Lowering Standards to Wed? Spouse Quality, Marriage, and Labor Market Responses to the Gender Wage Gap

Na'ama Shenhav*

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Abstract

This paper examines the effect of the female-to-male wage ratio, "relative wage," on women's spouse quality, marriage, and labor supply over three decades. Exploiting task-based demand shifts as a shock to relative pay, I find that a higher relative wage (i) increases the quality of women's mates, as measured by higher spousal education, (ii) reduces marriage without substitution to cohabitation, and (iii) raises women's hours of work. These effects are consistent with a model in which a higher relative wage increases the minimum non-pecuniary benefits ("quality") women require from a spouse and therefore reduce marriage among low-quality husbands.

*Department of Economics, Dartmouth College. E-mail: naama.shenhav@dartmouth.edu. I am grateful to Doug Miller, Marianne Page, Giovanni Peri, and Hilary Hoynes for their insights, guidance and support. I thank Kristin Butcher, Scott Carrell, Elizabeth Cascio, Chloe Gibbs, Nora Gordon, Judith Hellerstein, Melissa Kearney, Ethan Lewis, Erzo Luttmer, Richard Murnane, Claudia Olivetti, Maureen Pirog, Dave Rapson, Kim Shauman, Shu Shen, Dmitry Taubinsky, and Catherine Weinberger for useful discussions. I am also appreciative of the feedback that I received from numerous seminar participants at the Bureau of Labor Statistics, the Census Bureau, Cornell, Dartmouth College, Georgia State University, UC Davis, University of Colorado Denver, University of Houston, University of Maryland, and UC Santa Barbara, in addition to conference participants at SOLE. This work was supported by a National Academy of Education/Spencer Dissertation Fellowship. Previous versions of this work were circulated under the title "What Women Want: Family Formation and Labor Market Responses to Marriage Incentives" and "Bribed to Wed: Family Formation and Labor Market Responses to Marriage Incentives."

1 Introduction

Over the last three decades, the share of women never married before age 44 rose to 34% from 16% and likewise the share of births to unmarried women increased to 40% from 20%.[1] This decline in marriage has attracted significant attention; yet, to date, work in this area has neither addressed *which* marriages did not form nor the labor supply implications of the coinciding reduction in the gender wage gap. Both of these are critical for evaluating the social consequences of the marriage decline.

A central concern is that the increasing share of single mother households adversely affected child outcomes (Autor et al., 2015; Bertrand and Pan, 2013; Kearney and Levine, 2017). However, the ramifications for children depend immensely on the characteristics of the spouses that mothers would have married and the net effect on parental investments.

In the backdrop of these changes in marriage, labor market opportunities for women relative to men showed a marked improvement from 1980 to 2010. Foremost, women's wages relative to men's appreciated by an unprecedented 20%, depicted in Figure 1.[2] Paralleling this, women's relative hours worked and share of family income also increased.[3] Thus, it could be that the decline in marriage is simply a byproduct of the greater labor productivity of women, which could have improved the living standards of households.

In this paper, I study the effect of the closing of the gender wage gap on women's spouse quality, marriage, and labor market outcomes. I begin with an illustrative model of marriage built on basic economic principles of specialization as in Becker (1973), which generates a set of predictions that guide the empirical analysis: a more equal female to male wage ratio should (i) reduce a woman's propensity to marry, (ii) particularly a "low-quality" husband, based on his non-pecuniary qualities, (iii) raise the average husband quality among married women, and (iv) raise women's hours of work. This derives from the fact that women experience fewer pecuniary gains to marriage under a more equal female to male wage ratio, and hence increase the minimum non-pecuniary benefits that they require from a husband. In aggregate, then, when the gender wage gap decreases, the marriage rate declines, average spouse quality improves, and women's hours of work conditional on working

[1]See, e.g. Lundberg et al. (2016) for a recent summary of marriage and cohabitation patterns.

[2]Appendix Figure A.1 shows these patterns remain across narrowly-defined education groups.

[3]See, e.g. Glynn (2014); Knowles (2012); Bertrand et al. (2015).

increase.

Since wages are not randomly assigned, empirically I examine the impact of the ratio of the *potential* female to the *potential* male wage in the marriage market, or, simply, the "relative wage". I generate a proxy for the relative wage using a novel application of the Bartik approach (Bartik, 1991), which leverages two sources of variation: differential specialization in occupations and industries across sexes and marriage markets, and growth in wages across occupations and industries. I show that the addition of occupational variation, which is distinct from earlier work, gives the proxy additional predictive power, consistent with the disparate impacts of computerization across occupations documented during this period.[4] In support of the identifying assumption, I show that the relative wage is not correlated with pre-1980 trends in these outcomes or the average wage in the market, and that the potential wage for each sex is not predictive of opposite-sex wages, which rules out many types of confounding shocks in the market.

