.007]	[0.005]	[0.008]	[0.017]	[0.011]	
Attitude measure: Better if man is achiever outside home and women take care of home and family (mean 0, var 1)			-0.012*	-0.012***						-0.007
			[0.006]	[0.003]						[0.009]
Measure of Women's Opportunities	Log(Female high-skill wage)									
Other Controls	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45	45	45	45	45	45	45	45	45	45
R-squared	0.215	0.683	0.159	0.637	0.764	0.602	0.537	0.212	0.675	0.657

Note: The unit of observation is a state (including DC). The data is from the 1970 to 2000 US Census and 2008 to 2011 ACS. The sample is restricted to whites. Attitudes are measured using the 1977 to 2014 General Social Survey and are not available for 6 states (Hawaii, Idaho, Maine, Nebraska, Nevada, and New Mexico). Each column is a separate regression with the difference in evermarried rates between high-skilled and low-skilled for females (Panel A) and males (Panel B) age 35 to 44 for each of the years indicated as the dependent variable. The high (mid) sexism dummy refers to the top (middle) tertile of states in terms of conservativeness of gender norms as measured using the GSS. The attitude measure is the continuous measure of gender norms from the GSS standardized to have mean 0 and standard deviation 1 in the sample of 45 states. Log(female high-skill wage) is the log average wage of full-time (working 35 or more hours per week) females age 22 to 65 with a college degree in the preceding decade (t-10) in each state. Other controls include the share of males with college education, a quadratic in male high skilled wages, and quadratics in female and male low skilled wages. The labor market controls are measured among individuals age 22 to 65 in year t-10. Robust standard errors are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 7. Marriage Gap and the Interaction between Social Norms and Women's Labor Market Opportunities Across US States

	Dep Var. Difference in Ever Married Rates (High Skilled - Low Skilled)		
	A. Females		B. Males
Measure of Female Labor Market Opportunities:	Wages High Skilled Women		
	1. Terciles		
	(1)	(2)	(3)
Log(Female high-skill wage)	0.055	0.056	0.053*
	[0.040]	[0.054]	[0.030]
Log(Female high-skill wage)*High Sexism	-0.066***	-0.059**	-0.030**
	[0.019]	[0.028]	[0.015]
Log(Female high-skill wage)*Mid Sexism	-0.038*	-0.032	-0.020**
	[0.021]	[0.022]	[0.009]
R-squared	0.599	0.637	0.859
	2. Continuous Measure		
Log(Female high-skill wage)	0.021	0.025	0.036
	[0.041]	[0.046]	[0.034]
Log(Female high-skill wage)*Sexism Index	-0.021***	-0.012	-0.003
	[0.007]	[0.011]	[0.006]
Other Controls	No	Yes	Yes
Year FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
R-squared	0.575	0.617	0.853
Observations	225	225	225

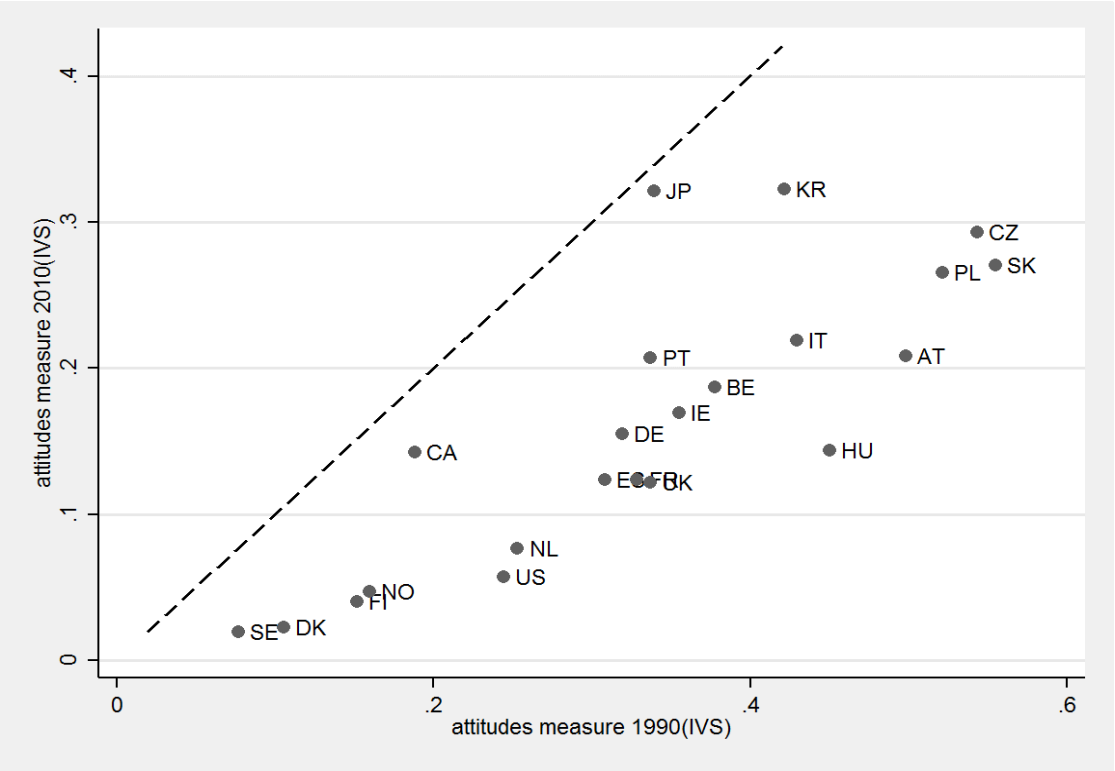
Note: The unit of observation is a state (45 states) by decade (1970, 1980, 1990, 2000, and 2010). The data is from the 1970 to 2000 US Census and 2008 to 2011 ACS. The sample is restricted to whites. Attitudes are measured using the 1977 to 2014 General Social Survey and are not available for 6 states (Hawaii, Idaho, Maine, Nebraska, Nevada, and New Mexico). Each column in each panel is a separate regression with the difference in evermarried rates between high-skilled and low-skilled for females (Panel A) and males (Panel B) age 35 to 44 as the dependent variable. All regressions include year and state fixed effects. The high (mid) sexism dummy refers to the top (middle) tertile of states in terms of conservativeness of gender norms as measured using the GSS. The attitude measure is the continuous measure of gender norms from the GSS standardized to have mean 0 and standard deviation 1 in the sample of 45 states. Log(female high-skill wage) is the log average wage of full-time (working 35 or more hours per week) females age 25 to 54 with a college degree in the preceding decade (t-10) in each state. Other controls include the share of males with college education, a quadratic in male high skilled wages, and quadratics in female and male low skilled wages. The labor market controls are measured among individuals age 25 to 54 in year t-10. Robust standard errors clustered at the state level are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 8. Correlation between Female College Attainment and Social Norms Across US States

