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

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Abstract

In most of the developed world, skilled women marry at a lower rate than unskilled ones. We document heterogeneity across countries in how the marriage market penalty for skilled women has evolved over time. As labor market opportunities for women have improved, the penalty has been growing in some countries but shrinking in others. We propose a theoretical model in which the (negative) social attitudes towards working women might contribute towards the lower marriage rate of skilled women, and might also induce a non-linear relationship between their labor market prospects and their marriage outcomes. The model is suited to understand the dynamics of the marriage market penalty for skilled women over time within a country with set social attitudes towards working women. The model also delivers predictions about how the marriage market penalty for skilled women should react to changes in their labor market opportunities across countries with more or less conservative attitudes towards working women. We test the key assumptions and predictions of this model in a panel of 23 developed countries, as well as in a panel of US states.

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1 Introduction

Women's advancement in education and the labor market has been accompanied by a steady decline in marriage rates in many developed countries (Stevenson and Wolfers, 2007, Jones and Gubhaju, 2009).[1] Interestingly, there is large heterogeneity across developed countries in the size of the gap in marriage rates between skilled and unskilled women (which we will refer to as the "marriage penalty") and its evolution over time. For example, in the US, there has been widespread discussion about the reversal in the "marriage gap" - where college-educated women today are, 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 of highly educated women choosing to opt-out of marriage (Economist, 2011, Hwang, 2015).

We systematically explore the evolution of the marriage penalty in a sample of developed countries, and show that the gap in marriage rates between skilled and unskilled women has been decreasing in North America, most Nordic countries, and some parts of Western Europe. On the other hand, the marriage gap has widened in East Asian countries as well as parts of Southern Europe, with single-hood rates for skilled women reaching unprecedented levels in the most recent cohorts. For example, in Hong Kong, 35% of college-educated women between the ages of 35 and 39 were single in 2011 compared to 15% in the US and Canada. In 2000 in Japan, and 2005 in South Korea and Singapore, 20% of college educated women between the ages of 35 and 39 had never been married. Strikingly, this divergence in the marriage market outcomes for skilled women across developed countries is occurring despite consistent patterns of increased labor market opportunities for skilled women (and men) in all of these countries.

To explain these patterns, we propose a theoretical model in which the (negative) social attitudes towards working women might contribute towards the lower marriage rate of skilled women, and might also induce a non-linear relationship between their labor market prospects and their marriage outcomes. A marriage market penalty (or premium) emerges endogenously in our model as a function of skilled women's rising labor market opportunities and the time allocation decisions that these generate. Our model is suited to understand the dynamics of the marriage market penalty for skilled women over time within a country with set social attitudes towards working women. Our model also delivers predictions about how the marriage market penalty for skilled women should react to set changes in their labor market opportunities across countries with more or less conservative attitudes towards working women.

The baseline version of our model considers two types of men and women, skilled and unskilled.

[1] There is a large literature that explores the implications of the advancement of women on marriage markets and fertility. For example, see Becker, 1973, Goldin, 2006 and Greenwood et al., 2012.

We assume that skilled individuals earn more than unskilled ones and that men's wages are higher than women's wages. We also assume that skilled men are socially less conservative than unskilled men, and hence experience relatively less disutility from having a working wife. We empirically verify the validity of this last assumption in a cross-section of developed countries. We further assume that married individuals derive utility from their own private consumption (a function of own's labor market income), spillovers from their spouse's consumption (a function of spouse's labor market income), the consumption of a public good, and the quality of the match to their spouse. The amount of public good produced within a couple is a function of the sum of the time not spent in labor market work by each spouse. We model more negative men's attitudes towards having a working spouse as lower weights from their wife's consumption into the husband's utility function. The utility of individuals that remain single is simply their own private consumption (e.g. own labor market income). While husbands always maximize their utility by devoting all of their time to labor market work, wives decide to focus solely on home production up to a certain level of potential labor market earnings. As their labor market opportunities increase further, wives start splitting their time between home production and labor market work, leading to lower provision of the household public good.

Given these time allocation optimizations by each spouse, we show how husbands' and wives' utility varies with the other spouse's earnings opportunities in the labor market. Because husbands always work full-time in the labor market, their wives' utility is strictly increasing in their husbands' earnings, implying that women (both skilled and unskilled) always prefer marrying a skilled man rather than an unskilled man. The relationship between husbands' utility and their wives' earnings potential is more complex. In the range of earnings potential where the wife decides to dedicate herself fully to home production, husband's utility is unaffected by increases in the wife's labor market potential. Further increases in the wife's labor market potential cause a decline in husband's utility as the wife starts spending more time in the labor force and less time in home production. Passed a certain threshold, the husband's utility in his wife's labor market earnings' potential begins to increase as the positive spillovers from her consumption start dominating the loss in public good production. The more socially conservative the husband is (e.g. the smaller the spillovers the husband gets from his wife working), the larger the range of labor market earnings over which the husband's utility is declining in the wife's labor market earnings. Hence, the relationship between husband's utility and women's labor market opportunities is U-shaped. There is a range of labor market returns to education over which both skilled and unskilled men prefer marrying an unskilled woman (as she will opt to spend more time in home production compared to a skilled woman). Because skilled men are assumed to be less conservative than unskilled men, they will start preferring to marry skilled women before their unskilled counterparts.

We complete the modeling exercise by formally studying the marriage decision and equilibrium marriage rates for the different types (skilled/unskilled; men/women). We use a one-period random

search model, where the probability of meeting a skilled man (woman) is the proportion of skilled men (women) in the population. A given woman will be willing to marry a given man if and only if the utility she derives in the marriage is greater than her utility as a single person. Because skilled women have better outside options if single, they will be pickier than unskilled women. Skilled men will always fare better in the marriage market as they are preferred to unskilled men by both skilled and unskilled women for a given match quality. For low levels of labor market opportunities at which both married skilled and unskilled wives opt to stay home, men set the same reservation quality level for skilled and unskilled women. However, because skilled women are pickier than unskilled ones, they will marry at a lower rate than unskilled women over that range. As the labor market opportunities for skilled women increase beyond these low levels, they opt into the labor market. Men start raising their reservation quality for skilled women over unskilled ones, further increasing the marriage gap between skilled and unskilled women. As the labor market prospects for skilled women keep on increasing further, skilled men (first) start lowering their reservation quality threshold for skilled women. This declining male pickiness dominates the increased pickiness of skilled women and the marriage gap between skilled and unskilled women starts decreasing. In other words, our model predicts a U-shape relationship between the marriage market penalty for educated women and their labor market opportunities.

The model we propose allows us to characterize the dynamics of the marriage market penalty for skilled women in an environment with specific gender norms as the labor market opportunities for them increase. The model is also valuable in generating some comparative statistics across environments with more or less conservative gender identity norms. In particular, the model predicts that the range over which the marriage market penalty for educated women rises with their labor market opportunities will be wider in countries that have more conservative gender role attitudes. In other words, we would expect the relationship between labor market opportunities for skilled women and the gap in marriage rates between skilled and unskilled women to be more likely to be negatively related for more gender conservative countries, while it would be more likely to be positively related in less conservative countries.

In the empirical section of the paper, we take the predictions of the model to the data. Using a variety of data sources, we build a panel dataset of 23 developed countries in North America, Western Europe, Northern Europe, Southern Europe and East Asia. We measure marriage rates across cohorts of skilled and unskilled men and women in those countries. As predicted by the model, keeping wages constant, we show a strong positive relationship between the marriage market penalty for skilled women and the degree of gender-related conservatism. We also show that this relationship is markedly stronger in the later cohorts, when educated women face, on average, better labor market prospects. We also show that the relationship between the marriage market penalty and educated women's labor market opportunities appear to markedly differ across group of countries in a way that is consistent with the prediction of a U shape relationship derived by our

model. We find that the relationship between the marriage penalty for educated women and skilled women's wages in a panel of countries from 1995 to 2010 is negative in the subset of countries with low sexism. In contrast, this relationship is significantly positive in the subset of countries with more conservative gender norms. These results are robust to the inclusion of year and country fixed effects as well as using GDP per capita as an alternative proxy for women's labor market opportunities.[2] A final implication of the model that we bring to the data is with respect to educational choice. Our model predicts that in more conservative countries, a lower fraction of women should decide to acquire higher education in anticipation of the greater barriers that skilled women face in the marriage market. This is exactly what we find - the gender gap (female-male) in tertiary education is positive in most countries, the Nordic countries experiencing the largest gap but still negative in the East Asian countries. Consistent with the underlying mechanism outlined in the model, we also find that the gender gap in higher education is smaller in countries where the marriage market penalty for skilled women is smaller.

Next, we show that most of the empirical results also hold in a panel of US states from 1970 to 2010. The advantage of focusing on US states is two-fold - first, focusing on variation within regions in a single country alleviates the concern that the cross-country results are driven primarily by unobserved heterogeneity across countries. Second, with US states, we are able to construct longer panels of the key variables required for our analysis and also provide a cleaner mapping between the timing of marriage decisions and labor market conditions. Most of our results at the cross-country level carries through when we exploit variation in gender norms across US states.

Our paper is related to a small but growing literature that emphasizes how the interaction of women's opportunities and social norms could impact marriage and fertility. Hwang (2015) uses a variant of Fernandez et al.'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 (2015) model, mothers' education affects sons preferences: only men born to college educated mothers acquire non-traditional gender role attitudes.[3] Thus in a society with very few college-educated mothers, most men are traditional and skilled/working women face a very large marriage penalty. Our model instead abstracts from the process of intergenerational transmission and focuses on the interaction between gender norms and women's labor market opportunities, which generates a U-shaped marriage penalty. Another related paper is Kawaguchi and Lee (2014) who argue that the high demand for foreign brides in developed Asian

[2]While GDP per capita is a more distant proxy for labor market opportunities, it has the advantage of being measured with less measurement error than our wage proxies.

[3]That is, only education matters independently on the mother's work status. Instead in the Fernandez et al. model a man's preferences for a stay-home wife depend on his mother's labor force participation: men whose mother worked while they were growing up develop a taste for gender equality. It follows that an increase in the fraction of working mothers in one generation improves the marriage prospects of educated women in the next.

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 the experience of East Asian countries, our paper takes a broader view and proposes a simple model that can reconcile the marriage patterns observed in a large sample of developed countries which we then empirically confront using cross-country data. Finally, our paper is also related to earlier work by Feyrer, Sacerdote and Stern (2008) who propose that cross-country fertility patterns could be explained by the interaction between the increasing status of women in the workforce and their status in the household. They document that countries with more conservative gender norms are also likely to have lower fertility rates.

Overall, this paper highlights the potential importance of social norms for understanding how the rising opportunities for women may affect family formation. Moreover, the "opting-out" of marriage observed among highly skilled women in conservative countries, East Asia in particular, has wide-ranging implications. Given that non-traditional family structures and out-of-wedlock births continue to be rare in these societies, the decline in marriage is likely to translate to declines in fertility a concerning phenomenon given that these countries already have the lowest fertility rates in the world. The fact that highly skilled women are the ones choosing to forgo childbearing could also result in lower social returns to education in these societies in the longer run. Furthermore, the penalty faced by skilled women in the marriage market could further serve to dampen the incentives to invest in higher education.

2 Data Description

2.1 Cross-country Data

a. Gender-related attitudes

We use two main sources of data to measure cross-country differences in attitudes towards the role of women in society. The first dataset is the Integrated Values Survey (IVS) from 2005-2013, which is essentially a harmonized dataset that covers both the European Value Survey (EVS) and World Value Survey (WVS). This dataset provides a range of gender-related questions that were asked consistently across a broad set of countries. Appendix Table 1 provides a selected list of the gender-related questions asked in the IVS. 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 from the latest survey year available.[4] Appendix Table 2 reports the average response to this question for each of the 24 countries in our sample as well as the year that the survey was conducted.

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 model. The social norm in the model is based on the belief that some individuals may regard a women's primary sphere to be 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. Appendix Table 1 provides a list of the relevant questions in the ISSP. 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, and disagree strongly. We code the response "agree" and "strongly agree" as indicating a greater degree of gender conservatism.

Table 1 provides the average responses to both questions by region, separately by gender and educational attainment. [5] As observed there is significant variation in the attitudes measures up of 30 percent of East Asians agree with both statements, but only between 3 to 8 percent of people do in the Nordic countries. Canada and the United States , as well as the larger countries in Europe (France, UK, Germany and the Netherlands), have more liberal gender norms compared to smaller countries in West Europe and to South Europe. As expected, in most regions, males are more likely to agree with the statementsinterestingly, however, the gender gap within country is rarely larger than 5 percentage points. Larger gaps within coutries are observed between skilled and unskilled males (educated men tend to be less conservative), an observation that will be important in our model. [6]

One constraint with the cross-country data is that the attitude question was not asked in exactly

[4] We focus on the responses of individuals age 18 and older in each country.

[5] Appendix Table A2 reports average responses to the "jobs scarce" question by country, and well as the year the IVS was conducted.

[6] Given that there is little evidence of large differences in responses between male and female responses (particularly in terms of the cross-country rankings), for our main analysis, we will focus on the average response to the questions. Because of the relatively small sample sizes in the attitude surveys, focusing on the average response for both males and females also allows us to construct a more precise measure of gender-related attitudes across countries. Nonetheless, the results are largely similar if we use male responses to the survey questions.

the same year in each country. We focus on data from 2005 to 2013 in the IVS and data from 2002 and 2012 from the ISSP. One concern with aggregating the attitude data to the country level is that it might lead to potentially misleading inferences if there are differential trends in gender-related attitudes over time across countries. Appendix Figure 1 shows trends over time for each gender-related attitude, plotted separately by five regions (North America, West Europe, South Europe, Nordic and East Asia). Two things are worth noting - first, both gender-related attitudes have largely become less conservative over time for all countries.[7] Second, the relative ranking of countries in terms of average responses to both the gender-related attitude questions has been largely constant over time. This suggests that the country-level variation in gender-related attitudes is largely stable over time.[8]

b. Cross-country Data on Marriage Rates and Labor Market Outcomes

We use several data sets to construct marriage gaps and labor market outcomes at the country level. Our main datasets are the European Union Labor Force Survey (EU-LFS), the European Union Statistics on Income and Living Conditions (EU-SILC), the European Community Household Panel (ECHP), and the Luxembourg Income Study (LIS), supplemented with Census and Labor Force Surveys for most non-European countries. The exceptions are Japan and Korea, for which we use smaller surveys. A description of data sources by country and year can be found in Appendix Table 3. For every country, we work with years with available data closest to 1995, 2000, 2005, and 2010. Our marriage outcomes are for individuals aged 35-44. This age range was chosen as a compromise between having data for the most recent cohort (individuals age 35-44 in 2010) and observing completed first marriage decisions among individuals in this cohort. The labor market conditions faced (e.g. wage rates) by each cohort of individuals in year t is constructed based on the labor market outcomes of individuals age 25-54 in each country.[9]

The coding of the marital status variable varies by data source and country.[10] In most countries, "married" individuals include either formal unions or registered partnerships. For the East Asian countries, the "married" status only includes legal marriages, but cohabitation remains rare in these countries. Following the Eurostat education classification, we define skilled individuals as those with completed tertiary education.[11] The data for GDP per capita (PPP) is from the World Bank. The summary statistics for the cross-country data are reported reported in Table 2.