I identify four key empirical patterns. First, I show that a higher relative female to male wage improves husband quality among married couples, in terms of observable characteristics. A 10% increase in the relative wage - roughly the variation that I leverage over this period - leads to a 16 percent increase in the share of women married to a higher-educated spouse. Women are also less likely to be married to an older spouse, which recent surveys find is associated with lower marital satisfaction (Lee and McKinnish, 2017). Further, descriptive evidence suggests a higher relative income is associated with greater marital happiness for couples with a dominant male earner, as in the model.

Second, I find that a higher relative wage reduces marriage through a meaningful decline in first marriages and increased divorce. A 10% increase in the relative wage leads to a 3.1 percentage point (p.p.) increase in the share of never-married women and a 1.7 p.p. increase in the share of divorced women. The data do not allow me to distinguish between *delay* of first marriage and a permanent "opting out" of marriage; however, suggestively, I find that the first-marriage decisions of low-educated and younger women are particularly responsive to the relative wage, which I interpret as delay of marriage among all young women, and possible "opting out" for low-educated women. These patterns align with the evolving marriage norms among these groups (Lundberg et al., 2016; Edin and Kefalas, 2005). The estimates can explain 20% of the decline in marriage between 1980

[4]See, e.g., Black and Spitz-Oener (2010); Beaudry and Lewis (2014); Weinberg (2000).

and 2010.

Third, I examine whether a higher relative wage affects whether women *live* with a romantic partner. I find that 65% of women who do not marry under a higher relative wage (and would have lived with their spouse) instead opt to live with a female roommate or live alone. Further, though 23% of these women live with a single man, I do not find a material increase in reported cohabitation, suggesting these may be largely non-romantic living arrangements.

Fourth, I find that a higher relative wage increases women's labor supply, even once I condition on the female wage. A 10% increase in the relative wage induces an additional 1 hour of work per week conditional on working. However, I find no effect on employment or labor force participation. In total, the appreciation of the relative wage causes a 5% increase in women's annual earnings and a 7% rise in women's share of household income.

The results provide a collage of evidence consistent with Beckerian principles, as in the model, and are not consistent with several alternative explanations. Since women do not remain living with their partners, it seems unlikely that women are trying to avoid the costs of marriage. Rather, this aligns with a perception that the marginal spouse is undesirable outside of marriage. Additionally, while the relative wage predicts an increases in the probability that women earn more than men, the effects through the latter "aversion to women earning more than men" channel (BKP) account for the minority of the decline in marriage, and none of the rise in spouse quality. I also rule out that the effects are only concentrated in markets with declining men's wages or a high share manufacturing, and show that female wages are also influential for marriage decisions. Nevertheless, I find the largest and most-precisely-estimated effects for markets where men's wage growth was in the lowest quartile, suggesting that the decline in men's real wages – and hence, "marriageable men" – plays an important role in the responses to the relative wage that I document (Autor et al., 2018).

This paper relates to several literatures. First, it adds to the set of studies on the causal determinants of spouse quality, which has thus far focused exclusively on the role of the balance of sexes in the market (Charles and Luoh, 2010; Angrist, 2002; Abramitzky et al., 2011) or individual education (McCrary and Royer, 2011; Geruso and Royer, 2018). I show that labor market opportunities have a significant impact on partner choice, and argue that selection out of less-desirable marriages is an important channel for this effect.

Second, it connects to a growing body of work that quantifies the impact of men and women's employment opportunities on marriage using quasi-experimental methods, but has not yet addressed spouse quality (Blau et al., 2000), including some concurrent work (Autor et al., 2018; Kearney and Wilson, 2018). Blau et al. (2000) and Autor et al. (2018) find that increasing demand in industries in which women (men) are concentrated lead to reductions (increases) in marriage, while Kearney and Wilson (2018) find no effect of increased demand in the male-dominated fracking industry on marriage. This paper provides the first evidence on spouse quality, grounding the analysis in a conceptual framework, and focusing on the impact of wages explicitly.

Moreover, different from Autor et al. (2018) and Kearney and Wilson (2018), who focus on manufacturing and resource extraction, respectively, I obtain variation from all industries and occupations and track outcomes during the period with the greatest growth in the relative wage. This allows me to leverage all combinations of positive and negative wage growth for men and women. I also use up-to-date empirical methods and provide novel evidence of the credibility and robustness of my estimates, improving upon Blau et al. (2000).

It also closely relates to recent work by Bertrand et al. (2015) (hereafter, BKP) studying the interaction of gender norms with the relative wage in the household – the aversion to women earning more than men. This paper complements BKP in asking what the effects of the relative wage more broadly, utilizing the entire distribution of wages, and produces the first estimates that are generalizable to any change in the gender wage gap. I also provide new estimates of impacts on spouse quality.