	Dep Var. Share of Females with College Degree (Age 35 to 44)								
	Year=2010					2000	1990	1980	1970
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
High Sexism Dummy	-0.020**	-0.022*				-0.017	-0.010	-0.003	0.000
	[0.010]	[0.012]				[0.013]	[0.010]	[0.006]	[0.005]
Mid Sexism Dummy	-0.014**	-0.013*				-0.009	-0.005	-0.001	-0.000
	[0.005]	[0.007]				[0.010]	[0.006]	[0.005]	[0.005]
Attitude measure: Better if man is achiever outside home and women take care of home and family (mean 0, var 1)			-0.012**	-0.018***					
			[0.006]	[0.006]					
Diff. in Ever Married Rates (high-skill - low-skill) - Females					0.158				
					[0.139]				
Share of males with college degree	0.986***	0.914***	0.957***	0.911***	0.904***	0.814***	0.861***	0.666***	0.619***
	[0.034]	[0.096]	[0.043]	[0.066]	[0.090]	[0.141]	[0.078]	[0.050]	[0.060]
Measure of Women's Opportunities	Log(Female high-skill wage)								
Other Controls	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45	45	45	45	45	45	45	45	45

Note: The unit of observation is a state. Each column is a separate regression with the share of females age 35 to 44 with a college degree in each time period as indicated in the columns as the dependent variable.The high (mid) sexism dummy refers to the top (middle) tertile of states in terms of conservativeness of gender norms as measured using the GSS. The attitude measure is the continuous measure of gender norms from the GSS standardized to have mean 0 and standard deviation 1 in the sample of 45 states. All regressions include a control for the share of men age 35 to 44 with a college degree in each state. Other controls include the share of males with college education, a quadratic in male high skilled wages, and quadratics in female and male low skilled wages. The labor market controls are measured among individuals age 22 to 65 in year t-10. Robust standard errors reported in brackets. *** p<0.01, ** p<0.05, * p<0.1.

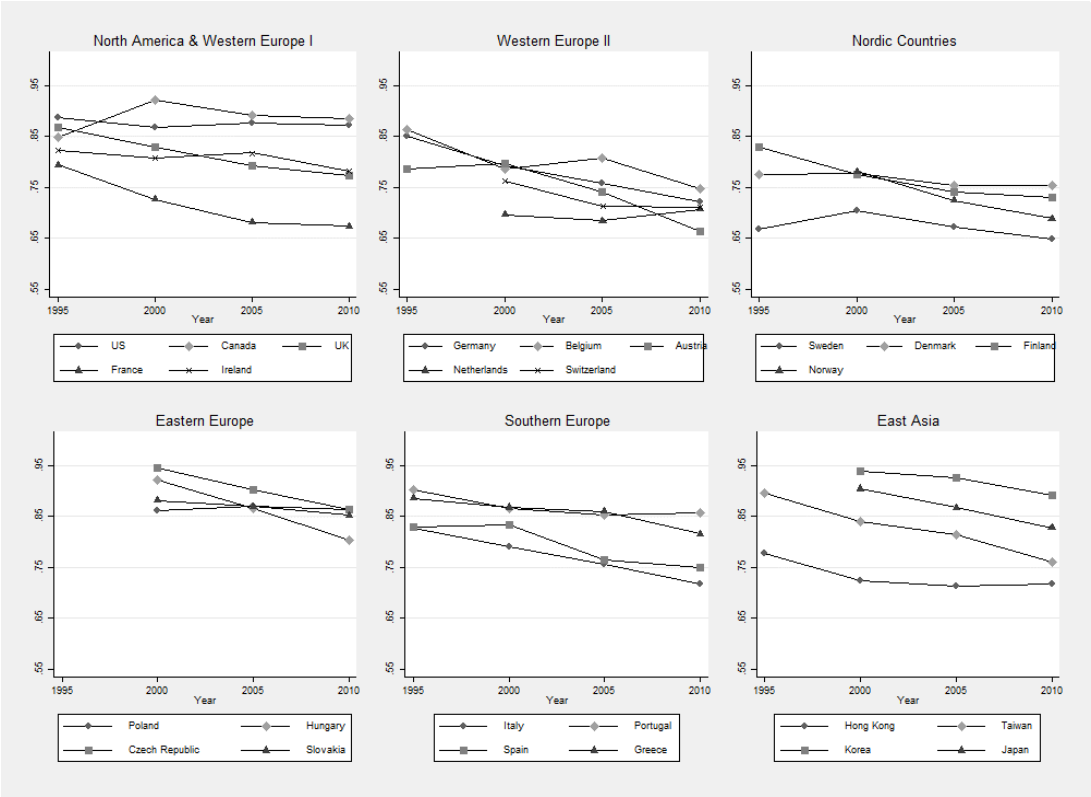
Appendix Figure 1: Gender-Related Attitudes over Time



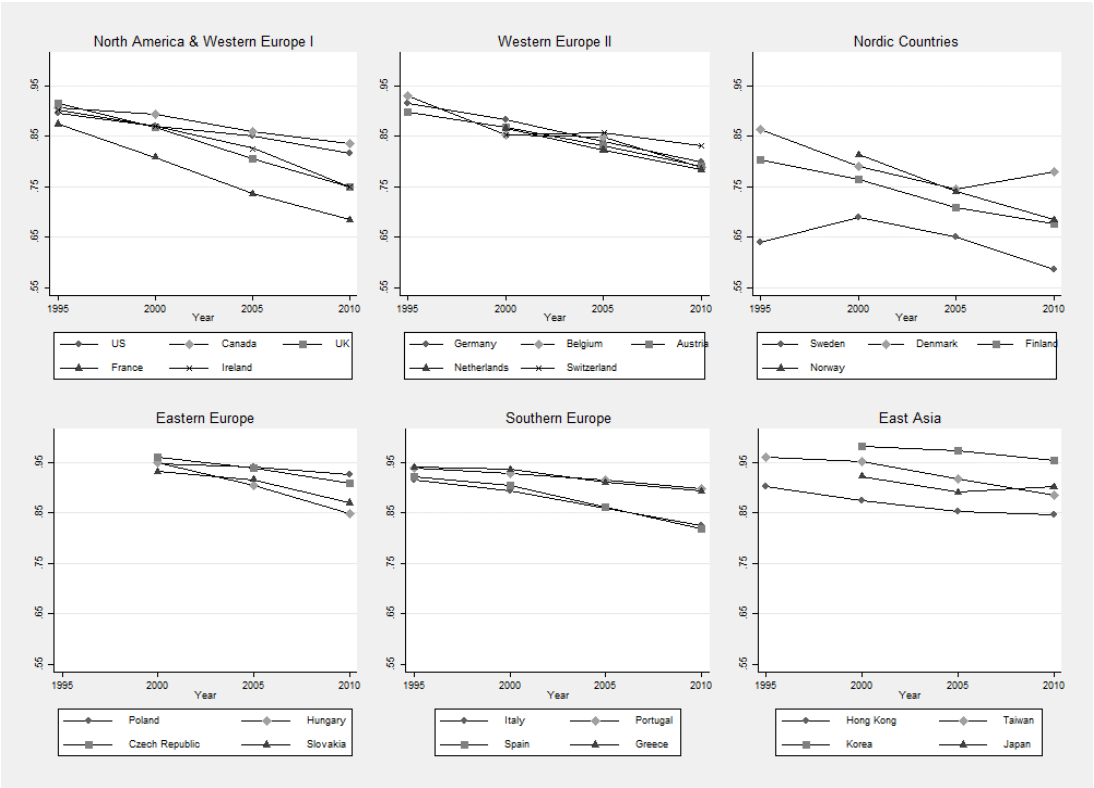
Note: The data is from the 1990 and 2000 IVS. The attitude measure is the share of the population 18+ agreeing with the statement "when jobs are scarce, men have more right to a job than women."