[7] The only exception is the smaller West European countries in the ISSP

[8] The cross-country correlation in the average response to the IVS ("job scarce") question across IVS survey waves (1990-1998 and 2007-2013) is approximately 0.88.

[9] Ideally, we would have liked to construct labor market conditions for individuals age 35-44 in year t at the time of marriage based on the labor market outcomes of those age 25-54 in year $t-10$; however, due to data limitations, this is not feasible and would entail a much smaller subset of countries for analysis.

[10] We use the classification adopted in the LIS.

[11] This is defined as individuals who completed ISCED levels 5 or 6.

3 Descriptive Facts

Figure 1 documents cross-country variation in the marriage market penalty for skilled women and skilled men in 2010 across the countries in our sample. We define the marriage market penalty for skilled women (y-axis) as the difference between the fraction of women with a tertiary education between 35 and 44 years old that were ever married and the fraction of women with less than a tertiary education between 35 and 44 years old that were ever married. Reported on the x-axis is the equivalent marriage market penalty for skilled men. It is apparent from Figure 1 that in the majority of countries in our sample, more educated women marry at a lower rate than their less educated counterparts. In contrast, the marriage rate of more educated men is larger than the marriage rate of less educated men. In other words, there is marriage market premium for skilled men in most countries in our sample but a marriage market penalty for skilled women. While this appears to be the norm, there are some exceptions. In particular, in most Scandinavian countries (Denmark, Sweden, Finland, Iceland), educated women marry at a higher rate than less educated ones. Also, in the US, UK, Canada and Ireland, skilled women also appear to marry at slightly higher rates than unskilled women in 2010. Nonetheless, even in these cases, the marriage premium is always larger for males.

Figures 2A and 2B show how the marriage market penalty for skilled women and skilled men, respectively, have been evolving over time. In particular, we report the difference in marriage rates between skilled and unskilled 35 to 44 years old at four points in time: 1995, 2000, 2005 and 2010. For these figures, we break down countries into 6 different groups: North America, East Asia, Northern Europe, Southern Europe and two groups of Western European countries.

Figure 2A shows the trends in the marriage market penalty for educated women across these countries over time. In particular, in the US and Canada, the marriage market penalty for educated women has been declining over time and has turned into a marriage market premium for the last two cohorts we observe in the data (2005 and 2010). A similar pattern of decline in the marriage market penalty can be observed in the UK, France, the Netherlands, and Ireland, even though most of these countries are still characterized by a lower marriage rate for skilled women in 2010.

Most of the Nordic countries, with the exception of Denmark, have also experienced a decline in the marriage market penalty for skilled women over the last 15 years. As of 2010, all of the Nordic countries, again with the exception of Denmark, are characterized by a marriage market premium for skilled women. Interestingly, two of the Nordic countries (Sweden and Finland) display what appears as a U-shape pattern over time: the marriage market premium for skilled women appears to to decline between 1995 and 2000, and then rises until 2010.

The opposite pattern is observed for the East Asian countries. While East Asian countries already experienced a marriage market penalty for educated women in the earliest cohort we observe in

the data, this penalty has been largely growing over time. The only exception to this pattern is Hong Kong, where the marriage market penalty for educated women is slightly smaller in the most recent cohort (35 to 44 years old women in 2010) than in the first cohort (35-44 year old women in 1995); the middle two cohorts in Hong Kong have the largest marriage penalty for skilled women, resulting in a weak U-shape pattern over time.

Southern Europe is characterized by fairly large marriage market penalties across the sample period. The magnitude of the penalties is pretty similar between the earlier cohort and the latest cohort. But there is some heterogeneity in the time trend between these countries. While Italy shows only minimal changes over time, Portugal and Spain both appears to have experienced an increase in the penalty in the middle cohorts followed by a decrease in the last cohort, resulting again in weak U-shape patterns.

Figure 2B reports similar trends for the marriage rate of skilled men compared to unskilled men. As indicated above, in 2010, educated men marry at a higher rate than less educated ones in most countries in our sample. It is apparent that such a marriage market premium for education among men was the norm in most countries throughout our 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 in East Asia over time is particular striking. While there has been a growth in the marriage market penalty for educated women in those countries, educated men have always married at a higher rate than less educated men throughout the sample period and, if anything, the marriage market premium for education has been growing for men in those countries.

The central hypothesis that motivates our paper is the marriage market penalty experienced by educated women is a reflection of men's dislike for having a working wife. Because educated women have better labor market opportunities than less educated ones, these women may experience more difficulty in finding a husband; also, these women tend to be pickier in the marriage market as they have better outside options if they remain single. Both forces, as we will argue in the theoretical model below, contribute to educated women marrying at a lower rate than less educated ones, at least until the value of the extra earnings that they can bring to a household start becoming large enough to undo the disutility for men of having a working wife.

Figure 3 provides graphical evidence of a systematic correlation between the conservativeness of gender identity norms in a country and the marriage market penalty for educated women in that country. In particular, in the left panel of Figure 3, we graph the relationship between the gap in marriage rates for high-skilled vs low-skilled women age 35-44 in a country in 2010 and a measure of gender role attitudes in that country.

Figure 3 clearly shows that countries that are more conservative according to the IVS measure are also countries where educated women marry at an especially low rate compared to less educated women in 2010. In contrast, we see a much weaker relationship, between the marriage market penalty (premium) for educated men and this measure of conservativeness (Figure 3, right panel). The model we develop in the next section attempts to reconcile these patterns.

In summary, the descriptive evidence in this section confirms that educated women marry at lower rates than less educated ones in the majority of developed countries. There is strong evidence that the cross-country variation we observe in the marriage market penalty for educated women is related to the conservativeness of gender norms in these countries. The time series evidence suggests that there has been heterogeneity across groups of countries in how the marriage market penalty for educated women has evolved over time. As labor market opportunities for educated women improved in all of these developed countries, the marriage market penalty has increased in some countries but declined in others (and in fact, turned into a premium in a subset of countries). In the next section, we develop a model that can account for these key facts in the data. Most importantly, the model will be able to explain why the relationship between improvements in skilled women's labor market opportunities and their marriage outcomes might not be linear, either within a country over time, or between countries.

4 Model of Marriage and Household Decision Making

We develop a model that ties together the fact that in some countries men overwhelmingly disapprove of married women working with the lower marriage probability faced by skilled women. As is shown below, the marriage "penalty" emerges endogenously as a consequence of skilled women's higher wages and the time allocation decisions that these generate.

Borrowing from Fernandez, Fogli and Olivetti (FFO, 2004), the key ingredient in the household model is that the gender norm generates spousal disagreement over public good provision. Since skilled women have higher wages, they provide less of it relative to unskilled women. This makes them less attractive potential partners on the marriage market. Thus a woman's education decision involves a trade-off between a higher wage rate and a lower marriage probability.

This static model has interesting implications. The model predicts a U-shaped relationship between the marriage penalty faced by skilled women and their market wage. Intuitively, at low wage levels, the loss in public good consumption due to the wife working, which is increasing in her market wage, is too large relative to the husband's gains from the externality from the wife's consumption. However, when the market wage is high enough, working women become increasingly more attractive relative to non-working women. In more traditional societies, the penalty is more

severe and persistent relative to female earnings. Thus the model predicts that for any wage level, the marriage penalty is higher in more traditional societies. It also predicts that assuming fixed or slow-changing social norms, we should see that as women's labor market opportunities increase, the marriage penalty increases, reaches its peak and then declines, eventually switching sign. Taken together, these predictions imply that, comparing two societies that differ in the conservativeness of their gender roles views, we might observe that, following an increase in wages, the marriage penalty faced by skilled women increases in the more traditional society but declines in the more gender equal society.

4.1 Model Set Up

The timing in the model is as follows. First, women choose whether to become skilled. Agents then obtain a match in the marriage market which we model as a one-period random search model. Given this match, they decide whether to marry or to stay single. Lastly, married agents decide how to allocate their time between work and the household production of a public good (for example, children). Single agents do not produce a household public good (they remain childless) and simply consume their labor income.

For tractability, we assume that there are two types for each sex. Women can be either skilled S or unskilled U. The fraction of skilled women is endogenous. There are also two types of men, skilled S and unskilled U, who differ in terms of market earnings and also differ in terms of their view of gender roles. Both assumptions are in keeping with the empirical evidence (see Table 1) but the model's prediction in terms of marriage penalty are unaltered if men do not differ on the social norm dimension. [12] Men's type and its distribution in the male population are given.

4.2 Household Decisions

The basic set up of the model follows FFO (2004b). In this model the welfare of individual i who is married to another agent j, consists of utility from own private consumption c_i, some spillover α_i from the spouse's consumption c_j, utility from consumption of a household public good c, and utility from the quality of the match with j as perceived by agent i, q_{ij}.

One possible interpretation of the utility function is that individuals obtain utility from their career in a way that is proportional to its status or success as measured by wages. In such an interpretation, α_i is the utility agent i derives from her/his spouse's career (this is true both for men and for women). For men, however, the α_i can be especially low because of traditional societal

[12] The main results of the analysis, except for the prediction that an increase in the fraction of educated men reduces the marriage penalty, are unaltered if we assume that men have homogeneous preferences.

views about women's role. This parameter captures the idea that a working/career wife might challenge the conventional idea of gender roles in a household (e.g. 'identity' as in Akerlof and Kranton, 2000). Note that under this specification the utility penalty, paid by men, associated with a working wife arises endogenously.[13]

Match quality $q \in [-\infty, \infty]$ is assumed to be a random draw from a distribution Q. Each agent is endowed with a unit of time which is allocated between producing the household public good (t_i) and working in the market ($1 - t_i$).

We assume that given a total time investment of $T = t_i + t_j$, each agent obtains $c = Tn$ units of the public good. One interpretation of this good is children, where n is the (fixed) number of children, and the total time T invested in them determines their quality.

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., $c_k = (1 - t_k)w_k$, $k = i, j$.

Agent i's utility when married to agent j, V_i^j, is given by:

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

where i takes t_j as given and $\beta > 0$, $0 \le \alpha_i < 1$.

We assume throughout $w_m > w_f$ so that women have a comparative advantage in home production. We also assume $w_m > \beta$. This assumption implies that men work full time irrespective of their marital status (or skill level). Under these assumptions the first order condition yields two possible cases: (i) $w_m > \beta > w_f$, then $t_m = 0$ and $t_f = 1$; (ii) $w_m > w_f > \beta$, then $t_m = 0$ and $t_f = \beta / w_f$. In the first case, the wife does not work and instead dedicates herself full time to raising of children while the husband works full time. 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.

We next characterize the utility of a married man, V_m, as a function of his wife's wage w_f. Substituting from the first order conditions we get:

Case 1: $w_f \le \beta$**,** $t_f = 1$

$$V_m(w_f) = w_m + \beta \log n$$

[13]The same outcome can be generated by more complicated models where because of limited commitment or disagreement about the allocation over different consumption goods a married woman works more than what would be optimal from her husband's standpoint (see for example, Lundberg and Pollak, 2003, and Mazzocco, 2007)

Case 2: $w_f > \beta$**,** $t_f = \frac{\beta}{w_f}$

$$V_m(w) = w_m + \beta \log n + \alpha_m(w_f - \beta) + \beta \log \frac{\beta}{w_f}$$

with:

$$\frac{\partial V_m}{\partial w_f} = \alpha_m - \frac{\beta}{w_f}$$

Note first that for $w_f \in [0, \beta)$, the wife does not change her time allocation in response to changes in w_f (she is devoted full-time to household production), and hence there is no effect on the husband's utility.

In the second case, for $w_f \in [\beta, \frac{\beta}{\alpha_m}]$, the husband's utility is decreasing as a function of w_f; in this interval an increase in w_f leads the wife to decrease the amount of time spent at home thereby decreasing the man's utility by $(\beta - \alpha_m w_f)dw_f/w_f$. For $w_f > \beta/\alpha_m$, the husband's utility is strictly increasing in w_f despite the fact that the wife is putting in less time at home.

Figure 4A depicts a married man's utility as a function of his wife's wage for two different values of α_m. Note that $w_f^*(\alpha_m)$ is the wage rate that solves:

$$\alpha_m(w_f - \beta) + \beta \log \frac{\beta}{w_f} = 0$$

That is, it is the wage rate at which a men is indifferent between a skilled and unskilled woman.

If we assume that (female) unskilled wages w_{fu} lie in the interval $[0, \beta)$ (i.e., an unskilled woman is a housewife) and skilled wages w_{fs} lie in the interval $[\beta, w_{fs}^*(\alpha_{ms}))$ (i.e., skilled women work in the market as well as at home) then both skilled men and unskilled men prefer unskilled women. If instead skilled female wages w_s lie in the interval $[w_f^*(\alpha_{ms}), w_f^*(\alpha_{mu}))$ then skilled men prefer skilled women and unskilled men prefer unskilled women. A further increase in female wages above $w_f^*(\alpha_{mu})$ implies that both skilled and unskilled men would prefer skilled women.

It is also useful to characterize the utility of a married woman, V_f, as a function of her husband's wage w_m. Substituting from the first order conditions we get:

Case 1: $w_f \leq \beta$**,** $t_f = 1$:

$$V_f(w_m) = \alpha_f w_m + \beta \log n$$

Case 2: $w_f > \beta$**,** $t_f = \frac{\beta}{w_f}$:

$$V_f(w_m) = \alpha_f w_m + \beta \log n + (w_f - \beta) + \beta \log \frac{\beta}{w_f}$$

Based on these two expression it is clear that skilled women will be pickier than unskilled women since they have a better outside option. It is also clear that both skilled and unskilled women will be pickier towards unskilled men since their earnings are lower.

4.3 Marriage Decision: Random Matching

We next turn to the matching part of our model which we model as a one-period random search in which the probability of a given individual meeting another individual (of a different sex) of type j depends on its proportion in the relevant population. Defining π_i as the share of skilled individuals in the population of gender i. The probability of a woman meeting a skilled man equals π_m, the probability she meets an unskilled man is $1 - \pi_m$.

Matched individuals each obtain a random draw of match quality $q \in [-\infty, \infty]$ from a distribution F. Individuals then decide whether to stay in a match (marry) and obtain married utility V_i^j as in equation (1) or to remain single whereby her/his utility is given by:

$$U(w_i) = w_i \tag{2}$$

that is, there is no household public good nor any externality from another agent's consumption.

Hence agent i will be willing to marry agent j

$$\alpha_i(1 - t_j)w_j - w_i t_i + \beta \log(t_i + t_j)n + q_i \geq 0 \tag{3}$$

where i indexes the skill type of the man if i is a male or the skill type of the woman if i is female, and similarly for j.