Further, I provide two pieces of evidence distinguishing Beckerian forces from the aversion channel in BKP. First, for women's hours of work and marital satisfaction, I find that the relative wage has the *opposite* effect from the aversion channel. Second, I perform bounding exercises and directly control for this aversion to quantify the role of each mechanism. I conclude that the aversion channel explains the *minority* of the impacts on marriage and none of the impact on spouse quality.

Finally, this paper is linked to the small, but important literature showing that a higher relative wage can improve the quality of interactions between men and women, most notably by reducing in the incidence of emotional and physical abuse against women (Aizer, 2010; Munyo and Rossi, 2015). These studies often emphasize increases in household bargaining as a mechanism. My findings offer two additional channels for these effects: a decline in relationships with low-quality spouses and greater financial independence of women, which can be a source of power against potential spouses (Edin and Kefalas, 2005).

2 Hypothesis Development

To develop hypotheses regarding the effect of the gender pay gap on spouse quality and women's employment, I draw on the basic economic principles of a Beckerian-type model (Becker, 1973). In Appendix A.1, I present a model in the spirit of Bertrand et al. (2018), which formalizes these principles. In this section, I provide simple intuition for these principles and summarize the resulting predictions that I take to the data.

My predictions focus on the decisions of single heterosexual women. In deciding whether to marry a potential spouse, women weigh the extrinsic and intrinsic benefits of marriage against the value of remaining single. The extrinsic benefits of marriage consist of the difference between the income of a married household and income of a single woman. This is assumed to be positive since men earn a higher wage than women – despite the fact that married women are expected to work fewer hours than single women. Intuitively, these pecuniary gains from marriage grow as the wages of potential husbands increase and wane as women's own potential wages increase.

The intrinsic benefits of marriage are two-fold. Since married women work fewer hours than single women, they also spend more time child-rearing. This corresponds to a higher quantity of valuable maternal investments enjoyed by the household, which brings positive gains to marriage. Since child-rearing is a substitute to work, this benefit is decreasing with women's wages. Additionally, husbands provide wives with "spouse quality" (and vice versa.) This is a subjective, match-specific measure, which includes all non-pecuniary qualities that a woman considers relevant for marriage, and can be positive or negative. This could include the strength of a potential husband's preference for paternal investments in children, his sensitivity towards his partner and others, or more minor traits such as timeliness and attention to detail. Women are willing to marry if and only if the spouse quality of a potential husband is at least as high as the negative of the sum of the other gains, the "threshold spouse quality."

In this framework, when the relative wage increases, holding the average wage constant, the pecuniary and child-rearing gains to marriage decline, and so women's threshold for acceptable husband quality rises.[5] Consequently, my first hypothesis is that average husband quality among married women improves. At the same time, fewer potential husbands to surpass the now-higher threshold for husband quality.

In contrast, the implications of a higher relative wage for acceptable wife quality are ambiguous. This is because potential husbands experience two countervailing effects from an increase in women's wages. On the one hand, increases in the wage of potential wives implies that men now experience greater extrinsic benefits from marriage since pooled income rise. This raises the gains to marriage, and reduces the threshold for acceptable wife quality. On the other hand, since a higher wage implies that wives spend less time in child-rearing, this reduces the marital gains that come from maternal time with children. This channel tends to push men's threshold for acceptable wife quality upwards. It is thus unclear whether more or fewer potential wives will surpass the resulting threshold for wife quality, and similarly unclear whether wife quality will increase or decrease.[6]

As a result of these potentially conflicting changes in threshold spouse quality for men and women, the effects of a change in the relative wage on the number of new marriages formed is indeterminant. However, marriage declines with greater certainty in the presence of frictions or asymmetric preferences in the household. For example, if husbands experience some discomfort from wives' careers, then the utility gains from a rise in pooled income would be smaller than the loss in maternal time (see Appendix A.1 for details). Recent research documenting marital conflict when women's wages surpass men's suggest that this may be an appropriate assumption in the US context (BKP). A decline in the bargaining power of husbands would similarly attenuate the gains from pooled income. Finally, marriage declines unambiguously if the change in the relative wage is caused by a reduction in the male wage alone, i.e. the average wage declines alongside the rise in the relative wage, since this eliminates the uncertainty created by opposing effects of women's wages.

A third hypothesis is that the marginal marriage, which does not take place when marriage declines, involves a potential husband with negative spouse quality. This follows from the fact that the pecuniary and child-rearing gains of marriage are positive. Given this, it seems unlikely

[5] Assuming that the average wage does not change any qualitative predictions, but streamlines the discussion, since it implies that both male and female wages are affected by the change in the relative wage. It also matches the empirical specification.