Appendix Figure 2A. Female Ever Married Rates from 1995 to 2010 by Country and Skill, 35-44

A. Skilled



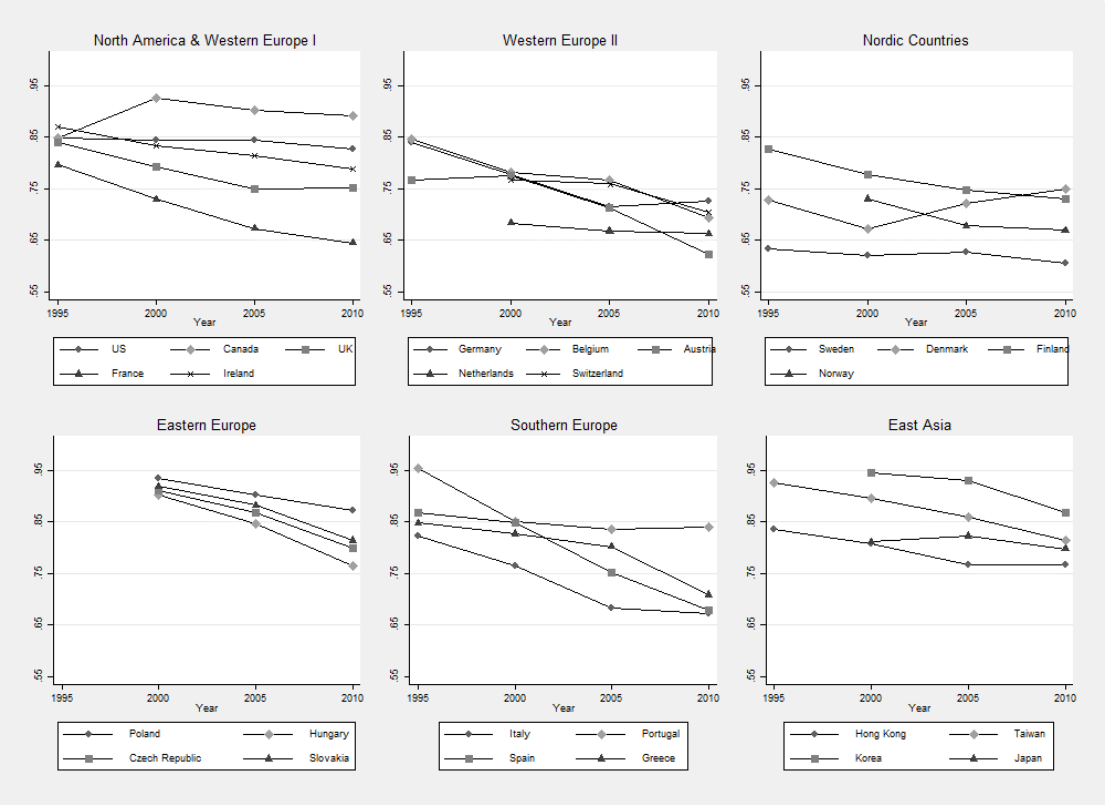
B.Unskilled



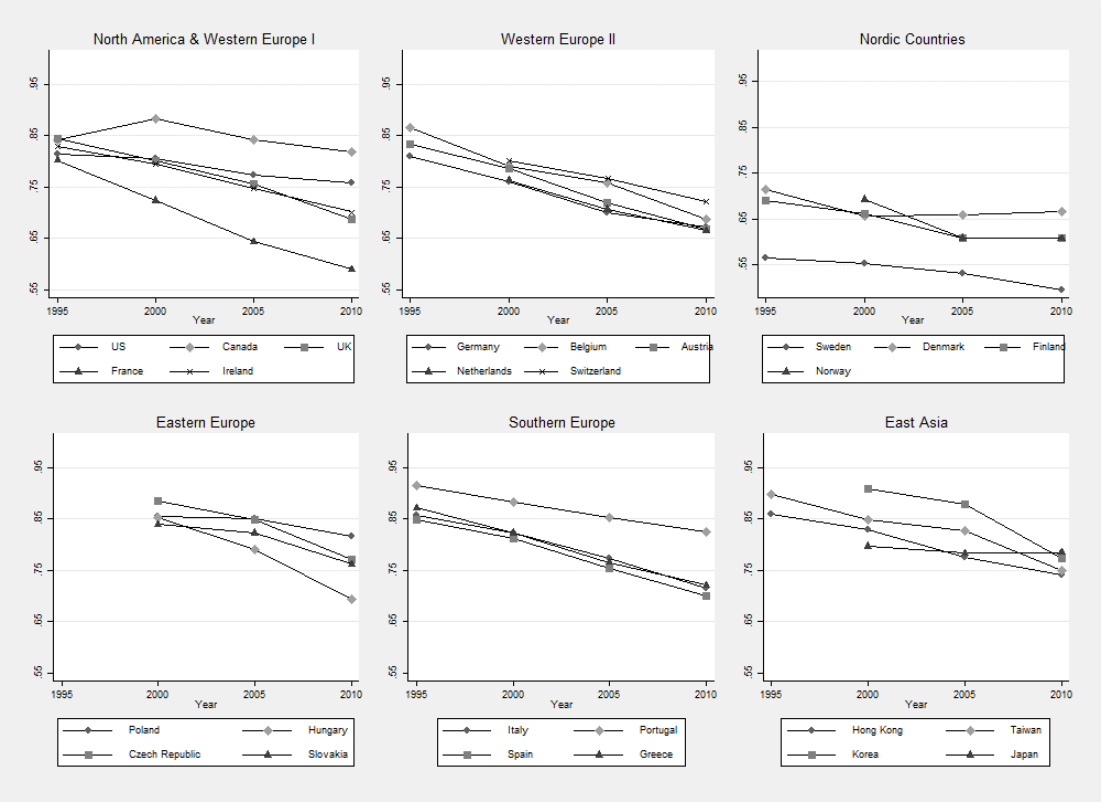
Note: See Appendix Table 2 for a description of the data sources. The figure shows the trends in the ever married rates for females aged 35-44 from 1995 to 2010 for each of the 26 countries in our sample separately by skill level.