Thus, we can solve for the reservation qualities, q^*, of males and females. For males, this yields:

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

Note that male pickiness is invariant to his own wage (since he works full time whether married or single) and invariant to female wages if these are below β.

The comparative statics results obviously mirror the analysis of married men's utility (see Appendix A). For female wages above β, the effect of an increase in female wages on men's reservation quality is given by the sign of $-\alpha_m + \frac{\beta}{w_f}$. That is, if $w_f < \frac{\beta}{\alpha_m}$, the loss in production of public good due to

wife working ($\frac{\beta}{w_f}$) is greater than the gain from the externality deriving from wife's consumption (α), then a men's pickiness increases in the wife's wage. However, for $w_f > \frac{\beta}{\alpha_m}$, men's pickiness starts declining relative to wife's wage.

Assuming $w_f^U \leq \beta$ and $w_f^S > \beta$,the first line of q_m^* is men's reservation quality if they meet an unskilled woman, whereas the second is the reservation quality when they are matched with a skilled woman. The former is smaller than the latter as long as $w_f^S < w_f^*(\alpha_m)$ but then it becomes larger for values of $w_f^S \geq w_f^*(\alpha_m)$.

The comparative static exercise also shows that for all $w_f > \beta$ the threshold quality is higher for lower α_m. So under the assumption that $\alpha_m^S > \alpha_m^U$ an unskilled man's threshold quality when matched to a skilled woman is always larger than that of a skilled man.

For women, the same calculation yields:

$$q_f^* = \begin{cases} w_f - \alpha_f w_m - \beta \log n & if \quad w_f < \beta \\ (\beta - \alpha_f w_m) - \beta \log \frac{\beta}{w_f} n & if \quad w_f > \beta \end{cases}$$

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 is that of skilled females. Female pickiness is always increasing in her own wage, linearly for $w_f < \beta$ because it only affects her consumption when single, and decreasing in men's wages (see comparative statics in Appendix A). The second condition implies that both skilled and unskilled women are pickier when matched with an unskilled men.

Let's define $\Pi_{f,ij}$ 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 is given by $\Pi_{f,ij} = \int_{q_{m,ji}^*}^{\infty} \int_{q_{f,ij}^*}^{\infty} dF(q)dF(q) = \overline{F}(q_{m,ji}^*)\overline{F}(q_{f,ji}^*)$, where $\overline{F} = (1 - F)$ is the complementary cumulative distribution function.

The probability that a match is formed is given by the product of $\Pi_{f,ij}$ times the probability of meeting a men of type j in the population, $j = S, U$. Having defined π_m as the fraction of skilled men in the population, it follows that the marriage probability of a woman of type i will be given by:

$$\Pi_f^i = \pi_m \overline{F}(q_{m,Si}^*)\overline{F}(q_{f,iS}^*) + (1 - \pi_m)\overline{F}(q_{m,Ui}^*)\overline{F}(q_{f,iU}^*) \tag{4}$$

The skilled-unskilled difference in marriage probability is then given by $\Pi_f^S - \Pi_f^U$. Based on our comparative static results we can analyze how this differential evolves as a function of w_f^S. See Figure 4B for a graphical representation.

Under our maintained assumption that $w_f^U < \beta$ men's threshold quality for unskilled women is the same irrespective of their own type. That is, $q_{m,SU} = q_{m,UU} = q_{mU}$.

When $w_f^U < w_f^S < \beta$, married skilled women do not work. The social norm is not binding, men have the same threshold quality for skilled and unskilled women. That is: $q_{m,Sj} = q_{m,Uj} = q_m$ for $j = S, U$. However, skilled women still have a lower marriage rate than unskilled women because, given the better outside option, they are more likely to reject a proposal. The skilled-unskilled difference in marriage probability increases (becomes more negative) as, for given $w_f^U < \beta$, w_f^S increases in this range.

If w_f^S lies in the interval $[\beta, w_f^*(\alpha_m^S)]$ then both skilled and unskilled men prefer to marry an unskilled woman. That is, $q_{m,US} > q_{m,SS} > q_m$, the marriage penalty is at its largest as, for given π_m, all the terms in (4) are lower for skilled women. Note that in this range the threshold quality of skilled men has an inverted U-shape. It increases for $\beta < w_f^S < \frac{\beta}{\alpha_m^S}$ reaching its max when $w_f^S = \frac{\beta}{\alpha_m^S}$, and it declines for $\frac{\beta}{\alpha_m^S} < w_f^S <= w_f^*(\alpha_m^S))$. This is the wage range of maximum marriage penalty for skilled women. The skilled-unskilled differential in marriage probability is U-shaped over this range.

When w_f^S lies in the interval $[w_f^*(\alpha_m^S), w_f^*(\alpha_m^U)]$, the marriage penalty declines even faster because skilled men prefer skilled women over unskilled women (that is, $q_{m,US} > q_m > q_{m,SS}$). In this range, the marriage penalty can turn into a premium. A further increase of w_f^S above $w_f^*(\alpha_m^U)$ would bring unskilled men to also prefer skilled to unskilled women (that is, $q_m > q_{m,US} > q_{m,SS}$), thus leading to a marriage premium for skilled women.

4.4 Education Decision

We can now close the model by examining women's education decision.

The expected utility V^i of a woman of type $i = S, U$ given the model parameters $\theta = (w_m, w_f, \alpha, \pi_m)$ is given by:

$$V^i(\theta) = \sum_{j=s,u} \Pi_{f,ij} V_i^j + \left(1 - \sum_{j=s,u} \Pi_{f,ij}\right) U(w_i) \tag{5}$$

We assume that a woman faces an idiosyncratic (utility) cost of becoming skilled of γ where the latter is an iid random draw from a continuous cumulative distribution function $G(\gamma)$ with support $[0, \infty]$.

Let

$$\Delta(\theta) \equiv V^S(\theta) - V^U(\theta) \tag{6}$$

be the relative utility of a skilled female (relative to an unskilled female) given the vector of model parameters θ.

Note that since wages are set, the expected utility differential between skilled and unskilled women

is independent of the proportion of women who decide to become skilled. All women with $\gamma \leq \Delta(\theta)$ will decide to become skilled. The equilibrium π_f at any point in time is at the intersection of $\Delta(\theta)$ and $\gamma = G^{-1}(\pi_f)$.

4.5 Discussion

An immediate implication of the search model is that, if we compare two economies that differ by their gender roles, the expected utility of skilled relative to unskilled women would be larger in the less traditional country. This is because a higher average α[14] increases the marriage probability of skilled women. If, as we have assumed, both types of men have the same reservation utilities for unskilled women, this automatically implies that the less traditional country should have a smaller marriage penalty for skilled women. Thus the model predicts that, all else being equal, the country with more equal gender norms should have a higher proportion of skilled women and a smaller skilled-unskilled marriage gap.[15]

It is also the case that the expected utility of skilled relative to unskilled women increases in w_f^S. Thus a higher skilled wage is generally associated with an increase in the proportion of women who choose to become skilled. As we discussed above, at low levels of w_f^S 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 at an increasing rate once the marriage penalty associated with the investment decision declines.

Finally, the model also implies that comparing two societies that differ in the conservativeness of their gender roles views, an increase in wages increases the marriage penalty faced by skilled women in the more traditional society but decreases it in the more gender equal society. Thus the model predicts that the wage increase induces a smaller increase in the fraction of educated women in the former than in the latter.

[14] Within country variation in gender norms by education is much smaller than the variation across countries.

[15] The same would be the case for two economies with the same α but different proportion of skilled men π_S.

5 Empirical Tests of the Key Assumptions and Predictions of the Model

5.1 Cross-Country Evidence

An important assumption in the theoretical model is that skilled men are less conservative than unskilled men. In Table 1, we verify that this assumption holds in the sample of developed countries in our dataset. Specifically, we focus on two measures of gender role attitudes. The first one was already introduced in Figure 3: "When jobs are scarce, men have more right to a job than women" (from the IVS). The second measure is based on answers to the following statement: "A man's job is to earn money, a woman's job is to look after the home and family" (from the ISSP).

We compare the fraction of skilled and unskilled men that express agreement with either of these two statements. Across all the countries in our dataset, the share of skilled men that agree with the first statement is 11%, compared to 20% for unskilled men. Across all the countries, the share of skilled men that agree or strongly agree with the second statement is 13%, compared to 28% for unskilled men. We also show, in the bottom half of Table 1, that this overall pattern of greater conservatism among less skilled men holds true in each of the country-groups used in our analysis. According to the figures in Table 1, the two most conservative groups in our dataset are unskilled men in East Asia (with 40% of them agreeing with the statement that "when jobs are scarce, men have more right to a job than women") and unskilled men in Southern Europe (with 26% agreeing with that same statement).

Next, we turn to the empirical implications of the model. The first prediction of the model is that, all else equal, skilled women should face particularly high penalties in the marriage market in more conservative environments. Suggestive evidence of such a relationship was presented in Figure 3 for the cohort of women that were between 35 and 44 years old in 2010. Table 3A shows that this relationship between the marriage market penalty for skilled women and gender role attitudes is robust to a variety of controls. The baseline correlation corresponding to Panel 1 of Figure 3 is reported in column (1) of Table 3A. The gap in ever-married rates between high and low skilled women in low sexism countries is 11 percentage points smaller than in high sexism countries and 6 percentage points smaller than in mid sexism countries. [16] Columns (2) to (7) of Table 3A show that the relationship remains robust to a variety of controls, in particular, as predicted by the model, to a quadratic function of skilled women's wages (or of log(gdppc)). Other controls include the skill wage premium for men and women, the fraction of men age 35 to 44 with tertiary education, *log(wage)* for high-skilled men (quadratic), labor force participation premiums for men and women

[16] See Appendix Table 2 for the classification of countries into the three sexism groups.

(skilled-unskilled) and the skill wage premium of men.[17] For example, column (3) shows that the estimated coefficients on the high and mid sexism dummies are essentially unchanged compared to column (1) after we further include all controls. Columns (6) and (7) show that the results remain robust to this battery of controls when we use the continuous measure of gender norms instead of grouping countries into 3 categories.

Finally, columns (8) to (10) of Table 3A show that the negative correlation between the marriage market penalty for women and the gender conservativeness of the country holds at other points in time (2005, 2000 and 1995), even though it appears strongest, both statistically and economically, in the most recent period.

Note that in most of our specifications, and as predicted by the model, keeping norms constant the relationship between the marriage penalty and skilled women's opportunities is U-shaped. However, the coefficients, although of the correct sign, are not precisely estimated. More robust evidence on the non-linear pattern will be presented in Table 4a.

Another prediction of our model is that only skilled women should see their relative marriage market outcomes affected by the conservatism of the country. As we already saw in Figure 3, the strong visual relationship between marriage market penalty and conservatism for skilled women appears weaker for men. Table 3B confirms this in a regression format. Table 3B replicates the same set of specifications as Table 3A but uses the difference in ever-married rate between skilled and unskilled men as the dependent variable. While there is statistical significance in most specifications, the association between marriage market penalty for skilled men and conservatism appears weaker (both in terms of magnitude and statistical significance) than it is for women. For example, while we saw in Table 3A statistically strong patterns for women whether we use a categorical or continuous version of the strength of gender norms, there is virtually no relationship between the gender gap in marriage rates for skilled vs. unskilled men and the continuous norm measure (see columns (6) and (7) of Table 3B).

Next, we turn to empirical tests of some of the more subtle predictions of the model. Our model predicts that increased labor market opportunities for skilled women may in fact hurt them in the marriage market, especially in countries with more conservative gender attitudes. Indeed, holding gender norms constant, men should be particularly less attracted to skilled women (and hence the marriage market penalty for educated women should start growing) when these educated women face sufficiently good labor market prospects that they would decide, if married, to devote part of their time to labor market work. Additionally, holding gender norms constant, our model predicts that, at some point, married women's potential earnings may become so high that it undoes their lack of appeal to men (as men start valuing the consumption spillovers from their spouses'

[17] The wage measures used are annual wages for full-time employees aged 225-54 (working 35 hours or more). For a small number of countries where full-time wages are not available, we use average wages for all employees.

income more than the disutility they experience from the lower production of the household public good). Moreover, the potential earnings level at which men would start finding skilled women more attractive than unskilled women should be lower in less conservative countries than more conservative ones. Within countries over sufficiently long period of time, we should expect to see a U-shape pattern between the marriage market penalty for college educated women and their labor market opportunities.

An immediate implication of this prediction of the model is that the relationship between the marriage market penalty for skilled women and their labor market opportunities should be more likely to be negative in high sexism countries and more likely positive in the least sexist countries. 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 (e.g. *log(high-skilled female wages)* or *log(GDP per capita)*), the interaction between the proxy for women's opportunities and the high sexism and mid sexism dummies, and dummies for high sexism and mid sexism countries. In other specifications, we also include controls for year and country fixed effects as well as other relevant country*year covariates. The results from this exercise are reported in Table 4A. The standard errors of the estimates are clustered at the country level. The coefficients in column (1) indicate that higher labor market opportunities for skilled women are associated with an increase in the penalty they experience in the marriage market in the high sexism countries. Column (2) replicates column (1) but accounts for fixed differences between countries and time periods in the gap in ever-married rates between skilled and unskilled women. The patterns we observe align well with the predictions of the model. As skilled women's wages increase, the marriage market penalty for skilled women goes down in the least sexist countries (coefficient on *Log(Female high skill wage))*: 0.059). In mid sexism countries, while this relationship is still positive (0.059 - 0.053), is very small and not statistically different from 0. In high sexism countries, the relationship flips sign (0.059 - 0.112): as skilled women's wages increase, the marriage market penalty for them actually increases.

Column (3) shows that the patterns in column (2) are robust to the inclusion of a vector of time-varying controls, including the share of males with tertiary education, the female and male wage skill premia, the female and male labor force participation premia and a quadratic in high-skilled female and male wages. Columns (4) replicates column (3) using the continuous measure of sexism. The point estimates for the estimated coefficient on the interaction terms between high skilled female wage and sexism is of the expected sign (-0.57), and marginally significant.

Columns (5) to (8), replicate columns (1) to (4), respectively, but use *log(gdp per capita)* as an alternative measure of skilled females' labor market opportunities. Again, the regressio,n results are consistent with the prediction of the model, particularly in the specification where we control for country and year fixed effects, e.g. columns (6) and (7). As GDP per capita increases, the marriage

market penalty for skilled women declines in the least sexist countries. In mid sexism countries, this relationship is still positive but smaller in magnitude (0.159 - 0.026). In high sexism countries, the relationship flips sign (0.159 - 0.248): as GDP per capita increases, the marriage market penalty for skilled women increases. Finally, column (8) replicates columns (4), respectively, using the continuous measure of sexism. The finding here is qualitatively similar. At very low level of sexism, there is a positive relationship between *log(gdppc)* and the marriage market premium for skilled women but this relationship flips signs as the level of sexism increases.