[6] Because of this ambiguity and limited measures of husbands spouse quality – discussed in Section 5.2 – I place less emphasis on the predicted effects of the relative wage for wife quality.

that women would remain with this match in the absence of the compensating gains of marriage. Empirically, this implies that cohabitation would also be an unlikely substitute to marriage for these matches.

Fourth, women are expected to work more hours under a higher relative wage. This is because more women will be induced to be single, and therefore will return to full-time work; and among married women, and the higher wage will make it optimal to work more hours. Women's employment may or may not increase, depending the density of would-be-nonemployed wives around the spouse quality threshold.

An extension of these principles is that a higher relative wage will also trigger additional divorces, despite the fact that a higher bar is applied for screening potential spouses. This is because marriages formed under a lower threshold spouse quality will no longer meet the higher spouse quality. Further, since divorce decisions are based on realized spouse quality after marriage, while screening occurs based on perceived spouse quality prior to marriage, additional couples will become marginal to changes in the relative wage over time. Both of these effects can be expected to be stronger for women who have been married for a longer time, all else equal.

3 Data and Background on the Gender Wage Gap

To create my proxy for potential wages, I use the IPUMS 1970 (1%) Census and the 1980–2011 March Current Population Surveys (King et al., 2010; Ruggles et al., 2010). I restrict the samples to working age individuals between 18 and 64 years old who have positive reported earnings for the previous year and are not self-employed. The roughly one million working age individuals in the 1970 census allow me to establish detailed employment shares in each marriage market prior to my period of analysis. I observe approximately 60,000 households in the March CPS that I use to obtain annual information on average hourly wages for each industry and occupation.[7] Having annual wages allows me to test responses to once-lagged wages, in case there is a delay in responses; however, the results are nearly identical when I use the decadal wages in the Census (see Appendix A.4.2.) See Appendix A.3 for more detail on the data construction.

For my outcomes of interest, I turn to the IPUMS 1980–2000 decennial Censuses and the 2010

[7]The May CPS/Outgoing Rotation Group (MORG) also provides annual information, but had a notable redesign in 1994, which makes its measures less comparable over time (Autor et al., 2008).

American Community Survey (ACS) (Ruggles et al., 2010). I observe current marital status, cohabitation (reported from 1990 on by the head of household), employment, and wages for individuals in the sample as well as spousal age and education, and total income in the household. I focus on a sample of almost 5 million women ages 22 to 44, who are likely to be on the margin of marriage. This ensures that I can reliably classify whether an individual completed some college or not - since the hazard for completing some college is significantly lower after age 22 - and that women are all of child-bearing age (Bailey, 2006). I include individuals that identify as one of three race-ethnicity groups: white non-Hispanic, black non-Hispanic, and Hispanic; and two education levels: less than or equal to high school and at least some college. Appendix Table A.1 presents descriptive statistics for the sample.

3.1 Wage Convergence Across Sexes

Although many factors contributed to wage growth during this period, a number of recent studies document that technology-induced demand shifts account for the majority of the closing gender wage gap.[8] In particular, the wave of computerization beginning in 1980 reoriented demand for occupations based on their complementarity with technology; increasing the need for workers in cognitive- and people-oriented occupations while incrementally eliminating physically-intensive occupations (Autor et al., 2003; Bacolod and Blum, 2010; Autor and Price, 2013; Deming, 2017). These shifts favored women due to their historical specialization and innate advantage in the former category of work (Beaudry and Lewis, 2014; Weinberg, 2000). The sharp break from previous trends comes across in a simple plot of wage growth by skill group and gender, as in Figure 2. It also highlights the particular significance of 1980 for the acceleration of wages of high-skilled women and the depreciation of the wages of low-skilled men (Autor et al., 2008; Katz and Murphy, 1992; Blau and Kahn, 1997).

Given the role of mechanization in this convergence, it is interesting to observe how the growth in the relative wage varies across states with distinct industrial concentrations. Figure 3 visually depicts the geographic variation in the change in the log relative wage from 1980-2010. The con-

[8] Other factors include: the rise in women's educational attainment and workplace experience, the introduction of birth control, the rise in females in professional and managerial occupations, reductions in discrimination, increasingly positive selection into the workforce, and changes in demand. See Blau and Kahn (2016) for discussions of the relative importance of these factors.

vergence of male and female wages ranges from 5% to 30%.[9] The majority of states experienced convergence above 18%, with higher rate of convergence seen in the Rust Belt - the center of American manufacturing - and lower convergence primarily in the South and New England. Employment of women in the health sector - which had rapidly growing wages over this period - may have also influenced this pattern. This could have contributed to the high rates of convergence in Minnesota, for example, where 15% of low-skilled women were employed as doctors, nurses, or health assistants in the 1970 Census.