Appendix Figure 2B. Male Ever Married Rates from 1995 to 2010 by Country and Skill, 35-44

A. Skilled

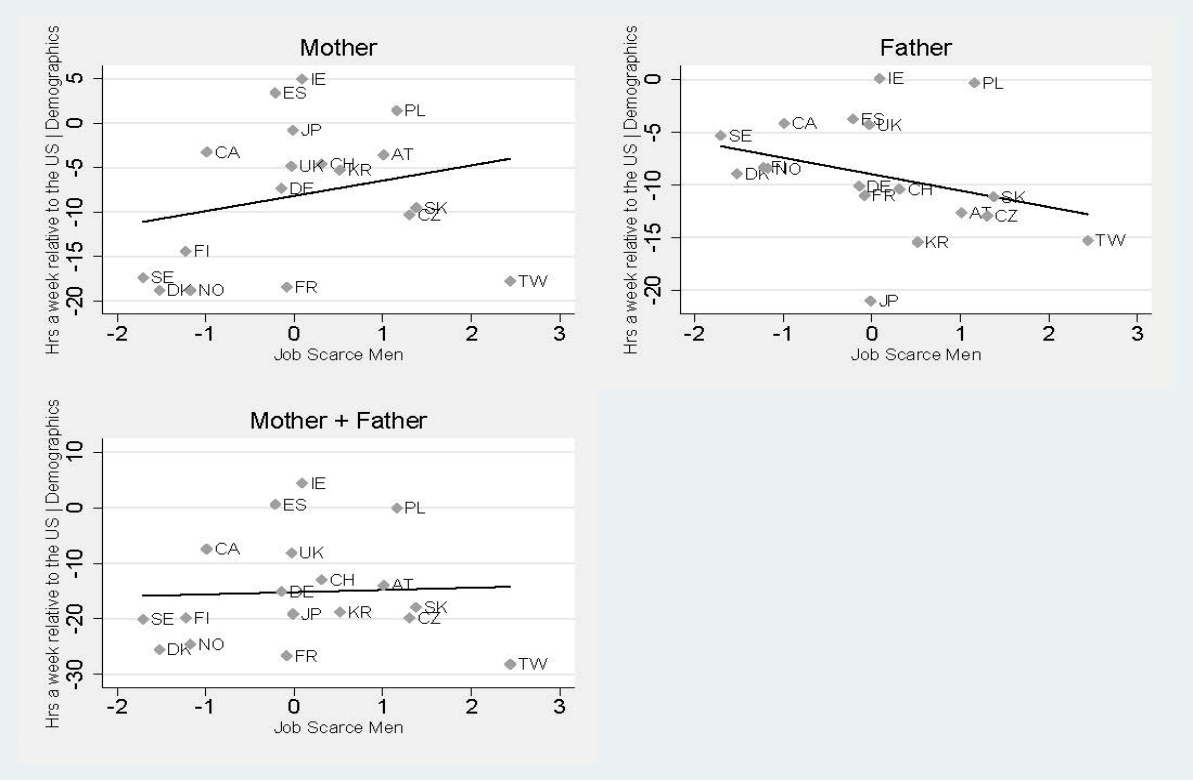


B. Unskilled



Note: See Appendix Table 2 for a description of the data sources. The figure shows the trends in the ever married rates for males aged 35-44 from 1995 to 2010 for each of the 26 countries in our sample separately by skill level.

Appendix Figure 3. Time Spent on Household Production and Gender Norms



Note: The y axis is the country dummy coefficient of a regression of hours per week spent in total household production (family care plus household work) on country fixed effects, number of children, dummy for children under 5 years of age, household size, education, and age of the respondent, and if she has a partner living in the household. Reference country is the US. Data comes from the 2012 ISSP, with the sample restricted to individuals age 18-64 with at least one own child living in the household.

Appendix Table 1: Classification of Countries by Sexism Groups

			IVS, 1990			IVS, latest	ISSP			
Country	Country code	Region	% Agree: When jobs are scarce, men have more right to a job than women	Sexism Group (1: Low, 2: Mid, 3: High)	No. Obs.	% Agree: When jobs are scarce, men have more right to a job than women	% Agree: A man's job is to earn money; a woman's job is to look after the home and family.	Sexism Group (1: Low, 2: Mid, 3: High)	Survey years	No. Obs.
Sweden	SE	Nordic	0.08	1	1027	0.02	0.08	1	2002	1080
Denmark	DK	Nordic	0.11	1	1024	0.02	0.10	1	2002	2782
Finland	FI	Nordic	0.15	1	561	0.04	0.11	1	2002, 2012	2418
Norway	NO	Nordic	0.16	1	1221	0.05	0.07	1	2002, 2012	2919
Canada	CA	North America	0.19	1	1711	0.14	0.12	1	2012	983
USA	US	North America	0.24	1	1803	0.06	0.23	2	2002, 2012	2473
Netherlands	NL	West Europe	0.25	1	1006	0.08	0.13	1	2002	1197
Spain	ES	South Europe	0.31	2	4072	0.12	0.21	2	2002, 2012	5066
Germany	DE	West Europe		2	3221	0.16	0.18	2	2002, 2012	3133
France	FR	West Europe	0.33	2	989	0.12	0.17	2	2002, 2012	4312
UK	UK	West Europe	0.34	2	1467	0.12	0.18	2	2002, 2012	3897
Greece	GR	South Europe	0.34	2	1117	0.32				
Portugal	PT	South Europe	0.34	2	1170	0.21	0.34	3	2002	1092
Japan	JP	East Asia	0.34	2	914	0.32	0.28	2	2002, 2012	2261
Ireland	IE	West Europe	0.36	2	991	0.17	0.16	2	2002, 2012	2415
Belgium	BE	West Europe	0.38	2	2698	0.19	0.25	2	2002, 2012	1360
Switzerland	CH	West Europe	0.39	2	1189	0.20	0.24	2	2002, 2012	2215
Korea	KR	East Asia	0.42	3	1243	0.32	0.33	3	2012	1396
Italy	IT	South Europe	0.43	3	1987	0.22				
Hungary	HU	East Europe	0.45	3	959	0.14	0.39	3	2002	1023
Austria	AT	West Europe	0.50	3	1350	0.21	0.33	3	2002, 2012	3188
Hong Kong	HK	East Asia	0.52	3	1225	0.28				
Poland	PL	East Europe	0.52	3	852	0.27	0.44	3	2002, 2012	2367
Czech Republic	CZ	East Europe	0.54	3	924	0.29	0.48	3	2002, 2012	3093
Slovakia	SK	East Europe	0.55	3	465	0.27	0.51	3	2002, 2012	2261
Taiwan	TW	East Asia	0.72	3	771	0.42	0.45	3	2002, 2012	4055