Table 4B replicates the same analysis as Table 4A but uses the gender gap in ever married rates between skilled and unskilled men as the dependent variable. In contrast to the findings in Table 4B, we do not find systematic evidence across specifications of a differential effect of high skilled female wages on the marriage market premium of skilled men based on the conservativeness of the country.

A final implication of our model that we can bring to the data is with respect to educational choice. Our model predicts that in a more gender conservative country, a lower fraction of women should decide to become skilled as educated women in those countries expect that they will face greater barriers in the marriage market. This is exactly what we find in the country-level data. Figure 5 plots the gender gap in higher education among men and women that 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 the smallest in Nordic countries and the largest in the East Asian countries (Taiwan, Singapore, and South Korea).

Figure 5 provides graphical evidence showing a negative relationship between the gender gap (female-male) in tertiary education and the strength of gender norms. Table 5 confirms this relationship in a multivariate regression setting. The basic relationship, as reported in column (1) is robust to controlling for the labor market returns to education as measured by the male and female skilled wages (column (2)) and to a battery of other controls (column (3)). The relationship also holds when we use the continuous measure of conservatism (column (4)). The correlation between the gender gap in college graduation and the sexism dummies is also present in 2005 and 2000 data, but not so in 1995. Interestingly, we also show that that there is a strong positive correlation between the gender gap in higher education and the marriage market premium for skilled women, even after controlling flexibly for men and women's wages and skill premia. Women's educational achievement relative to men are stronger in those countries where skilled women face a smaller penalty in the marriage market. This correlation is consistent with the mechanism our model predicts linking the gender gap in education to gender norms: the value for women to get educated is lower in more sexist countries because of the negative impact of this additional education in the marriage market.

5.2 Evidence from US States

While the original goal of this paper was to provide some theoretical explanation (and empirical tests) for the divergent experiences across developed countries in the marriage market penalty for skilled women, most of the empirical tests that we have presented in the previous section can also be performed on a panel of US states. One advantage of focusing on US states 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. Another advantage of the single country context is that it provides the assurance of less unobserved heterogeneity across states than there is across countries. Nonetheless, a limitation of the cross-state analysis is that there is less variation across states in the US than across developed countries in the key variable that drives our theory, e.g. the strength of gender norms. See data sources and description of the state level datal in Appendix B.

The structure of the analysis and tables in this section of the paper is similar to that in the prior section. In Table 6A, we study the correlation between the gender gap in marriage rates for skilled vs. unskilled women across states in 2010. The regressions only include 45 states as these were the only states for which data on gender norms were available in the GSS. Like in the cross-country setting, and consistent with the predictions of our model, we observe a large marriage market penalty for skilled women living in the more sexist US states. There is no significant difference in this penalty between mid sexism and low sexism states. The higher marriage market penalty for skilled women in more sexist states is robust to the addition of variety state-specific controls corresponding to the country specific controls we had used in Table 3A.[18] Column (5) of Table 6A also shows that this negative relationship between the marriage market premium for skilled women and gender conservatism in a state is robust to using a more continuous measure of the strength of gender norms across US states instead of the categorial variable.

As already discussed above, one of the appeals of the US data is that it allows us to go further back in time. Columns (6) to (7) replicate column (4) of Table 6A 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 3 decades (1990 to 2010) but is not present in the earlier decades (1980 and 1970). Recall that one prediction of our model is that educated women may 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

[18]Note that, unlike the cross-country data, the labor market controls are measured among individuals age 25 to 54 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 age 25 to 34). Due to data limitations, we were not able to construct the variables in the preceding time period in the cross-country analysis.

opportunities and utility if they remain single increases. When labor market opportunities for skilled women are low, we would not expect to see large differences in their relative marriage rates based on the sexism of the place. 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.

Table 6B replicates Table 6A for men. Our findings there are more difficult to reconcile with the theory. While the theory suggests that there should be a weaker relationship between state-level sexism in the marriage market premium for skilled men vs. unskilled men, we tend to find such a relationship with skilled men experiencing a relatively higher likelihood to be married compared to unskilled men in the less sexist states. Columns (4) and (5) of Table 6B does, however, suggest that this relationship might not be very robust. The coefficient for the high sexism becomes smaller and less precisely estimated when controls are added to a regression. Additionally, switching from a categorical to a continuous measure of sexism weakens the association: the point estimate remains negative (e.g. more sexism implies more of a marriage market penalty for skilled men) but the correlation is no longer statistically significant.

Table 7A replicates the analysis in Table 4A. However given the stronger quality of the wage data in the context, we do not present results where we use state GDP per capita as an alternative proxy of labor market opportunities for skilled women. The analysis is performed on a 1970 to 2010 panel of US states. Recall that the main prediction of the model we want to test in this table is 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 7A appears strikingly consistent with that in the country-level panel in Table 4A. Specifically, while we find a positive relationship between skilled women's wages and their marriage market premium in the least sexist states, that relationship is smaller in magnitude in the mid sexism states and even smaller in the high sexism states (see column (1) of Table 7A).

Our preferred specifications for this analysis are in the remaining columns of Table 7A where we control for fixed differences across states and across time the difference in marriage rate between high and low skilled women. For example, as observed in column (2), for low sexism states, there appears to be a positive (but statistically insignificant) relationship between skilled women's wages and how they fare in the marriage market relative to less skilled women. This relationship is still positive but smaller (0.019-.010) in the mid sexism states. Most interesting, this relationship becomes strongly negative (0.019-0.074) in the high sexism states. Columns (4) and (5) show that the patterns of increasing penalty in the marriage market for educated women as their labor market opportunities improve in more sexist places is also present when we use the continuous sexism measure.

While the findings in Table 7A appear quite consistent with our model, the findings in Table 7B (where we replicate the analysis of Table 7A for men) are less so. While we would have expected

the relationship between the marriage market premium for skilled men and skilled women's labor market opportunities to be weaker, we find some evidence that the patterns for skilled men appear similar to that for skilled women, with the exception of column (5), which is based on the continuous measure of sexism and includes controls for time-varying state-level controls.

Finally, Table 8 replicates in the US states context the analysis of Table 5 where we observed a negative correlation between sexism and women's educational attainment compared to men. Although the sign of the estimates are consistent with that in Table 5 and our model, only a few are statistically significant.

Finally, we also show in columns (6) to (9) of Table 8 that that there is a positive correlation between the gender gap in higher education and the marriage market premium for skilled women, even after flexibly controlling for men and women's wages and skill premia. The results in Column (7) that includes the full set of state-level controls is marginally significant at the 10% level and indicates that women's educational achievement relative to men are stronger in those states where skilled women face a smaller penalty int he marriage market. As discussed earlier, this correlation is consistent with the mechanism our model predicts that links the gender gap in education to sexism: the incentive for women to pursue higher education is lower in more sexist areas due to the negative impact of this additional education in the marriage market.

Overall, these results appear 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 across countries. Moreover, the fact that the key predictions of the model are borne out in both the cross-country and US state panel suggests that the model is able to reconcile why the marriage penalty has evolved differently across different environments and over time.

6 Conclusion

We document large heterogeneity in the size and evolution of the gap in marriage rates between skilled and unskilled women in a sample of developed countries. To explain these patterns across countries and over time, we propose a theoretical model in which conservative attitudes toward working women might contribute towards the lower marriage rate of skilled women, and also tends to induce a non-linear relationship between their labor market prospects and marriage outcomes. A marriage market penalty (or premium) emerges endogenously in our model as a function of skilled women's rising labor market opportunities and the time allocation decisions that these generate. We show that the interaction between women's labor market opportunities and gender norms generates a U-shaped marriage penalty.

We test the predictions of the model using a panel of 23 of the largest developed countries from 1995 to 2010 as well as a panel of US states from 1970 to 2010. There is a strong cross-country relationship between the marriage market penalty for skilled women and average men's sexism. Furthermore, we show that this relationship is markedly stronger in the later cohorts, when educated women face better labor market prospects. Consistent with the predictions of the model, we show that the relationship between the marriage penalty for educated women and proxies for women's opportunities (skilled women's wages and GDP per capita) is negative in the subset of countries with lower sexism indices but positive in the subset with higher sexism indices. Our model also predicts that in more conservative countries, a lower fraction of women decide to acquire high education as skilled women anticipate that they will face greater barriers in the marriage market. Consistent with this prediction, we find that the gender gap in education favoring women is larger in countries with less conservative norms and lower marriage penalty. Our analysis using the panel of US states largely corroborates the cross-country findings.

Our model and empirics have interesting implications for the long run trends of what is today a concerning phenomenon in East Asia and other conservative countries: the increasing singleness rate of college educated women. First, economic growth and increasing wages for highly skilled women will make these countries move along the U-shape curve and the negative trend will be eventually be reversed. Second, even if slowly, gender norms systematically trend towards less conservative views, and thus the threshold wage at which there is change in slope will come earlier rather than later. Finally, the increasing share of males acquiring a high education will speed up this process, as skilled men are more likely to be willing to marry a highly educated woman. The observed upward sloping trend in most of other developed countries should give East Asian countries some hope.

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A Appendix: Comparative Statics

$$\frac{\partial q_m^*}{\partial w_m} = 0 \qquad \frac{\partial q_f^*}{\partial w_m} = -\alpha_f$$

$$\frac{\partial q_m^*}{\partial w_f} = \begin{cases} 0 & if \quad w_f < \beta \\ -\alpha_m + \frac{\beta}{w_f} & if \quad w_f > \beta \end{cases} \qquad \frac{\partial q_f^*}{\partial w_f} = \begin{cases} 1 & if \quad w_f < \beta \\ \frac{\beta}{w_f} & if \quad w_f > \beta \end{cases}$$

$$\frac{\partial q_m^*}{\partial \alpha_m} = \begin{cases} 0 & if \quad w_f < \beta \\ \beta - w_f & if \quad w_f > \beta \end{cases}$$

B Appendix: US State-Level Data

Gender-related attitudes

To construct state-specific measures of gender-related attitudes, we use data from the 1972 to 2006 waves of the General Social Survey (GSS). We use the question: "It is much better for everyone involved if the man is the achiever outside the home and the women takes care of the 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 response "agree strongly" and "agree" as indicating a greater degree of gender conservatism. This specific question was chosen from the eight gender-related questions in the GSS as it appeared 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.[19] This question also appears most comparable to the question asked in the ISSP. Note that, unfortunately, the "jobs scarce" question from the IVS that is used in the cross-country analysis is not available in the GSS.

To combine the individual responses from different GSS waves into a single state-specific measure, we regress the individual-level responses to the question on a full set of year dummies. Throughout, we use responses for all individuals age 18 and older. Next, we use the residuals from this regression to create a measure of "average" gender conservatism in a particular state, which is simply the mean across all years of the residual individual-level response in a community.

Marriage Rates and Labor Market Outcomes

[19]The full list of gender-related questions available in the GSS is shown in the bottom panel of Appendix Table 1.

To construct marriage gaps and labor market outcomes at the state level, we use data from the 1970 to 2000 US Censuses and the American Community Survey single-year files from 2008 to 2011 (which we refer to as the 2010 ACS for simplicity). The sample is limited to native-born whites.[20] Following the cross-country analysis, our marriage and education outcomes are for individuals aged 35-44. For each cohort of individuals (age 35-44) observed in year t, we proxy for their labor market prospects (e.g. wage rates and skill premium) when they are making their marriage decisions as the labor market outcomes of individuals age 25 to 54 in the preceding decade (i.e. $t-10$). The summary statistics for the state-level data are reported in Appendix Table 4.

[20]Given that there are important differences in the marriage patterns by race in the US (Pew Research Center, 2014), we limit our analysis to the sample of native-born whites.

Figure 1. Cross-country Variation in the Marriage Penalty in 2010 by Gender

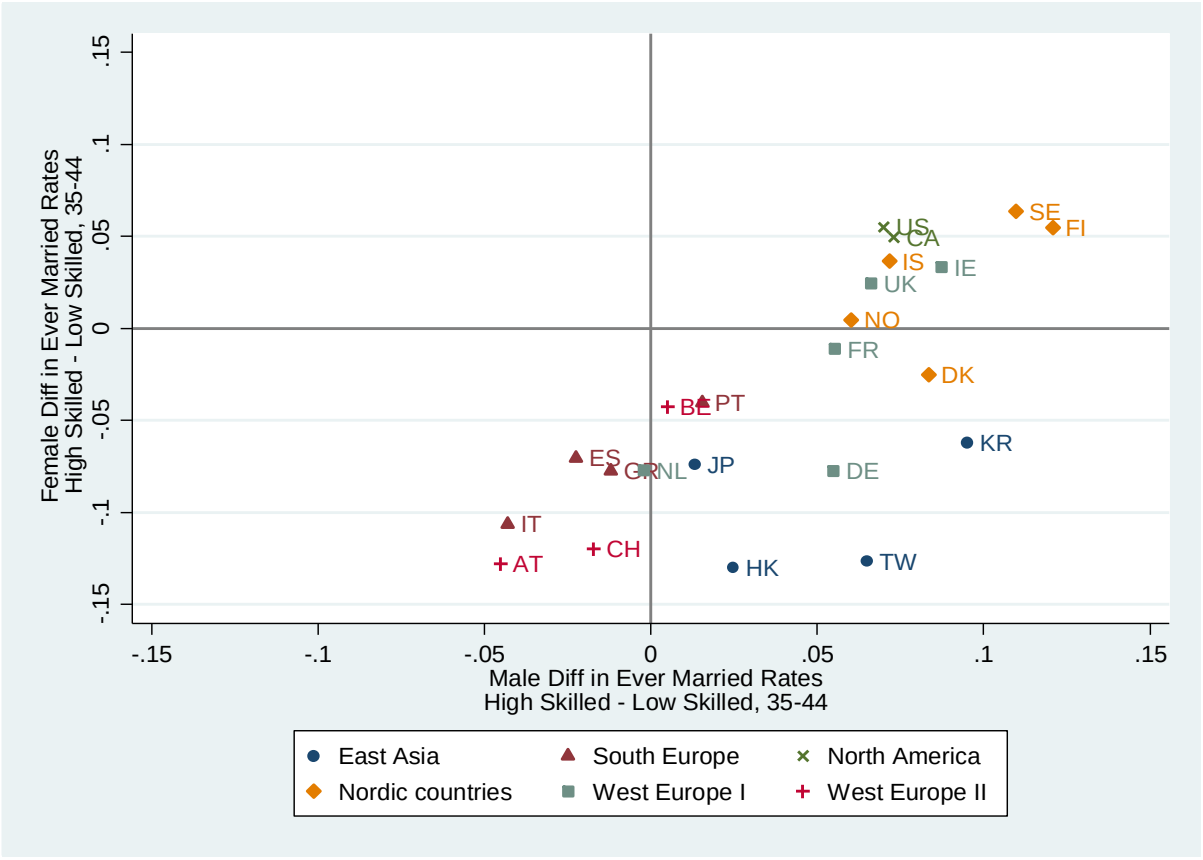


Figure 2A. Difference in Ever Married Rates (High Skilled - Low Skilled)
Females 35-44 by Year