In the next section, I return to these occupational differences across sexes and geographic areas and the ensuing wage convergence as an important building block for my empirical strategy.

4 Estimation Strategy

Conceptually, I would like to estimate how a woman's outcomes change when the log of the ratio between her potential wage and the potential wage of her likely spouses — the log relative wage in her marriage market — rises. I focus on the impact of potential wages, not actual wages, because they have been argued to be the relevant measure for marriage decisions (Pollak, 2005). For this reason, I follow BKP and Aizer (2010) in running reduced-form regressions of outcomes on a proxy for potential wages – rather than instrument observed wages with the proxy – which allows for potential wages to impact marriage decisions through multiple channels, such as through higher bargaining power as well as through a higher realized wage. To implement this, I follow patterns of assortative mating and define a marriage market, μ, as men and women that share a common education level e (up to high school or at least some college), race r (white non-Hispanic, black non-Hispanic, Hispanic), and who live in the same state s.

Using these parameters to determine the marriage market is not perfect, since it imposes some assumptions about the set of relevant mates for a given woman, but it has several clear benefits. First, I maintain continuity with BKP, who define marriage markets using the same set of education, race, and geographic cells. This allows for greater comparability across estimates. Second, defining education in two coarse bins, rather than finer categories, follows historical patterns of intermixing across education categories. In particular, among 1980 married women, 20 percent of the college-

[9] Appendix Figure A.2 shows the variation in male and female wages across states.

educated were married to a man with only some college, and 32 percent of women that only had some college married a man with a college degree.[10,11] An additional advantage is that these coarse bins allow me to categorize young men and women who may be in transition between some college and college to their "permanent" marriage market with greater confidence. Third, defining the marriage market to one's state of residence, rather than a more granular geographic level, allows for matching to occur outside of one's locality. If these parameters are misspecified, such that the relative wage I assign to individuals is not reflective of own wages or potential partners' wages, I expect that my results will be attenuated by measurement error.

4.1 Construction of Relative Potential Wage

Since wages and potential wages are not randomly assigned, I follow the general approach of the literature and set the potential wage as the weighted average of national industry-specific log wages $w_{jt,-s}$ excluding the state in which the market is located ($-s$), where the weights reflect the share of the market μ and sex g employed in industry j prior to the period of analysis (1970) (Aizer (2010), BKP, Diamond (2016)).

$$w_{\mu gt} = \sum_j \frac{E_{j\mu g,1970}}{E_{\mu g,1970}} \times w_{jt,-s}$$

To gain intuition for this approach, one can consider the simple case of two industries, j_1 and j_2, and that wages vary from low to high over time only for j_1. In that case, the the logic of identification simplifies to a difference-in-difference design, comparing the effect of the wage change across markets that have a greater presence of j_1 to those with a lesser presence of j_1.

I introduce two adjustments to this setup. First, I incorporate variation in shares and wages across occupations o within an industry, drawing on recent work which highlights the importance of occupation-specific tasks in the closing of the gender gap. This requires knowledge of the historical industry and occupation of men and women in a marriage market. Since these cells are quite small in the data, I approximate this by assuming that men and women in each race and skill nationally

[10] A slightly lower share of 1980 married women with some college married men with only a high school degree (29 percent). By 2010, women with exactly some college were less likely to marry men with a college degree than men with high school or less (22 vs 33 percent); however, since this is an endogenous outcome, I prefer to follow historical patterns by grouping some college and college together.

[11] The results are not sensitive to an alternative education grouping that separates college-educated from lower-educated, as shown in Appendix A.4.

work in the same occupations within each industry. Then, I estimate the initial employment share of each marriage market and sex in o and j, $\frac{E_{oj\mu g,1970}}{E_{\mu g,1970}}$, by multiplying the 1970 share of a sex and marriage market that I observe working in each industry by the share of that sex with the same skill and race in 1970 US that worked in a given occupation in that industry.[12] The use of sub-industry wages has become a standard way to gain additional precision in this prediction, but typically relies on demographic-level wages (BKP). I discuss the additional power gained from this approach in Section 4.3.

Second, I allow systematic updating of the initial marriage-market weights following national trends in occupation growth. This helps to account for the large changes in the distribution of employment over this period. However, rather than rely on overall growth in occupations, which was influenced by changes in women's labor supply behavior (Black and Juhn, 2000), I take advantage of the differential growth in the importance of occupations *across industries*. This is reflected in deviations in the growth of the within-industry employment share of the occupation, $\frac{E_{ojt,-s}}{E_{jt,-s}}$, from the growth in the national employment share of the occupation, $\frac{E_{ot,-s}}{E_{t,-s}}$.[13] This source of growth is more likely to reflect industry-productivity or industry-technology than labor supply decisions, and contributes additional power to the potential wage, which I quantify in the next section.