Note: The data is from the Integrated Values Survey (IVS) and the 2002 and 2012 International Social Survey Program (ISSP). The IVS measure uses data for 1990 when available, or takes the measure from the closest year (CH 1996, GR 1999, HK 2005, HU 1991, PL 1989 and TW 1994) and extrapolates it to 1990. The latest year available for the IVS measure varies between 2006 and 2012. The gender-related questions are based on the responses of individuals age 18 or older. The table reports the fraction of respondents in each country who agree with each of the gender-related statements in the IVS and ISSP (across all available survey years).

Appendix Table 2. Data Sources for Cross-country Panel, by Year

	1995*	2000*	2005*	2010*
Austria	EU-LFS/ECHP	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Belgium	EU-LFS/ECHP	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Czech Republic			EU-LFS/EU-SILC	EU-LFS/EU-SILC
Denmark	EU-LFS/ECHP	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Hungary			EU-LFS/EU-SILC	EU-LFS/EU-SILC
Finland	EU-LFS/LIS	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
France	EU-LFS/ECHP	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Germany	EU-LFS/ECHP	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Greece	EU-LFS/ECHP	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Ireland	EU-LFS/ECHP	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Italy	EU-LFS/ECHP	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Netherlands		EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Norway		EU-LFS/LIS	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Poland			EU-LFS/EU-SILC	EU-LFS/EU-SILC
Portugal	EU-LFS/ECHP	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Slovaka			EU-LFS/EU-SILC	EU-LFS/EU-SILC
Spain	EU-LFS/ECHP	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Sweden	EU-LFS/LIS	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Switzerland		EU-LFS/LIS	EU-LFS/LIS	EU-LFS/EU-SILC
UK	EU-LFS/ECHP	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
US	CPS	CPS	CPS	CPS
Canada	LFS	LFS	LFS	LFS
Taiwan	MPUS	MPUS	MPUS	MPUS
Hong Kong	Census	Census	Census	Census
Japan		JGSS	JGSS	JGSS
South Korea	EAPS/KLIPS	EAPS/KLIPS	EAPS/KLIPS	EAPS/KLIPS

* or closest year with available data

Notes: EU-LFS: European Union Labor Force Survey

ECHP: European Community Household Panel

EU-SILC: European Union Statistics on Income and Living Conditions

LIS: Luxembourg Income Study

CPS: US Current Population Survey

LFS: Canadian Labor Force Survey

MPUS: Taiwan Man Power Utilization Survey

JGSS: Japanese General Social Survey

KLIPS: Korean Labor and Income Panel Study

EAPS: Korea Economically Active Population Survey (Labor Force Survey)

Appendix Table 3. Household Production and Gender Norms

	Hours a week spent in activity relative to the US | Demographics		
	Total Household Production		
	(1) Female	(2) Male	(3) Total
Attitude measure: Men have more right to a job than women (mean 0, var 1)	1.772	-1.450*	0.529
	[2.020]	[0.826]	[2.225]
Mean of Dep. Var	-8.07	-9.08	-15.17
Observations	18	18	18
R-squared	0.063	0.089	0.004

Note: The outcome variable is the country dummy coefficient of a regression of hours a week spent in the activity (by the respondent or by her/his spouse) on country fixed effects, number of children, dummy for children under 5 years of age, household size, education, and age of the respondent, and if she has a partner living in the household. Note that total household production is the sum of care for family members and household work. The excluded country dummy is for the US. Data comes from the 2012 ISSP, with the sample restricted to individuals aged 18-64 with at least one own child living in the household. The countries included in the regression are: AT, CA, CH, CZ, DK, DE, ES, FI, FR, JP, KR, PL, SE, SK. We also have data for the US, which we use to construct the outcome variable. Robust standard errors are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1. Significance levels are based on the t-distribution.

Appendix Table 4. Correlation between the Marriage Gap and Social Norms among Individuals age 35-44 : Robustness Tests

	Dep Var. Difference in Outcome (High Skilled - Low Skilled) in 2010 - Females									
	A. Evermarried Rates, include as control:				B.Alternative Outcomes				C. Alternative Measure of Attitudes	
	Household Production		Share of Females with Tertiary Education		Currently Cohabitating or Ever-married		Own Child at home		ISSP Measure:	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	IVS attitude measure: Men have more right to a job than women									
High Sexism Dummy	-0.149***		-0.076*		-0.070**		-0.103***		-0.115***	
	[0.029]		[0.040]		[0.025]		[0.028]		[0.039]	
Mid Sexism Dummy	-0.095***		-0.037		-0.054***		-0.079**		-0.052	
	[0.025]		[0.035]		[0.017]		[0.028]		[0.033]	
Sexism Index		-0.048***		-0.026**		-0.027**		-0.028**		-0.048**
		[0.011]		[0.011]		[0.010]		[0.011]		[0.019]
Measure of Women's Opportunities	LGDP pc	LGDP pc	LGDP pc	LGDP pc	LGDP pc	LGDP pc	LGDP pc	LGDP pc	LGDP pc	LGDP pc
Other Controls	No	No	Yes	Yes	No	No	Yes	Yes	No	No
Observations	18	18	26	26	21	21	26	26	23	23

Note: The unit of observation is country. The dependent variable is the difference in the outcome indicated in each panel for high-skilled and low-skilled females for females in 2010. Panel A examines the relationship between the high-skill minus low-skill difference in female ever married rates and gender norms as measured using the IVS, including controls for total household production and the share of females with a tertiary education. Panel B uses evermarried + currently cohabiting rates and fertility as outcomes. Fertility is proxied by the share of females with an own-child present at home. Panel C examines the relationship bewteen the difference in female evermarried rates and gender norms using an alternative measure of gender norms based on the ISSP survey. The ISSP survey is not available for Italy, Greece, and Hong Kong. Other controls include the share of males in each country with tertiary education, the skill premium, and the gender gap. See Table A3 for the construction of Total Hhld production. Robust standard errors are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1. Significance levels are based on the t-distribution.