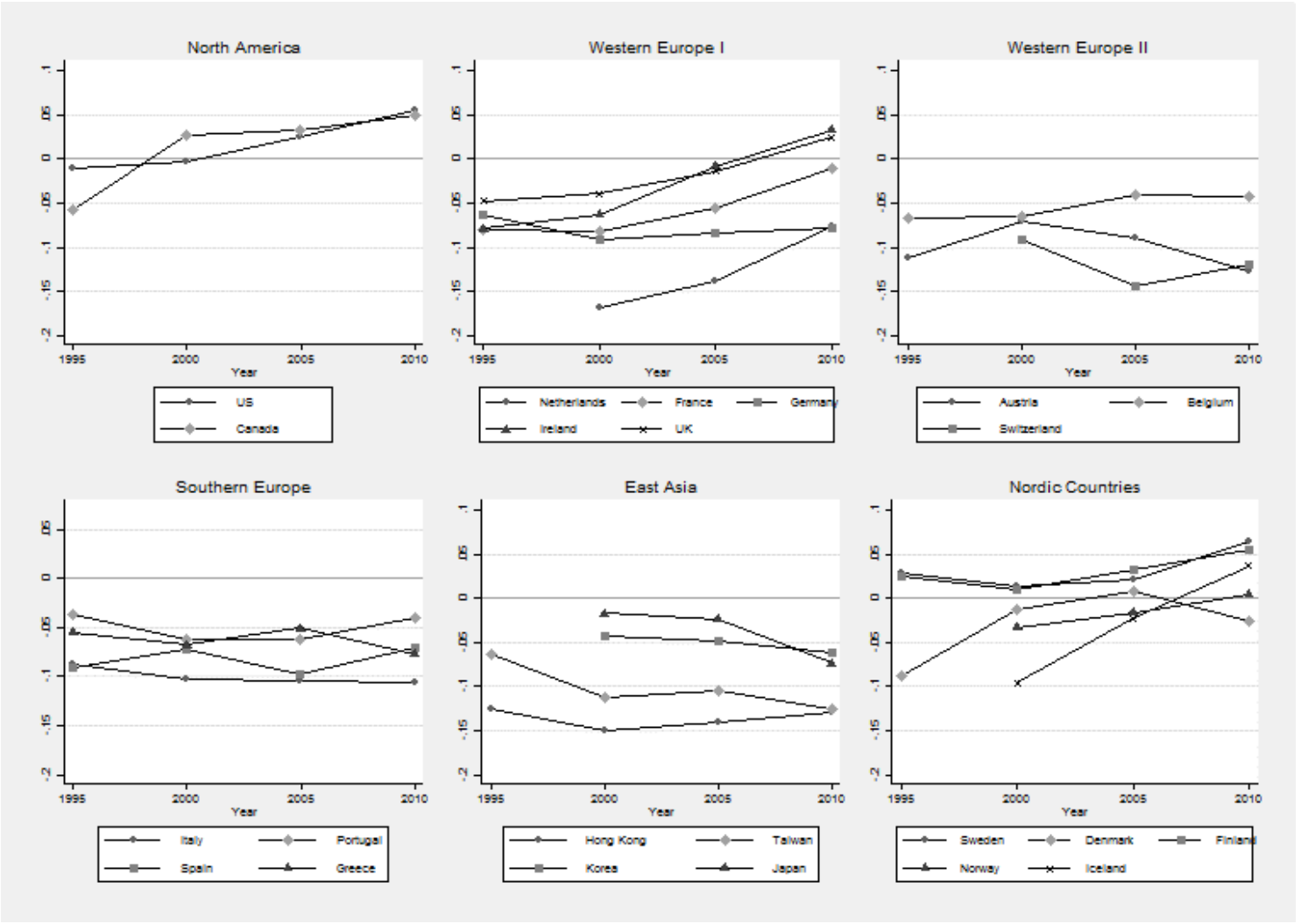


Figure 2B. Difference in Ever Married Rates (High Skilled - Low Skilled)
Males 35-44 by Year

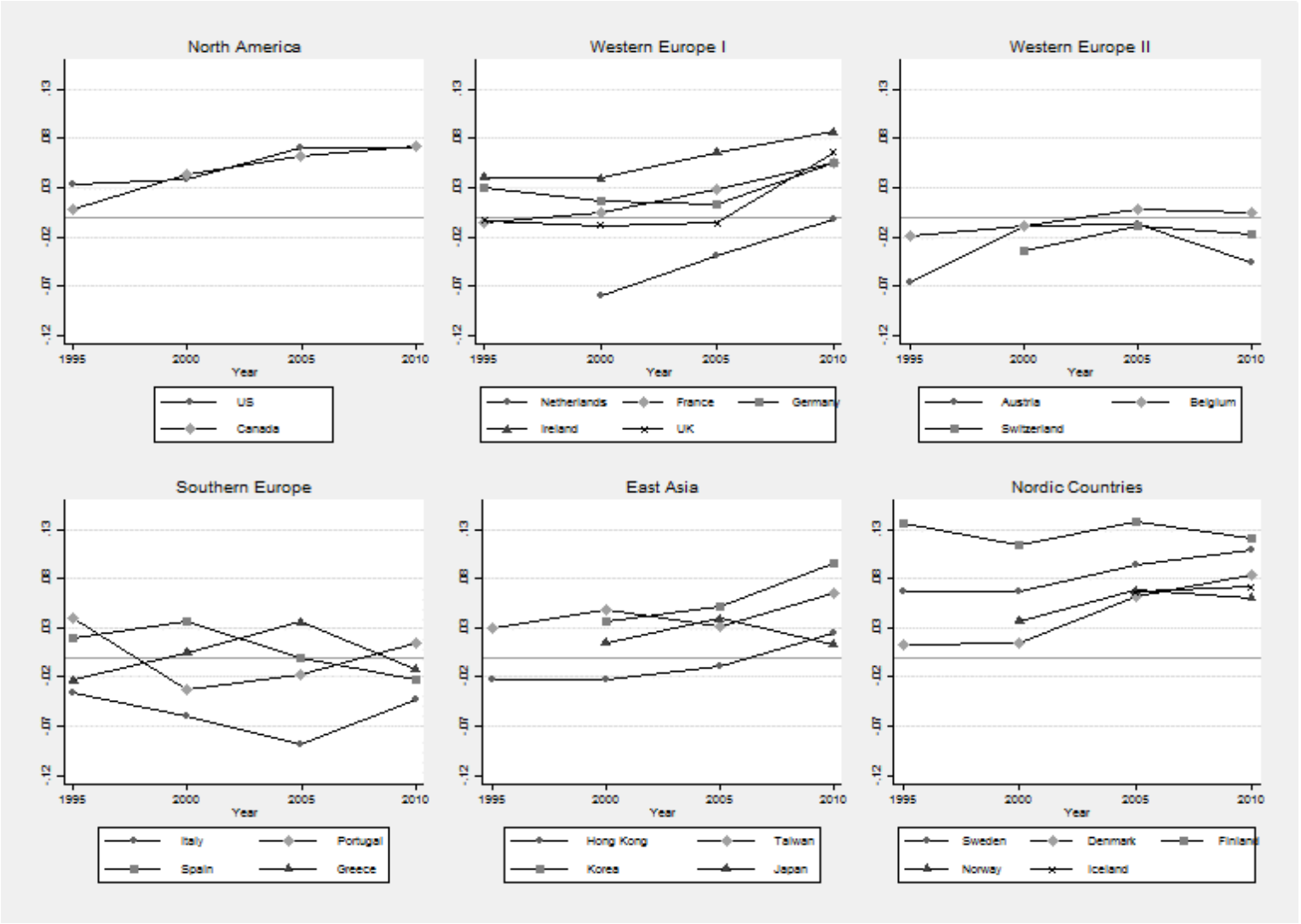


Figure 3. Correlation between Marriage Penalties and Social Norms by Gender in 2010