Letting the growth in the within-industry share relative to 1970 be $\pi^{W}_{ojt,-s}$, and the growth in the national occupation share relative to 1970 be $\pi_{ot,-s}$, this updating term is written as:

$$\pi^{W*}_{ojt,-s} = (\pi^{W}_{ojt,-s})(\frac{1}{\pi_{ot,-s}}).$$

The updating term is then normalized such that the weights sum to one. Updating the weights in this manner allows the weights for each marriage market to more realistically reflect the contemporaneous local employment conditions without compromising the validity of the potential wage.[14]

The resulting potential wage is:

[12] I calculate this as $\frac{E_{jersg,1970}}{E_{ersg,1970}} \times \frac{E_{ojerg,1970}}{E_{jerg,1970}}$. Appendix Figure A.3 shows a high correspondence between observed shares and this prediction.

[13] To fix ideas, in Table A.3 I present $\pi^{W}_{oj,2010}$ and $\pi_{o,2010}$ for management (Columns 2 and 3, respectively.) I update the weights using the ratio of columns (2) and (3).

[14] Appendix Table A.22 shows that the results are the same without updating shares.

$$\widehat{w_{\mu gt}} = \sum_j \underbrace{\frac{E_{j\mu g,1970}}{E_{\mu g,1970}}}_{\substack{\text{Between-industry} \\ \text{exposure, 1970}}} \times \sum_o \underbrace{\frac{E_{oj\mu g,1970}}{E_{j\mu g,1970}}(\pi^{W*}_{ojt,-s})}_{\substack{\text{Within-industry} \\ \text{exposure, t*}}} \times w_{ojt,-s}$$

Intuitively, the key variation in the log relative potential wage ($\widehat{w_{\mu female t}} - \widehat{w_{\mu male t}}$) comes from the extent of the segregation of men and women in occupations and industries within a marriage market interacted with the change in returns to occupation over time. All else equal, marriage markets experience more growth in the relative wage when men and women in the market have less overlap in their occupations (and industries) and when the occupations (and industries) that women are in experience relatively more growth in wages. As illustration of this specialization, Appendix Table A.2 shows that there is little overlap in the 10 most common occupations for men and women.

4.2 Estimating Equation

With this in hand, I use data collapsed to cells defined by a marriage market, μ, cohort, c, and decade, t, to estimate:

$$\begin{aligned} Y_{\mu ct} =& \beta ln Relative \widehat{Potential} Wage_{\mu t} + \alpha_\mu + \delta_{rt} \\ &+ \chi_{et} + \gamma_{st} + \xi_{ct} + \rho_{rs} * t + X_{\mu t}\phi + \upsilon_{\mu ct} \end{aligned} \quad (1)$$

The potential wages I construct circumvent the concerns of using local wages in this equation, but this approach remains vulnerable to potential biases that could induce a spurious correlation between potential wages and family outcomes. The most severe of these concerns stems from the initial patterns of sorting into occupations and industries across marriage markets. Returning to the simple example above, if markets with a greater weight given to j_1 are unobservably different, this approach would misattribute those differences to the potential wage. To address this, I include a vector of marriage market fixed effects, α_μ, which fully absorbs the cross-market variation in initial occupation and industry choices as well as in marital preferences and expectations regarding family and labor market work.

This solution would not be sufficient, however, if occupation choices are correlated with trends in behavior, rather than fixed differences. This could happen, for instance, if states with a larger hospital sector - and hence, a larger share of nurses - also tended to have a strong downward trajectory in marriage. Or if low-educated men and women concentrated in a few occupations and increasingly tended towards delaying marriage. Therefore, I add a rich set of fixed effects to control for differential trends for each race, education level, and state; δ_{rt}, χ_{et}, γ_{st}. I also allow for varying trends by state and race $\rho_{rs} * t$. The inclusion of this extensive set of controls ensures that I will not spuriously attribute the effect of secular trends to the relative wage, and significantly reduces the scope for systematic bias to affect my estimates. As I discuss in the next section, as one might hope, the variation in the relative potential wage is largely orthogonal to these fixed effects. Nevertheless, there is insufficient variation in wages to be able to include all of the three-way interactions between state, education, race, and year in this specification, which remains a limitation of this approach.[15,16]

To address remaining confounds in the marriage market, I include $X_{\mu t}$, a vector of mean educational attainment for men and women and the sex ratio, which could also influence marriage decisions and matching. In most specifications, I also control for the market-level average potential wage to account for changes in the level of wages that affect the combined earning power of households. The inclusion of the average wage does not alter the results, as I discuss in Section 5.1. Although potential wages do not vary by cohort, I include cohort by year fixed effects, ξ_{ct}, to increase the precision of the estimates. All regressions are weighted by population and I cluster standard errors at the state level.