Appendix Table 5. Female Marriage Gap and the Interaction between Social Norms and Women's Labor Market Opportunities: Robustness Tests

	Dep Var. Difference in Ever Married Rates (High Skilled - Low Skilled)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	A. Drops East Asia		B. Controls for Share of Females with Tertiary Education		C. Dep. Var: Own Children at Home		D. ISSP Measure of Sexism	
	IVS attitude measure: Men have more right to a job than women							
LGDP pc	0.279***	0.126**	0.299***		0.404**	0.187	0.249*	0.039
	[0.093]	[0.047]	[0.091]		[0.180]	[0.111]	[0.130]	[0.069]
LGDP pc*High Sexism	-0.281***		-0.412***		-0.316*		-0.361***	
	[0.094]		[0.090]		[0.165]		[0.127]	
LGDP pc*Mid Sexism	-0.183*		-0.186*		-0.324**		-0.138	
	[0.097]		[0.103]		[0.154]		[0.123]	
LGDP pc*Sexism Index		-0.136**		-0.154***		-0.087*		-0.132***
		[0.058]		[0.027]		[0.046]		[0.041]
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. Observations	72	72	86	86	71	71	74	74

Note: The unit of observation is country by year. Each column within a panel is a separate regression with the difference in ever married rates between high-skilled and low-skilled for females or males as the dependent variable. The high (mid) sexism dummy refers to the top (middle) tertile of countries in terms of conservativeness of gender norms as measured using the IVS (Panels A , B and C) and the ISSP (Panel D). The Sexism Index is the continuous measure of the conservatism of gender norms from the IVS/ISSP standardized to have mean 0 and standard deviation 1. Other controls include the share of males in each country with tertiary education, the skill premium, and the gender gap. Robust standard errors clustered at the country level are reported in brackets.*** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 6: Classification of US States by Sexism Group

	GSS Attitude Measure: Better if man is achiever outside home and women take care of home and family			
	No. of Observations	% Agree (average from 1977 to 2014)	Standardized residual after taking out year effects (mean 0, sd 1)	Sexism Group (1: Low, 2: Mid, 3: High)
Arkansas	216	0.61	2.78	3
Utah	129	0.57	2.12	3
West Virginia	266	0.56	1.72	3
Alabama	502	0.53	1.48	3
Mississippi	217	0.47	1.29	3
Kentucky	229	0.47	1.16	3
Tennessee	811	0.47	1.09	3
North Carolina	1038	0.47	1.03	3
Florida	1216	0.44	0.76	3
Texas	1711	0.43	0.72	3
Montana	84	0.47	0.62	3
Louisiana	372	0.42	0.57	3
Georgia	823	0.42	0.54	3
Oklahoma	333	0.42	0.49	3
Delaware	125	0.37	0.39	3
Missouri	667	0.40	0.33	2
South Carolina	355	0.42	0.31	2
Washington	642	0.38	0.18	2
Pennsylvania	1164	0.41	0.10	2
Illinois	981	0.39	0.03	2
Indiana	637	0.38	0.00	2
Ohio	1243	0.39	-0.04	2
California	2601	0.38	-0.13	2
Wisconsin	657	0.38	-0.22	2
Arizona	419	0.36	-0.22	2
New York	1801	0.36	-0.30	2
Colorado	710	0.35	-0.36	2
Wyoming	146	0.36	-0.40	2
Virginia	867	0.35	-0.50	2
Kansas	349	0.35	-0.51	2
Rhode Island	91	0.37	-0.52	1
New Jersey	692	0.35	-0.57	1
Michigan	1164	0.35	-0.59	1
Vermont	144	0.31	-0.60	1
South Dakota	123	0.29	-0.61	1
Oregon	305	0.34	-0.65	1
Massachusetts	626	0.31	-0.88	1
North Dakota	193	0.33	-0.88	1
Maryland	415	0.30	-1.03	1
Connecticut	306	0.31	-1.21	1
Iowa	201	0.30	-1.31	1
New Hampshire	85	0.33	-1.33	1
Minnesota	440	0.30	-1.35	1
Alaska	60	0.25	-1.54	1
District of Columbia	68	0.22	-1.94	1

Note: The data is from the 1977 to 2014 General Social Survey. The first column reports the fraction of individuals in each state who agree (strongly agree, agree) with the statement from 1977 to 2014. The second column reports the standardized value of the state-average of the residual individual-level responses to the gender-related question in the GSS after removing year effects. The state classifications (high, mid, low) reported in the last column are based on the standardized sexism measure in Column (2). Refer to text for details on the construction of the attitude variable.

Appendix Table 7. Correlation between the Marriage Gap and Social Norms among Individuals age 35-44 : Robustness Tests for US State-Level Analysis

	Dep Var. Difference in Evermarried Rates (High Skilled - Low Skilled) in 2010 - Females							
	A. Evermarried Rates, include as control:				B. Alternative Outcomes			
	Household Production		with College Education		Ever-married and Own Child at Home		Own Child at Home	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High Sexism Dummy	-0.033**		-0.036***		-0.040***		-0.025*	
	[0.013]		[0.013]		[0.012]		[0.014]	
Mid Sexism Dummy	-0.016		-0.020		-0.024**		-0.013	
	[0.014]		[0.013]		[0.010]		[0.010]	
Sexism Index		-0.010**		-0.013**		-0.013**		-0.009
		[0.004]		[0.006]		[0.005]		[0.006]
Measure of Women's Opportunities	Log(female high-skill wage)							
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.695	0.653	0.683	0.638	0.550	0.479	0.614	0.596
Observations	45	45	45	45	45	45	45	45

Note: The unit of observation is a state (including DC). The data is from the 1970 to 2000 US Census and 2008 to 2011 ACS. The sample is restricted to whites. Attitudes are measured using the 1977 to 2014 General Social Survey and are not available for 6 states (Hawaii, Idaho, Maine, Nebraska, Nevada, and New Mexico). Each column is a separate regression. Panel A uses the difference in ever married rates between high-skilled and low-skilled females age 35 to 44 as the dependent variable and additionally controls for household production (Columns (1) and (2)) and the share of females with college education (Columns (3) and (4)). Panel B uses the difference (high - low skill) in the share of females who are ever married and have a child (Columns (5) and (6)) and the difference (high - low skill) in the share of females who have a child present at home (Columns (7) and (8)) as the dependent variable. The high (mid) sexism dummy refers to the top (middle) tertile of states in terms of conservativeness of gender norms as measured using the GSS. The attitude measure is the continuous measure of gender norms from the GSS standardized to have mean 0 and standard deviation 1 in the sample of 45 states. Log(female high-skill wage) is the log average wage of full-time (working 35 or more hours per week) females age 25 to 54 with a college degree in the preceding decade (t-10) in each state. Other controls include the share of males with college education, a quadratic in male high skilled wages, and quadratics in female and male low skilled wages. The labor market controls are measured among individuals age 25 to 54 in year t-10. Robust standard errors are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 8. Female Marriage Gap and the Interaction between Social Norms and Women's Labor Market Opportunities: Robustness Tests for US State-Level Analysis