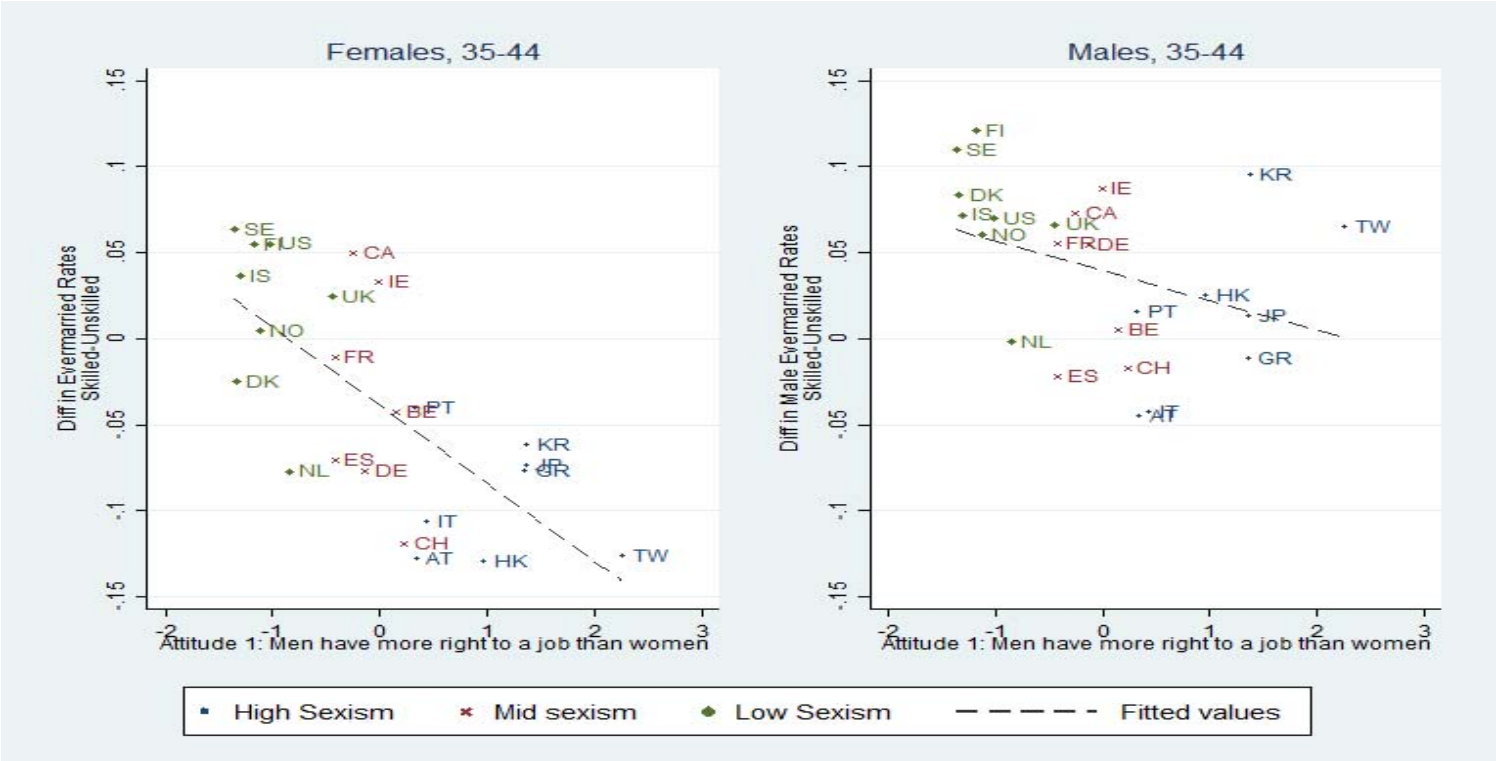


Figure 4A: Married men utility as a function of wives' wages

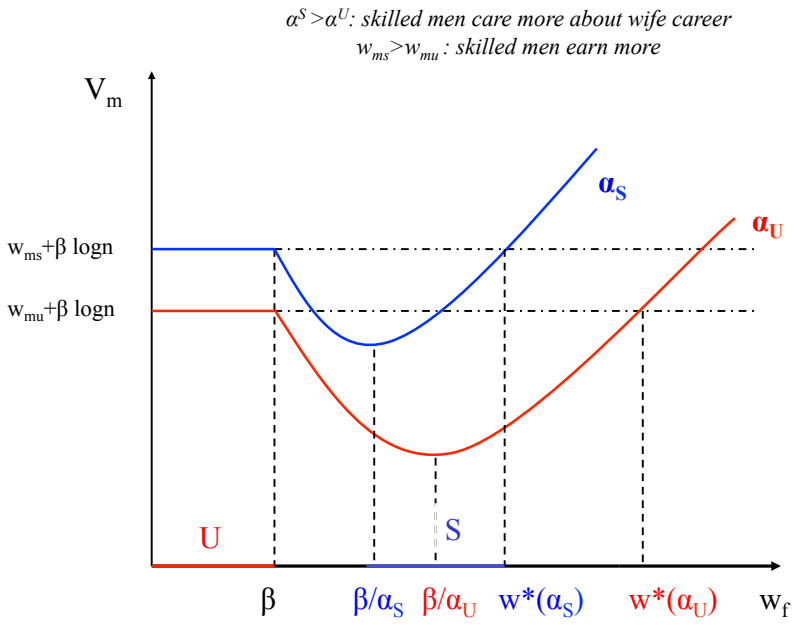


Figure 4B: Skilled-unskilled marriage probability as a function of wages

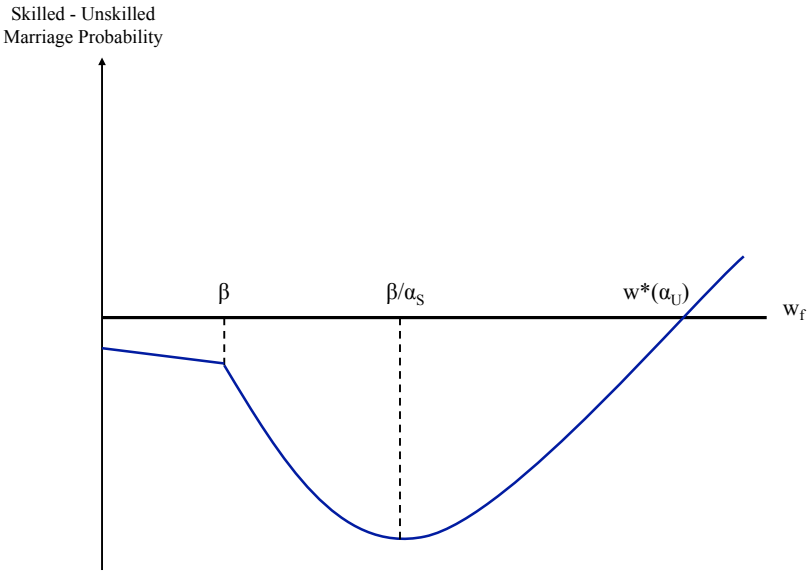


Figure 5. Gender Gap (Female-Male) in Education and Social Norms, 2010

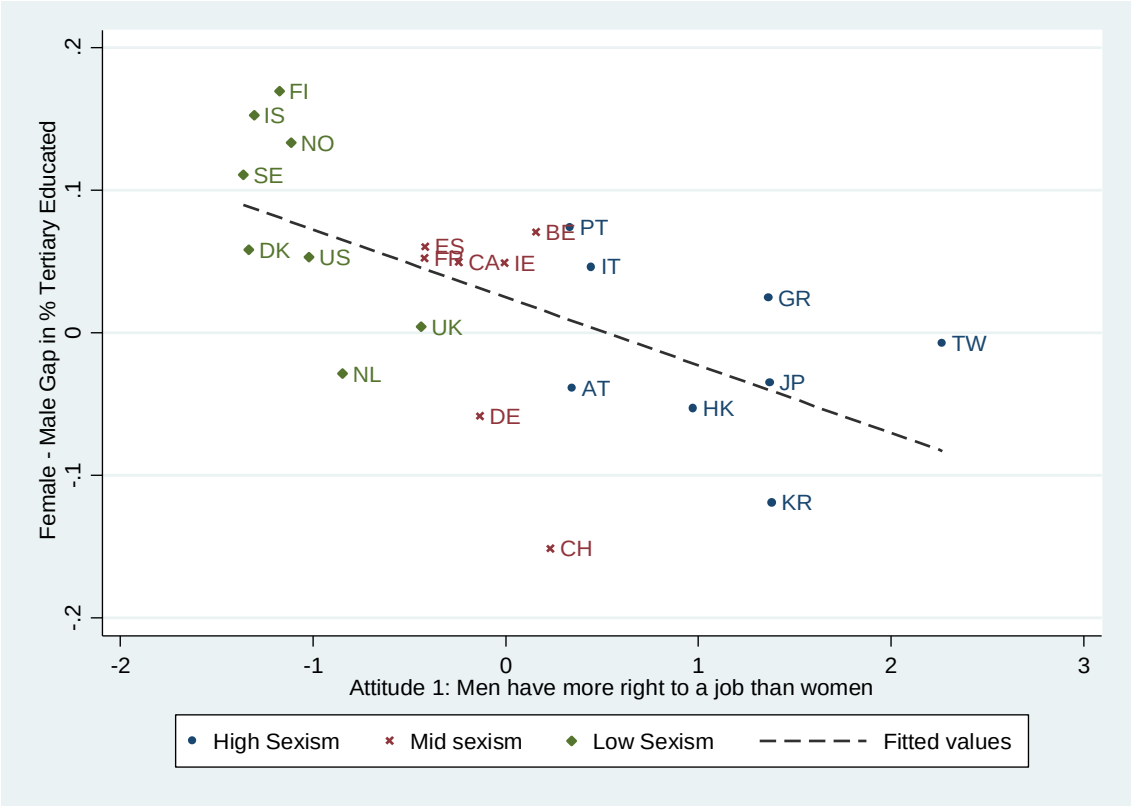


Figure 6. Cross-State Variation in the Marriage Penalty in 2010 by Gender

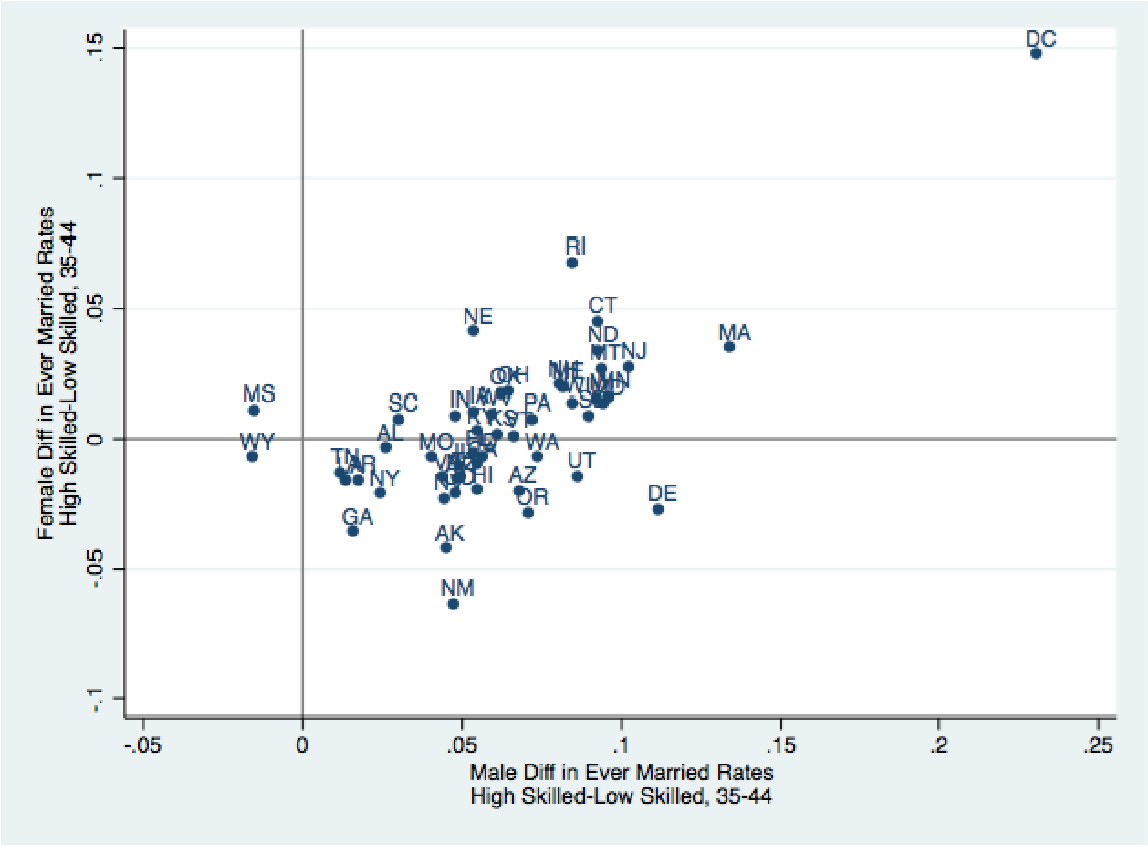


Figure 7. Correlation between Marriage Penalties and Social Norms by Gender in 2010

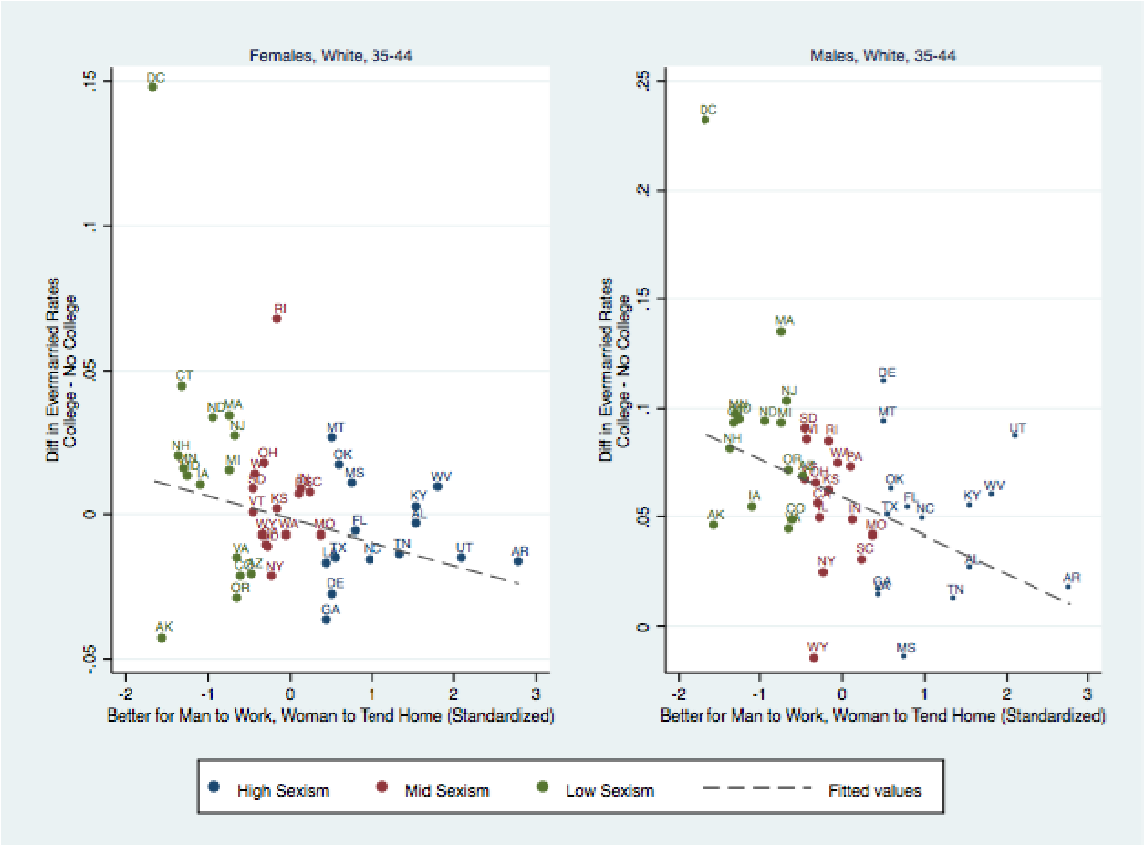


Table 1. Gender-Related Attitudes Across Countries

	IVS: Men have more right to a job than women (% Agree)					ISSP: Man's job to earn money, woman's job to look after family (% Strongly Agree / Agree)				
				Males					Males	
	All	Males	Females	< Post-sec	Post-sec or more	All	Males	Females	< Post-sec	Post-sec or more
Full Sample	0.166	0.174	0.157	0.199	0.108	0.201	0.227	0.178	0.282	0.133
	(0.112)	(0.119)	(0.108)	(0.133)	(0.099)	(0.105)	(0.108)	(0.104)	(0.132)	(0.071)
No. of countries	23	23	23	23	23	20	20	20	20	20
East Asia	0.336	0.351	0.320	0.406	0.269	0.352	0.381	0.326	0.483	0.241
South Europe	0.218	0.236	0.198	0.260	0.108	0.291	0.307	0.277	0.347	0.068
West Europe - Small	0.197	0.181	0.213	0.206	0.096	0.272	0.299	0.247	0.368	0.182
West Europe - Large	0.129	0.143	0.116	0.161	0.084	0.159	0.188	0.132	0.244	0.116
North America	0.100	0.106	0.095	0.137	0.062	0.175	0.208	0.146	0.261	0.161
Nordic	0.031	0.037	0.026	0.042	0.026	0.085	0.107	0.066	0.129	0.071

Correlation between average responses to IVS and ISSP questions: 0.88

Note. The first row reports the sample mean of the average male and female response (standard deviation) across countries for each of the two statements from IVS and ISSP. The sample mean of the average male response across countries is also reported separately by education level. In the remaining rows, we report the mean of the average response across five broad country groupings.

Table 2. Descriptive Statistics - Cross-country Data

	1995	2000	2005	2010
Marriage Penalty Females	-0.0718	-0.0586	-0.0446	-0.0368
Age 35-44	(0.0299)	(0.0526)	(0.0532)	(0.0660)
Marriage Penalty Males	0.00217	0.0130	0.0305	0.0404
Age 35-44	(0.0326)	(0.0440)	(0.0494)	(0.0487)
College Share - Males	0.218	0.257	0.291	0.339
	(0.0767)	(0.0873)	(0.0882)	(0.0996)
Gender College Gap	-0.0271	-0.0165	0.0101	0.0270
(Female-Male)	(0.0460)	(0.0643)	(0.0756)	(0.0806)
GDP per capita PPP	29,885	34,482	38,816	40,299
(2014 dollars)	(5,691)	(6,428)	(8,260)	(8,173)
Annual Salary - College Females	26,863	26,452	29,031	31,672
(PPP, 2000 dollars)	(7,334)	(8,386)	(10,252)	(8,978)
Skill premium Males	0.490	0.435	0.407	0.418
	(0.249)	(0.253)	(0.162)	(0.171)
Skill premium Females	0.441	0.396	0.374	0.385
	(0.234)	(0.219)	(0.172)	(0.184)
LFP Gap (College - No College)	0.211	0.157	0.136	0.117
Females	(0.0745)	(0.110)	(0.0722)	(0.0794)
No. Countries	14	20	22	23

Source: See Appendix Table A3

Table 3a. Correlation between the Marriage Penalty and Social Norms among Females age 35-44

	Dep Var. Difference in Ever Married Rates (High Skilled - Low Skilled) - Females									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Year=2010							2005	2000	1995
High Sexism Dummy	-0.110***	-0.117***	-0.137***	-0.138***	-0.129***			-0.081*	-0.076*	0.027
	[0.021]	[0.018]	[0.028]	[0.023]	[0.030]			[0.037]	[0.039]	[0.082]
Mid Sexism Dummy	-0.051*	-0.051	-0.051	-0.059*	-0.057			-0.023	-0.034	-0.043
	[0.029]	[0.029]	[0.035]	[0.032]	[0.036]			[0.036]	[0.031]	[0.048]
Attitude measure: Men have more right to a job than women (mean 0, var 1)						-0.056***	-0.059***			
						[0.015]	[0.017]			
L(Female HS wage)		2.951	-0.551			-1.493		-5.128	-10.069	-22.161
		[2.283]	[5.678]			[5.874]		[9.488]	[8.558]	[42.068]
L(Female HS wage)^2		-0.146	0.017			0.067		0.249	0.472	1.058
		[0.112]	[0.285]			[0.293]		[0.469]	[0.421]	[2.044]
Log(gdppc ppp)				-0.305	-1.378		-3.104			
				[3.154]	[3.476]		[3.808]			
Log(gdppc ppp)^2				0.010	0.064		0.143			
				[0.149]	[0.163]		[0.177]			
Other Controls	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	23	23	23	23	23	23	23	22	20	14
R-squared	0.508	0.578	0.721	0.576	0.700	0.686	0.686	0.558	0.607	0.789

Note: Other controls include: share of males with tertiarly education, the female and male skill premium, the female and male labor force participation premium, and a quadratic in female and male high skilled wages.

Robust standard errors in brackets.*** p<0.01, ** p<0.05, * p<0.1

Table 3b. Correlation between the Marriage Penalty and Social Norms among Males age 35-44

	Dep Var. Difference in Ever Married Rates (High Skilled - Low Skilled) - Males									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Year=2010							2005	2000	1995
High Sexism Dummy	-0.058**	-0.067***	-0.045	-0.073***	-0.056*			-0.070**	-0.047	-0.008
	[0.022]	[0.022]	[0.028]	[0.024]	[0.030]			[0.028]	[0.030]	[0.053]
Mid Sexism Dummy	-0.039*	-0.037	-0.040	-0.045*	-0.037			-0.043	-0.006	-0.012
	[0.021]	[0.023]	[0.025]	[0.025]	[0.024]			[0.025]	[0.039]	[0.027]
Attitude measure: Men have more right to a job than women (mean 0, var 1)						-0.018	-0.023			
						[0.014]	[0.017]			
L(Female HS wage)		0.273	0.961			-0.031		-3.439	-5.061	12.329
		[2.202]	[4.209]			[4.096]		[5.203]	[8.556]	[24.974]
L(Female HS wage)^2		-0.015	-0.041			0.007		0.178	0.241	-0.617
		[0.107]	[0.209]			[0.201]		[0.256]	[0.418]	[1.218]
Log(gdppc ppp)				0.553	-0.298		-1.223			
				[3.135]	[3.018]		[3.341]			
Log(gdppc ppp)^2				-0.030	0.013		0.056			
				[0.148]	[0.141]		[0.155]			
Other Controls	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	23	23	23	23	23	23	23	22	20	14
R-squared	0.269	0.323	0.644	0.451	0.624	0.590	0.580	0.646	0.362	0.939

Note: Other controls include: share of males with tertiarly education, the female and male skill premium, the female and male labor force participation premium, and a quadratic in female and male high skilled wages.