Finally, for ease of interpretation, I rescale the coefficients from all regressions to represent the effect of a 10% increase in the relative wage. Since this is roughly the variation that I leverage between 1980 and 2010, the estimates can be interpreted as the impact of the relative wage on outcomes over this period.

[15] Although in theory one could also include fixed effects for each year-education-race cell or each year-state-education cells, empirically, there is insufficient variation in the potential wage to include these. This suggests that an important source of variation in potential wages comes from differences in employment shares across education groups within a state and across education-race groups.

[16] This would be a concern, for example, if there are unobserved trends or shocks to marital outcomes within states across education groups that are correlated with potential wages. Since many of the salient changes in marriage occur across states or across education groups over this time period, this seems less likely. Further, such unobserved changes might be expected to affect both men and women; however, if that was the case, I would expect that potential wages for men and women would be correlated due to these unobserved common shocks. I show that this is not the case in Section 4.3.

4.3 Evidence on Identifying Assumptions

This estimating equation produces unbiased estimates of the effect of the potential relative wage under key identifying assumptions. First, the potential wage should be correlated with the observed wage, which I used as a stand-in for unobserved potential wages. Appendix Figure A.5 presents descriptive evidence of this correlation using observed wages in the Census/ACS. It shows a positive correlation between the long change (1980–2010) in log relative, log female, and log male wages and the equivalent change in the potential wage.

The first three columns of Table 1 show the estimated correlations from regressing observed wages on potential wages using a modified version of Equation 1, which omits the unnecessary cohort controls. The estimates show sizable correspondences between potential wages and observed wages which are precisely estimated. The coefficients are: 0.426 ($p<0.05$) for women, 0.481 (male, $p<0.01$) for men, and 0.833 ($p<0.01$) for the relative wage. In Appendix A.4 I show that the addition of variation by occupation increases the magnitude of this correlation four-fold and that updating reduces the estimated standard errors by 10%.[17] I also show that the results are robust to using a more succinct list of occupations, using alternative definitions of the marriage market, or using Census wages.

Second, the proxy for potential wages must be plausibly exogenous to decisions in the marriage market. As mentioned earlier, it is not necessary for the potential wage to only impact outcomes through wages. To increase the plausibility of this assumption, I include a rich set of fixed effects, which absorb a large number of potentially worrisome sources of variation (see discussion above.) As shown in Appendix Table A.4, the variation in the potential wage is uncorrelated with many of these fixed effects. Not surprisingly, adding the marriage market fixed effect in Column 2 has the largest impact on the coefficient, which is consistent with a large portion of the variation coming from the initial, and persistent, employment patterns in each marriage market.

[17]See Appendix Table A.21. Panels A and B show the correlation between observed wages and (i) a proxy constructed with shares and wages at the demographic-industry level and (ii) a proxy constructed with shares at the demographic-industry-occupation level and wages at the industry-occupation level, respectively. The Panel B proxy is equivalent to my preferred proxy without any dynamic updating. Once the full set of controls for my preferred specification are added in Column 7, the correlation in Panel B is 4 times higher than the correlation in Panel A. Further, comparing across Panel C, which has my preferred proxy, and Panel B, the standard errors are roughly 10 percent smaller in Panel C. For further detail, see the discussion in Appendix A.4. In results not reported, I find that a potential wage using only occupation variation suffers from lack of power similar to the industry-only potential wage, which is sensible given the variance in occupation-specific wages across industries.

Nonetheless, one might be concerned that the residual variation in the potential wage could be correlated with contemporaneous or lagged shocks to the marriage market, which could result in reverse causation. To address these concerns, I perform two types of placebo tests. First, I ask: is the current potential wage for men or women predictive of *opposite-sex* wages (Autor et al., 2018)? This allows me to rule out the possibility that the potential wage is spuriously correlated with a shift in general marriage market conditions, such as a local resource boom or greater enthusiasm for working. Reassuringly, Columns 4 and 5 of Table 1 show that only the coefficient on the same-sex potential wage is significant. Second, I check whether the future relative wage is predictive of *past* outcomes in the market. This allows me to assess whether the relative wage I construct is correlated with past trends in outcomes, as I describe in further detail in Section 6. I find no significant relationships across many outcomes, consistent with the identifying assumption.