	Dep Var. Difference in Evermarried Rates (High Skilled - Low Skilled) in 2010 - Females					
	A. Evermarried Rates, include as control:		B. Alternative Outcomes			
	Share of Females with College Education		Ever-married and Own Child at Home		Own Child at Home	
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Female high-skill wage)	0.056	0.025	0.066	0.027	0.050	0.020
	[0.054]	[0.046]	[0.074]	[0.075]	[0.073]	[0.072]
Log(Female high-skill wage)*High Sexism	-0.060**		-0.069**		-0.049	
	[0.027]		[0.033]		[0.033]	
Log(Female high-skill wage)*Mid Sexism	-0.032		-0.046*		-0.036	
	[0.021]		[0.025]		[0.024]	
Log(Female high-skill wage)*Sexism Index		-0.013		-0.023*		-0.017
		[0.010]		[0.014]		[0.013]
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE, State FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.637	0.617	0.797	0.789	0.766	0.761
No. Observations	225	225	225	225	225	225

Note: The unit of observation is a state (45 states) by decade (1970, 1980, 1990, 2000, and 2010). The data is from the 1970 to 2000 US Census and 2008 to 2011 ACS. The sample is restricted to whites. Attitudes are measured using the 1977 to 2014 General Social Survey and are not available for 6 states (Hawaii, Idaho, Maine, Nebraska, Nevada, and New Mexico). Panel A estimates the same specification as Table 7 but includes the share of females with college education as an additional control. Panel B uses two alternative outcomes that proxy for fertility; Columns (3) and (4) use the share of females age 35 to 44 who report having ever been married with an own-child present at home while Columns (5) and (6) use the share of females age 35 to 44 with an own-child present at home. All regressions control for state and year fixed effects. Other controls include the share of males with college education, a quadratic in male high skilled wages, and quadratics in female and male low skilled wages. The labor market controls are measured among individuals age 25 to 54 in year t-10. Robust standard errors reported in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Data Appendix for "Social Norms, Labor Market Opportunities, and the Marriage Gap for Skilled Women" by Bertrand, Cortes, Olivetti and Pan

1. Construction of Key Variables

Educational Classification

For consistency across countries, individuals are classified as "skilled" if they have completed tertiary education and "unskilled" if they did not complete tertiary education.

- EU-LFS data (UK, France, Germany, Netherlands, Ireland, Austria, Belgium, Switzerland, Italy, Spain, Portugal, Greece, Sweden, Finland, Denmark, Iceland, Norway)

  Skill levels were coded based on the level of education reported in the variable HATLEVID which summarizes the highest level of education or training successfully completed. Three classifications were provided: L, Lower secondary, M, Upper secondary and H, Third level. The L level corresponds to ISCED levels 1 to 3c. The M level corresponds to ISCED levels 3-4, and the H level corresponds to ISCED levels 5-6.

  Individuals were coded as having completed tertiary education if they were classified as "H" i.e. having completed ISCED levels 5-6.

Based on the ISCED description of the education programs, we construct similar measures of skill for the remaining countries. The details of how these variables are constructed for each country are as follows:

- US: CPS data – skilled individuals are classified as those whose highest educational attainment is an associate's degree or more.
  - Unskilled: None-Some college no degree (Codes 0-90, 100, 110)
  - Skilled: Associate degree (91, 92), Bachelor's degree (111), 5+ year of college or graduate degree (120-125).
- Canada: LFS data – skilled individuals are classified as those whose highest educational attainment is a bachelor's degree or more.
  - Unskilled: 0 to 8 years (0), Some secondary (1), Grade 11 to 13, graduate (2) Some postsecondary (3), Postsecondary degree or diploma (4)
  - Skilled: Bachelor's degree (5), Graduate degree (6)
- Taiwan: Manpower Utilization Survey (MPUS) – skilled individuals are classified as those whose highest educational attainment is junior college or more.
  - Unskilled: Illiterate (1), Self-educated (2), Primary school (3). Junior high school (4), Senior high school (5), Vocational school (6)
  - Skilled: Junior college (7), University (8), Masters (9) and PhD (10)
- Hong Kong: Census – skilled individuals are classified as those whose highest educational attainment is a diploma or more
  - Unskilled: No schooling, Kindergarten, Primary 1-6, Secondary 1-5, Grade 12, Secondary 6 and 7, Craft level (including apprenticeship)

    - Skilled: Diploma/Vocational education, Higher Diploma, Associateship or equivalent courses in Universities, Diploma or certificate courses in post-secondary colleges, Nurse training courses, sub-degree distance learning courses, first-degree, postgraduate

- South Korea: Korean Labor and Income Panel Study– skilled individuals are classified as those whose highest educational attainment is a 2-year program with a vocational, technical, or associate degree.
    - Unskilled: No schooling (2), Elementary school (3), Lower secondary (4) and (5) Upper secondary.
    - Skilled: 2-years college, vocational, technical, associate degree (6), University (4 years or more) (7), Graduate school (master's) (8), graduate school (doctoral) (9)

Marriage market outcomes

For each country in our sample, we construct the ever marriage rates of women and men age 35-44 by education. Individuals are coded as 0 if they report being single and 1 if they report any other marital status classification (single, divorced, widowed, legally separated).

The definition of marriage for each country is as follows:

For countries in the EU-LFS data (UK, France, Germany, Netherlands, Ireland, Austria, Belgium, Switzerland, Italy, Spain, Portugal, Greece, Sweden, Finland, Denmark, Iceland, Norway), marital status was coded based on the following:

Marital status is the conjugal status of each individual in relation to the marriage laws of the country (i.e. de jure status). Some countries (i.e. the Nordic, the Netherlands, France) have a legal framework for registering partnerships (in most countries these are same-sex partnership and they have a legal status parallel to married couples). Such information has also to be treated in a harmonised way and it is proposed to treat them as married and classify them under group 2 when they still exists, else as 0 as appropriate (legal separation or death of one of the partners).

For the remaining countries (US, Canada, Taiwan, Hong Kong, Japan and South Korea), marital status was defined as legal marriage.