Robust standard errors in brackets.*** p<0.01, ** p<0.05, * p<0.1

Table 4a. Female Marriage Penalty and the Interaction between Sexism and Women's Labor Market Opportunities

	Dep Var. Difference in Ever Married Rates (High Skilled - Low Skilled) - Females							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L(Female HS wage)	-0.012	0.059*	-1.612	-3.097			-2.961	-1.807
	[0.029]	[0.030]	[3.003]	[3.393]			[2.879]	[2.959]
L(Female HS wage)*High sexism	-0.061*	-0.112**	-0.178***					
	[0.031]	[0.045]	[0.062]					
L(Female HS wage)*Mid sexism	0.095	0.053	0.073					
	[0.075]	[0.082]	[0.085]					
L(Female HS wage)*Sexism Index				-0.057*				
				[0.030]				
Log(gdppc ppp)					0.005	0.159	0.306***	0.111**
					[0.041]	[0.099]	[0.107]	[0.053]
Log(gdppc ppp)*High sexism					-0.098*	-0.248***	-0.432***	
					[0.047]	[0.082]	[0.084]	
Log(gdppc ppp)*Mid sexism					0.017	-0.026	-0.209**	
					[0.105]	[0.092]	[0.086]	
Log(gdppc ppp)*Sexism Index								-0.171***
								[0.025]
Other Controls	No	No	Yes	Yes	No	No	Yes	Yes
Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Country FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Observations	81	81	79	79	86	86	79	79
R-squared	0.412	0.886	0.904	0.883	0.327	0.868	0.933	0.934

Note: Other controls include: share of males with tertiary education, the female and male skill premium, the female and male labor force participation premium, and a quadratic in female and male high skilled wages.

Robust standard errors clustered at the country level in brackets.*** p<0.01, ** p<0.05, * p<0.1

Table 4b. Male Marriage Penalty and the Interaction between Sexism and Women's Labor Market Opportunities

	Dep Var. Difference in Ever Married Rates (High Skilled - Low Skilled) - Males							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L(Female HS wage)	-0.045*	0.029	0.729	0.083			-0.064	0.476
	[0.025]	[0.029]	[2.052]	[1.968]			[2.204]	[2.258]
L(Female HS wage)*High sexism	0.012	-0.029	-0.046					
	[0.032]	[0.037]	[0.061]					
L(Female HS wage)*Mid sexism	0.087*	0.014	0.032					
	[0.043]	[0.034]	[0.058]					
L(Female HS wage)*Sexism Index				-0.025				
				[0.024]				
Log(gdppc ppp)					-0.038	0.001	0.154*	0.038
					[0.067]	[0.118]	[0.081]	[0.049]
Log(gdppc ppp)*High sexism					-0.033	0.026	-0.177**	
					[0.077]	[0.100]	[0.074]	
Log(gdppc ppp)*Mid sexism					0.042	0.032	-0.125*	
					[0.088]	[0.092]	[0.071]	
Log(gdppc ppp)*Sexism Index								-0.039
								[0.032]
Other Controls	No	No	Yes	Yes	No	No	Yes	Yes
Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Country FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Observations	81	81	79	79	86	86	79	79
R-squared	0.259	0.865	0.907	0.906	0.251	0.809	0.915	0.908

Note: Other controls include: share of males with tertiary education, the female and male skill premium, the female and male labor force participation premium, and a quadratic in female and male high skilled wages.

Robust standard errors clustered at the country level in brackets.*** p<0.01, ** p<0.05, * p<0.1

Table 5. Correlation between the Gender Gap in College Attainment and Social Norms Across Countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dep Var. % College Females - % College Males								
	Year=2010						2005	2000	1995
High Sexism Dummy	-0.095**	-0.131***	-0.143***				-0.151***	-0.164***	-0.079
	[0.033]	[0.031]	[0.033]				[0.034]	[0.045]	[0.111]
Mid Sexism Dummy	-0.071*	-0.090**	-0.075*				-0.070	-0.094*	-0.101
	[0.040]	[0.037]	[0.041]				[0.044]	[0.042]	[0.097]
Attitude measure: Men have more right to a job than women (mean 0, var 1)				-0.061***					
				[0.016]					
Diff. in Ever Married (HS - LS) - Females					0.867***	0.806***			
					[0.159]	[0.195]			
L(Female HS wage)		0.168	4.173	2.584	0.103	3.742	-0.058	-0.272	0.052
		[0.129]	[5.494]	[5.420]	[0.104]	[6.157]	[0.220]	[0.316]	[0.661]
L(Male HS wage)		-0.295**	5.198*	3.577	-0.183*	0.422	0.949	3.998	4.491
		[0.133]	[2.882]	[3.342]	[0.096]	[3.314]	[1.630]	[2.895]	[4.815]
Other Controls	No	No	Yes	Yes	No	Yes	No	No	No
Observations	23	23	23	23	23	23	22	20	14
R-squared	0.272	0.524	0.821	0.801	0.587	0.803	0.738	0.713	0.710

Note: Other controls include: share of males with tertiary education, the female and male skill premium, the female and male labor force participation premium, and a quadratic in female and male high skilled wages.

Robust standard errors are reported in brackets.*** p<0.01, ** p<0.05, * p<0.1

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

	Dep Var. Difference in Ever Married Rates (College - Non College) - Females								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Year=2010					2000	1990	1980	1970
High Sexism Dummy	-0.019**	-0.023***	-0.017**	-0.021**		-0.008	-0.010**	0.001	0.003
	[0.007]	[0.008]	[0.007]	[0.009]		[0.005]	[0.005]	[0.007]	[0.014]
Mid Sexism Dummy	-0.009	-0.010	-0.009	-0.007		-0.015***	-0.006**	-0.004	0.002
	[0.008]	[0.008]	[0.007]	[0.007]		[0.005]	[0.003]	[0.005]	[0.012]
Attitude measure: Better if man is achiever outside home and women take care of home and family (mean 0, var 1)					-0.010***				
					[0.004]				
L(Female HS wage)		-0.031	-5.234**	-2.407	-3.196	2.444	-2.204	-0.233	1.077
		[0.025]	[2.384]	[5.668]	[5.752]	[2.413]	[4.459]	[2.782]	[4.767]
L(Female HS wage)^2			0.248**	0.112	0.149	-0.117	0.099	0.005	-0.064
			[0.112]	[0.265]	[0.269]	[0.114]	[0.217]	[0.135]	[0.238]
Male College Rate (age 35-44)			-0.180***	-0.187**	-0.192**	-0.310***	-0.073**	0.026	0.437***
			[0.065]	[0.079]	[0.079]	[0.044]	[0.032]	[0.041]	[0.155]
Female Skill Premium			-0.134**	-0.154	-0.147	-0.177**	0.036	0.126**	0.104
			[0.054]	[0.098]	[0.105]	[0.067]	[0.060]	[0.057]	[0.087]
Other Controls	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45	45	45	45	45	45	45	45	45
R-squared	0.153	0.185	0.351	0.385	0.363	0.617	0.718	0.632	0.504

Note. The unit of observation at the state level. The sample is restricted to native-born whites. Each column is a separate regression of the difference in evermarried rates for college and non-college females age 35-44 in the specified year on gender-related attitudes as measured using the GSS. In columns (1) to (4) and (6) to (9), states are classified into three tertiles of sexism and the regressions are estimated using dummy variables that indicate countries with high, mid and low (omitted category) degrees of sexism. In column (5), estimates are reported using the continous measure of sexism, standardized to have a mean of 0 and standard deviation 1 in the cross-state sample. "Other controls" include: share of males with a college degree, the female and male skill premium, the female and male labor force participation skill premium, and a quadratic in female and male high skill (college) wages. The labor market controls are measured among individuals age 25 to 45 in year t-10. The regressions are weighted by number of females age 35 to 44 in each state and robust standard errors are reported in brackets.*** p<0.01, ** p<0.05, * p<0.1.

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

	Dep Var. Difference in Ever Married Rates (College - Non-College) - Males								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Year=2010					2000	1990	1980	1970
High Sexism Dummy	-0.042***	-0.040***	-0.022**	-0.015		-0.034***	-0.014	-0.015**	-0.014
	[0.010]	[0.010]	[0.010]	[0.011]		[0.009]	[0.008]	[0.007]	[0.009]
Mid Sexism Dummy	-0.028***	-0.028***	-0.020**	-0.019**		-0.020***	-0.015**	-0.011**	-0.006
	[0.010]	[0.010]	[0.008]	[0.009]		[0.007]	[0.006]	[0.004]	[0.006]
Attitude measure: Better if man is achiever outside home and women take care of home and family (mean 0, var 1)					-0.003				
					[0.006]				
L(Female HS wage)		0.012	-0.748	5.114	7.880	4.636	5.688	0.363	-5.580*
		[0.036]	[3.662]	[9.351]	[10.506]	[4.073]	[5.162]	[2.166]	[2.873]
L(Female HS wage)^2			0.040	-0.229	-0.360	-0.223	-0.280	-0.020	0.275*
			[0.172]	[0.437]	[0.491]	[0.194]	[0.251]	[0.105]	[0.143]
Male College Rate (age 35-44)			-0.151	-0.119	-0.099	-0.231**	-0.047	-0.020	0.077
			[0.095]	[0.115]	[0.115]	[0.107]	[0.049]	[0.037]	[0.113]
Female Skill Premium			-0.287***	-0.204	-0.245*	-0.162	-0.061	0.042	0.068
			[0.075]	[0.122]	[0.140]	[0.099]	[0.090]	[0.039]	[0.062]
Other Controls	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45	45	45	45	45	45	45	45	45
R-squared	0.330	0.332	0.504	0.541	0.481	0.611	0.475	0.433	0.395

Note. The unit of observation at the state level. The sample is restricted to native-born whites. Each column is a separate regression of the difference in evermarried rates for college and non-college males age 35-44 in the specified year on gender-related attitudes as measured using the GSS. In columns (1) to (4) and (6) to (9), states are classified into three tertiles of sexism and the regressions are estimated using dummy variables that indicate countries with high, mid and low (omitted category) degrees of sexism. In column (5), estimates are reported using the continous measure of sexism, standardized to have a mean of 0 and standard deviation 1 in the cross-state sample. "Other controls" include: share of males with a college degree, the female and male skill premium, the female and male labor force participation skill premium, and a quadratic in female and male high skill (college) wages. The labor market controls are measured among individuals age 25 to 45 in year t-10. The regressions are weighted by number of males age 35 to 44 in each state and robust standard errors are reported in brackets.*** p<0.01, ** p<0.05, * p<0.1.

Table 7a. Female Marriage Penalty and the Interaction between Sexism and Women's Labor Market Opportunities Across US States

	Dep Var. Difference in Ever Married Rates (High Skilled - Low Skilled) - Females				
	(1)	(2)	(3)	(4)	(5)
L(Female HS wage)	0.128***	0.019	-0.549	-0.027	-1.278
	[0.018]	[0.036]	[1.087]	[0.034]	[1.102]
L(Female HS wage)*High sexism	-0.081***	-0.074***	-0.055**		
	[0.021]	[0.022]	[0.022]		
L(Female HS wage)*Mid sexism	-0.034	-0.010	-0.002		
	[0.023]	[0.022]	[0.022]		
L(Female HS wage)*Man achiever, women stay home				-0.038***	-0.030***
				[0.008]	[0.009]
Other Controls	No	No	Yes	No	Yes
Year FE	No	Yes	Yes	Yes	Yes
Country FE	No	Yes	Yes	Yes	Yes
Observations	225	225	225	225	225
R-squared	0.485	0.884	0.890	0.879	0.888

Note. The unit of observation is a state by year (1970, 1980, 1990, 2000 and 2010). The sample is restricted to native-born whites. The dependent variable is the difference in evermarried rates for college and non-college females age 35-44 in each year. High (Mid) sexism refers to states in the top (mid) tertile of responses to the gender-related attitude question as measured using the GSS. "Man achiever, women stay home" refers to the continuous attitude measure, standardized to have a mean of 0 and standard deviation 1 in the cross-state sample. "Other controls" include: share of males with a college education, the female and male skill premium, the female and male labor force participation skill premium, and a quadratic in female and male high skilled wages. The labor market controls are measured among individuals age 25 to 54 in year t-10. The regressions are weighted by the number of females in each state and year. Robust standard errors clustered at the state level are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table 7b. Male Marriage Penalty and the Interaction between Sexism and Women's Labor Market Opportunities Across US States

	Dep Var. Difference in Ever Married Rates (High Skilled - Low Skilled) - Males				
	(1)	(2)	(3)	(4)	(5)
L(Female HS wage)	0.148***	0.049	-1.859	0.009	-1.512
	[0.015]	[0.029]	[1.497]	[0.026]	[1.580]
L(Female HS wage)*High sexism	-0.063***	-0.061***	-0.034*		
	[0.021]	[0.019]	[0.018]		
L(Female HS wage)*Mid sexism	-0.058**	-0.033*	-0.029*		
	[0.022]	[0.017]	[0.015]		
L(Female HS wage)*Man achiever, women stay home				-0.026***	-0.012
				[0.009]	[0.010]
Other Controls	No	No	Yes	No	Yes
Year FE	No	Yes	Yes	Yes	Yes
Country FE	No	Yes	Yes	Yes	Yes
Observations	225	225	225	225	225
R-squared	0.542	0.920	0.931	0.917	0.928

Note. The unit of observation is a state by year (1970, 1980, 1990, 2000 and 2010). The sample is restricted to native-born whites. The dependent variable is the difference in evermarried rates for college and non-college males age 35-44 in each year. High (Mid) sexism refers to states in the top (mid) tertile of responses to the gender-related attitude question as measured using the GSS. "Man achiever, women stay home" refers to the continuous attitude measure, standardized to have a mean of 0 and standard deviation 1 in the cross-state sample. "Other controls" include: share of males with a college education, the female and male skill premium, the female and male labor force participation skill premium, and a quadratic in female and male high skilled wages. The labor market controls are measured among individuals age 25 to 54 in year t-10. The regressions are weighted by the number of males in each state and year. Robust standard errors clustered at the state level are reported in brackets. *** p<0.01, ** p<0.05, * p<0.1

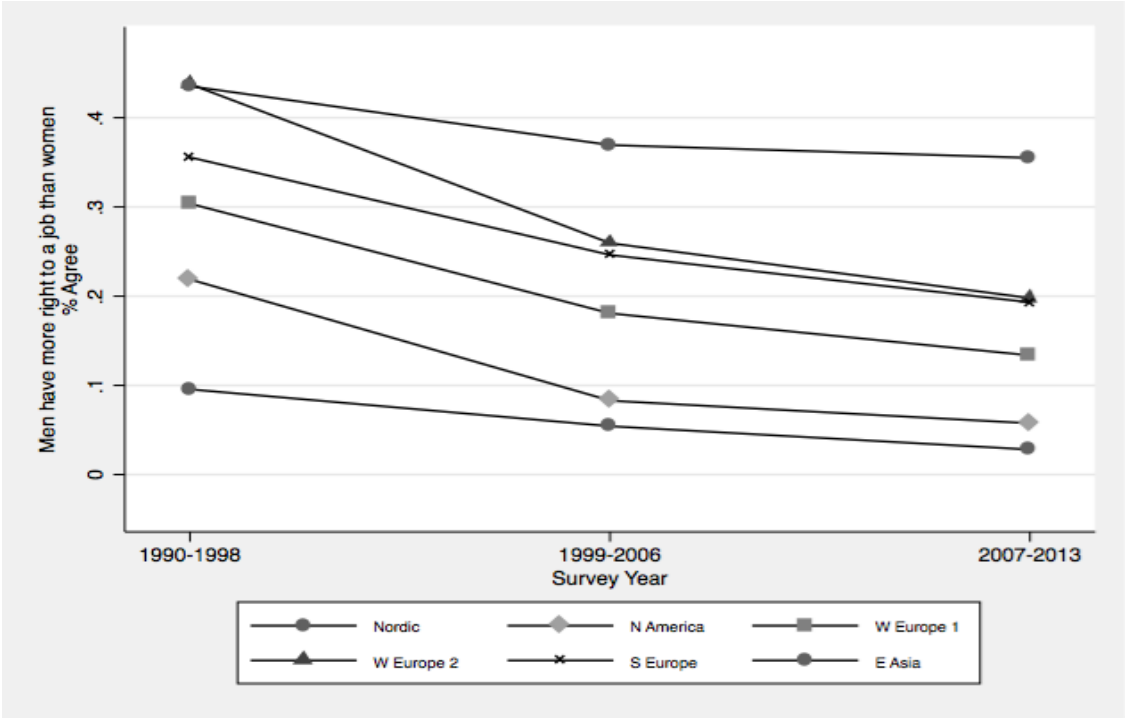
Table 8. Correlation between the Gender Gap in College Attainment and Social Norms Across US States

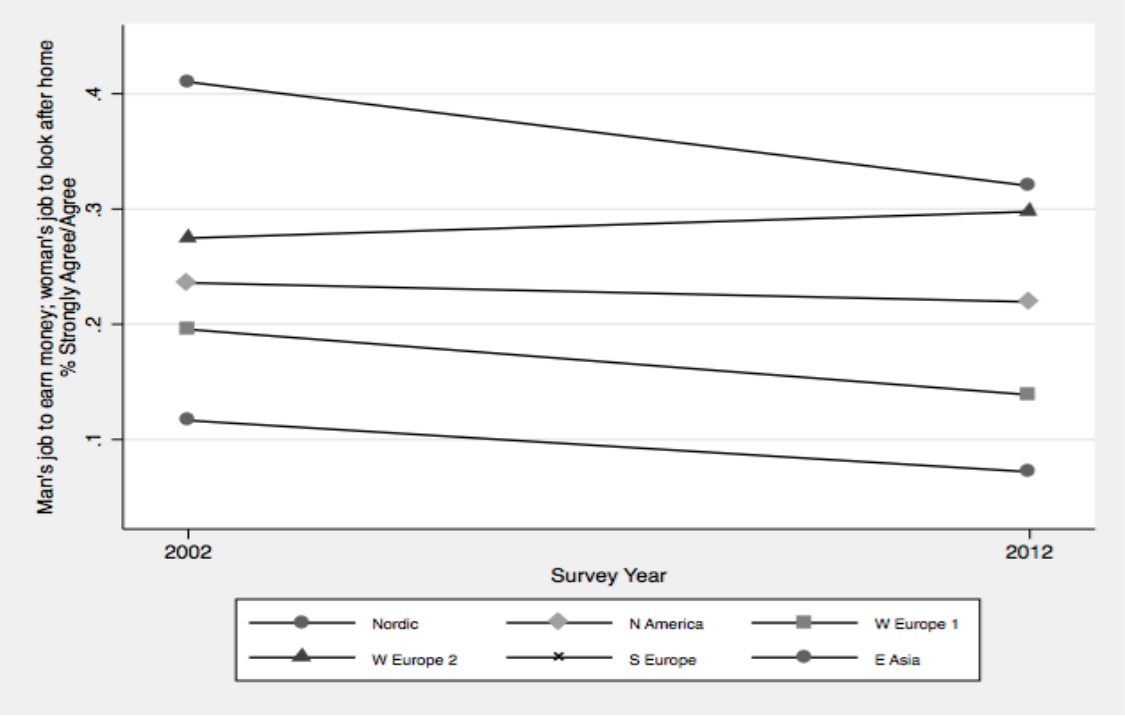
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Dep Var. %College Females - %College Males (Age 35 to 44)										
	Year=2010							2000	1990	1980	1970
High Sexism Dummy	-0.010*	-0.002	-0.011					-0.009	-0.007	-0.009*	0.001
	[0.006]	[0.006]	[0.009]					[0.008]	[0.007]	[0.005]	[0.005]
Mid Sexism Dummy	-0.004	-0.006	-0.010*					-0.005	-0.010***	-0.001	0.001
	[0.005]	[0.005]	[0.005]					[0.006]	[0.003]	[0.004]	[0.004]
Attitude measure: Better if man is achiever outside home and women take care of home and family (mean 0, var 1)				-0.012*							
				[0.006]							
Diff. in Ever Married (HS - LS) - Females					0.181	0.138	0.214*				
					[0.122]	[0.103]	[0.126]				
L(Female HS wage)		0.203**	-6.552	-7.153		0.168**	-3.652	-5.708	-4.767	-3.591	-1.989
		[0.091]	[7.005]	[5.148]		[0.076]	[6.634]	[6.446]	[5.470]	[2.385]	[1.981]
L(Male HS wage)		-0.220**	3.304	4.339		-0.181**	1.883	1.524	-0.054	3.758	1.953
		[0.082]	[6.617]	[4.603]		[0.068]	[6.103]	[7.318]	[5.135]	[3.464]	[3.093]
Other Controls	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Observations	45	45	45	45	51	51	51	45	45	45	45
R-squared	0.063	0.254	0.392	0.472	0.048	0.232	0.337	0.317	0.660	0.885	0.872

Note: Other controls include: share of males with tertiary education, the female and male skill premium, the female and male labor force participation skill premium, and a quadratic in female and male high skilled wages. The labor market controls are measured among individuals age 25 to 45 in year t-10.

Robust standard errors reported in brackets. *** p<0.01, ** p<0.05, * p<0.1

Appendix Figure 1: Convergence in Gender-Related Attitudes





Note. The graphs plot the average of the mean responses of individuals age 18 and older for each country by country group and survey year. The top figure uses the gender-related question from the IVS while the bottom figure uses the question from the ISSP. The sample of countries is restricted to those with available data in each of the survey years.

Appendix Table 1: Selected Gender-Related Questions in the IVS, ISSP and GSS

Integrated Values Survey (IVS)	Scale	Coding
When jobs are scarce, men have more right to a job than women	**1: Agree, 2: Disagree, 3: Neither**	**1: Agree, 0: Disagree or Neither**
A working mother can establish just as warm and secure a relationship with her children as a mother who does not work	1: Agree Strongly, 2: Agree, 3: Disagree, 4: Disagree Strongly	1: Agree Strongly, 0: Agree, Disagree, Disagree Strongly
A pre-school child is likely to suffer if his or her mother works	1: Agree Strongly, 2: Agree, 3: Disagree, 4: Disagree Strongly	1: Agree Strongly, Agree, 0: Disagree, Disagree Strongly
A job is alright but what most women really want is a home and children	1: Agree Strongly, 2: Agree, 3: Disagree, 4: Disagree Strongly	1: Agree Strongly, 0: Agree, Disagree, Disagree Strongly

International Social Science Program (ISSP)	Scale	Coding
A man's job is to earn money; a woman's job is to look after the home and family.	**1: Agree strongly, 5: Disagree strongly**	**1: Agree/Strongly Agree, 0: otherwise**
A working mother can establish just as warm and secure a relationship with her children as a mother who does not work.	1: Agree strongly, 5: Disagree strongly	1: Strongly Disagree/Disagree, 0: otherwise
A pre-school child is likely to suffer if his or her mother works.	1: Agree strongly, 5: Disagree strongly	1: Agree/Strongly Agree, 0: otherwise
All in all, family life suffers when the woman has a full-time job.	1: Agree strongly, 5: Disagree strongly	1: Agree/Strongly Agree, 0: otherwise
A job is all right, but what most women really want is a home and children.	1: Agree strongly, 5: Disagree strongly	1: Agree/Strongly Agree, 0: otherwise

US General Social Survey (GSS)	Scale	Coding
It is much better for everyone involved if the man is the achiever outside the home and the women takes care of the home and family	**1: Agree strongly, 4: Disagree strongly**	**1: Agree/Strongly Agree, 0: otherwise**
It is more important for a wife to help her husband's career than to have one herself	1: Agree strongly, 4: Disagree strongly	1: Agree/Strongly Agree, 0: otherwise
A preschool child is likely to suffer if his or her mother works	1: Agree strongly, 4: Disagree strongly	1: Agree/Strongly Agree, 0: otherwise
A working mother can establish as warm and secure a relationship with her children as a mother who does not work	1: Agree strongly, 4: Disagree strongly	1: Agree/Strongly Agree, 0: otherwise
Do you approve or disapprove of a married woman earning money in business or industry if she has a husband capable of supporting her?	1: Agree, 2: Disagree, 3: Neither	1: Agree, 0: Disagree or Neither
Do you agree or disagree with this statement? Women should take care of running their home and leave running the country up to men.	1: Agree, 2: Disagree, 3: Neither	1: Agree, 0: Disagree or Neither
If your party nominated a woman for president, would you vote for her if she were qualified for the job?	1: Agree, 2: Disagree, 3: Neither	1: Agree, 0: Disagree or Neither
Tell me if you agree or disagree with this statement: Most men are better suited emotionally for politics than are most women.	1: Agree, 2: Disagree, 3: Neither	1: Agree, 0: Disagree or Neither

Appendix Table 2: Classification of Countries by Sexism Groups

Country	Country code	Year Surveyed	% Agree: When jobs are scarce, men have more right to a job than women	Sexism Group (1: Low, 2: Mid, 3: High)
Sweden	SE	2011	0.020	1
Denmark	DK	2008	0.023	1
Iceland	IS	2009	0.026	1
Finland	FI	2009	0.040	1
Norway	NO	2008	0.047	1
USA	US	2011	0.058	1
Netherlands	NL	2012	0.077	1
UK	UK	2009	0.122	1
France	FR	2008	0.123	2
Spain	ES	2011	0.124	2
Canada	CA	2006	0.143	2
Germany	DE	2013	0.155	2
Ireland	IE	2008	0.169	2
Belgium	BE	2009	0.187	2
Switzerland	CH	2008	0.196	2
Portugal	PT	2008	0.207	3
Austria	AT	2008	0.208	3
Italy	IT	2009	0.219	3
Hong Kong	HK	2013	0.278	3
Greece	GR	2008	0.321	3
Japan	JP	2010	0.322	3
Korea	KR	2010	0.323	3
Taiwan	TW	2012	0.421	3

Note. The gender-related question is from the IVS and is based on the responses of individuals age 18 or older.

Appendix Table 3. Data Sources for Cross-country Panel, by Year

	1995*	2000*	2005*	2010*
UK	EU-LFS/ECHP	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
Netherlands		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
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
Switzerland		EU-LFS/LIS	EU-LFS/LIS	EU-LFS/EU-SILC
Italy	EU-LFS/ECHP	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Spain	EU-LFS/ECHP	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Portugal	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
Sweden	EU-LFS/LIS	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Finland	EU-LFS/LIS	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Denmark	EU-LFS/ECHP	EU-LFS/ECHP	EU-LFS/EU-SILC	EU-LFS/EU-SILC
Iceland			EU-LFS/EU-SILC	EU-LFS/EU-SILC
Norway		EU-LFS/LIS	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	KLIPS	KLIPS	KLIPS	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

Appendix Table 4. Descriptive Statistics - US States

	1970	1980	1990	2000	2010
Marriage Penalty Females (age 35-44)	-0.063	-0.059	-0.060	-0.045	-0.002
	(0.031)	(0.017)	(0.014)	(0.015)	(0.018)
Marriage Penalty Males (age 35-44)	0.001	-0.011	-0.008	0.011	0.058
	(0.018)	(0.011)	(0.014)	(0.022)	(0.028)
College Share - Males (age 35-44)	0.188	0.261	0.323	0.281	0.330
	(0.042)	(0.062)	(0.060)	(0.057)	(0.068)
Gender College Gap (age 35-44)	-0.094	-0.100	-0.058	0.004	0.042
	(0.023)	(0.022)	(0.016)	(0.015)	(0.015)
Log Annual Full-time Wages - College Females among 25-34 in *t-10*	9.639	9.897	9.929	10.154	10.374
	(0.138)	(0.121)	(0.114)	(0.162)	(0.147)
Skill premium Males among 25-34 in *t-10*	0.369	0.383	0.317	0.471	0.521
	(0.085)	(0.074)	(0.065)	(0.049)	(0.057)
Skill premium Females among 25-34 in *t-10*	0.513	0.514	0.403	0.484	0.503
	(0.081)	(0.071)	(0.043)	(0.057)	(0.056)
No. of States	45	45	45	45	45

Note. The data is from the 1970-2000 US Census and the 2008 to 2011 ACS. The sample is restricted to native-born whites. The mean and (standard deviation) of the key variables used in the cross-state analysis are reported in the table. The marriage penalty is defined as the difference in evermarried rates for college vs. non-collegel individuals. High Skill is defined as those with a college education or more; Low Skill is defined as those with less than a college education. The Gender College Gap (Female-Male) is defined as the difference in the fraction of females with a college education and the fraction of males with a college education. The skill premium is defined as the log wage difference between an individual with a tertiary education and an individual without a tertiary education. Similarly, the LFP gap is the difference in the LFP rates of tertiary educated individuals and the LFP rates of non-tertiary educated individuals. The labor market variables for each time period (i.e. year t) are constructed based on individuals age 25 to 54 in the preceding decade (i.e. year t-10).