Labor market variables

Construction of wage series:

- Earnings sample restricted to full-time employees who work 35 or more hours per week
- Annual wages for full-time employees age 25 to 54

The country-specific annual wage measures are converted to 2000 USD dollars using the following procedure:

- Country-level wage measures are first deflated to 2000$ using the country-specific CPI from the World Bank

  World Bank country-specific CPI data:
  http://data.worldbank.org/indicator/FP.CPI.TOTL

- The European local currencies are then converted to Euros (for the EU member nations) using exchange rates in 2000.

  Historical local currency to Euro exchange rates: http://ec.europa.eu/eurostat/web/exchange-rates/data/database

- Finally, all wage measures are converted to 2000$ using PPP conversion factors for private consumption from the World Bank.

  World Bank PPP conversion factors, private consumption:
  http://data.worldbank.org/indicator/PA.NUS.PRVT.PP?page=3

For countries that were not included in the World Bank data, we used the following data sources to implement the conversions:

- Taiwan
  - CPI data from the Taiwan National Statistics Bureau
    http://eng.stat.gov.tw/ct.asp?xItem=12092&ctNode=1558&mp=5
  - PPP conversion rate for GDP at current prices (national currency per current USD) from: http://www.econstats.com/weo/V013.htm

- Hong Kong
  - CPI data from the Hong Kong Census and Statistics Department
    http://www.censtatd.gov.hk/hkstat/sub/so60.jsp

<u>European Community Household Panel (1994 to 2001)</u>

- Annual wage measures for 15 countries from 1994 to 2001
- Countries included: UK, Sweden, Finland, Denmark, Germany, Netherlands, Belgium, Austria, Ireland, France, Italy, Spain, Portugal, Greece

LIS data used to fill in the gaps from ECHP data for the following countries:
- Switzerland 1992 (recoded to 1995)
- Sweden, Norway, Finland 1995
- Switzerland 2000
- Switzerland 2004 (recode to 2005)

2. Additional Information on the Data Sources used for to Construct the Cross-Country Panel

European Union Labor Force Survey (EU-LFS): The Labour Force Surveys are conducted by the national statistical institutes across Europe and are centrally processed by Eurostat. All definitions apply to persons aged 15 years and over living in private households. Persons carrying out obligatory military or community service are not included in the target group of the survey, as is also the case for persons in institutions/collective households.

European Union Statistics on Income and Living Conditions (EU-SILC): The European Union Statistics on Income and Living Conditions (EU-SILC) is an instrument aiming at collecting timely and comparable cross-sectional and longitudinal multidimensional microdata on income, poverty, social exclusion and living conditions. This instrument is anchored in the European Statistical System (ESS).

European Community Household Panel (ECHP): This is a panel survey in which a sample of households and persons are interviewed year after year. The interviews cover a wide range of topics concerning living conditions. The total duration of the ECHP was 8 years, running from 1994 to 2001 (8 waves). As from 2003/2004, the EU-SILC survey covers most of the above-mentioned topics. The Member States involved were Belgium, Denmark, Germany, Ireland, Greece, Spain, France, Italy, Luxembourg, the Netherlands, Austria, Portugal, Sweden and the United Kingdom.

Luxembourg Income Study (LIS): The Luxembourg Income Study Database (LIS) is the largest available income database of harmonized microdata collected from about 50 countries in Europe, North America, Latin America, Africa, Asia, and Australasia spanning five decades. Harmonized into a common framework, LIS datasets contain household- and person-level data on labour income, capital income, social security and private transfers, taxes and contributions, demography, employment, and expenditures.

Non-European Data

United States: The data is from the 1995, 2000, 2005, and 2010 Annual Social and Economic Supplement (ASEC) of the Current Population Survey. The CPS is a monthly U.S. household survey conducted jointly by the U.S. Census Bureau and the Bureau of Labor Statistics. A battery of labor force and demographic questions, known as the "basic monthly survey," is asked every month. Over time, supplemental inquiries on special topics have been added for particular months. Among these supplemental surveys, the March Annual Social and Economic Supplement (ASEC) is the most widely used by social scientists and policymakers. The sample sizes for the surveys range from about 150,000 to 210,000.

Canada: We use data from the 1995, 2000, 2005, and 2010 Canadian Labor Force Survey. This public use microdata file (PUMF) contains non-aggregated data for a wide variety of variables collected from the Labour Force Survey (LFS). The LFS collects monthly information on the labour market activities of Canada's working age population. The target population is the non-institutionalised population 15 years of age and over. The survey is conducted nationwide, in both the provinces and the territories. Excluded from the survey's coverage are: persons living on

reserves and other Aboriginal settlements in the provinces; full-time members of the Canadian Armed Forces, the institutionalized population, and households in extremely remote areas with very low population density. These groups together represent an exclusion of less than 2% of the Canadian population aged 15 and over. The sample sizes for the surveys range from about 640,000 to 735,000. The wage data is only available from 1998 onwards.

Taiwan: We use data from the 1995, 2000, 2005, and 2010 Taiwan Manpower Utilization Survey (MPUS). This is a household-level survey that provides labor force information for a representative sample of Taiwanese individuals over the age of 15. The sample covers the civilian population in Taiwan. The sample size for each survey is approximately 60,000 individuals.

Hong Kong: We use data from the 5 percent 1996, 2001, 2006, and 2011 Hong Kong Population Census and By-Census. The Hong Kong Census provides a range of demographic and labor force information on all members of an enumerated household. The sample sizes range from about 300,000 to 500,000.

Korea: The marriage data is from the 2000, 2004, and 2010 Economically Active Population Survey (EAPS). The EAPS is a nationally representative labor force survey conducted by the National Bureau of Statistics. The survey includes all usual residents of Korea age 15 and over except members of the armed forces and the institutionalized population. The sample size of each of the surveys is about 800,000. The wage data is from the 1998 and 2007 waves of the Korean Labor and Income Panel Study (KLIPS). KLIPS is a longitudinal survey of the labor market/income activities of households and individuals residing in urban areas. The first wave of the KLIPS was launched in 1998. The sample sizes for the 1998 and 2007 surveys are 13,321 and 11,855, respectively.

Japan: We use data from the 2000-2003, 2005-2006, and 2008-2010 waves of the Japanese General Social Survey (JGSS) to construct the marriage outcomes and labor market variables. We pool together the 2000-2003 waves of the survey for the 2000 time period, the 2005 and 2006 waves for the 2005 time period, and 2008-2010 waves for the 2010 time period. The sample sizes for these pooled samples are as follows: 2000-2003 (N=12,299), 2005-2006 (N=6,277), 2008-2010 (N=9,223).