Finally, following Goldsmith-Pinkham et al. (2018), I verify that no single occupation-industry is contributing the majority of the identifying variation for the potential wage. This ensures that the occupation-industry space is sufficiently large, which is, in theory, a sufficient condition for exogeneity under the "many invalid instruments" argument (Borusyak et al., 2018; Goldsmith-Pinkham et al., 2018). Appendix Figure A.4 shows that the top 5 occupation-industries contribute 17% of the variation, in terms of "Rotemberg weights," for men and 50% of the variation for women, the majority of which is accounted by school teachers (18%). Further, excluding female school teachers, the top shares are dispersed across different industries and occupations, indicating that endogenous shares are less likely to be problematic for this setting.

5 Results

5.1 Marriage and Cohabitation

Panel A of Table 2 presents the estimated effect of the relative wage on marriage decisions, before controlling for the average potential wage. Column 1 shows that a 10% increase in the relative wage, leads to a 5.1 p.p. (8%) decline in the probability that a woman is married. To put this in perspective, this effect size is of similar magnitude to the increase in the fraction of never-married women following the introduction of the birth control pill and twice as large as the increase attributed to the rise in incarceration (Goldin and Katz, 2002; Charles and Luoh, 2010).[18] My estimate implies that approximately 20 percent of the reduction in marriage during the last three decades is attributable to the increase in the relative wage.[19] The subsequent columns decompose this result into its two main components, dissolution of existing marriages and decline in first marriage. I find that a 10% increase in the relative wage leads to a 1.9 percentage point increase in the likelihood of divorce, accounting for one-third of the change in marriage rates. The 3.2 p.p. rise in never-married women, an 18% increase, then accounts for the remainder of the marriage decline. This could either reflect a delay of first marriage or a more permanent "opting out" of marriage – I return to this question in Section 5.4, where I analyze responses separately for younger and older women.

Panel B examines the sensitivity of my results to controlling for the mean inflation-adjusted potential earnings in the market, which I construct as the average of the male and female potential wage in the market. This allows me to separate the effect of the relative wage from absolute wages, which appear to be slightly correlated in Figure 2. The estimated effects of the relative wage are only marginally reduced by the introduction of this control variable. A 10% increase in the relative wage leads to a 4.8 p.p. decline in marriage, a 1.7 p.p increase in the likelihood of divorce, and a 3.1 p.p. increase in the likelihood of being never married. The insensitivity of the point estimates to this control indicates that there is substantial variation in the relative wage measure independent of the average wage measure; nevertheless, I include this control going forward to allow for the cleanest interpretation of the results, and the results are not affected when I do not include this control.

Having shown that higher relative wages leads to a decline in marriage, I turn to considering *which* couples respond to the change in this incentive. As a first step, I look at whether women substitute away from marriage towards cohabitation, a potentially less-costly form of commitment. Since the data on cohabitation is incomplete, I use three complementary measures to gain evidence on whether women are living with a romantic partner. First, I use the official report of cohabitation, which, as mentioned previously, is only available for the head of household from 1990 on. Second, I look at whether a woman only lives with an unmarried man, who may be a romantic partner or

[18] The availability of the pill led to a 6 p.p. increase in the likelihood of being never married, which was mirrored in a similar-sized decline in divorce rates (Goldin and Katz, 2002). The rise in imprisonment from 1980 to 2000 increased the share of never-married women by 2.3 p.p., and reduced divorce rates by 0.9 p.p (Charles and Luoh (2010) - calculations based on their Tables 2 and 3).

[19] Calculated as $\frac{5.1*.8}{73.83-55.98}$ =22.9%. See Appendix Table A.1 for source numbers.

a platonic roommate. I consider these two measures as providing approximately lower and upper bounds of effects on the stock of cohabitating couples. Third, I observe whether a woman lives with only another woman, as certain evidence of living in a platonic arrangement.

Column 1 of Table 3 shows that a higher relative wage does not meaningfully increase official reports of cohabitation. The point estimate indicates that a 10% increase in the relative wage reduces cohabitation by 1% and is statistically insignificant. Consistent with this, in the following columns, I find a rise in women living in a platonic arrangement. The estimates imply that 30% of women who would have married and resided with a husband instead live with another woman (a 1.2 p.p. increase relative to the 4 p.p. decline in living with a husband). There is a similar increase in the share of women living alone, although less precisely estimated, accounting for 35% of the decline in living with a husband. By comparison, I find a smaller increase (by 0.9 p.p, or 22.5% of the previously married women) in the propensity to live with an unmarried man.

5.2 Spousal Matching

Second, I analyze whether these is an improvement in the attributes of women's spouses. The primary outcome of interest is spousal education, which has been frequently been cited as influential in women's matching decision (Charles and Luoh, 2010; Fisman et al., 2006). Education also correlates with multiple other dimensions of skill, such as social skills, health, and parenting style, which may independently be valued in the marriage market. I also analyze impacts on spousal age, another common measure of spouse quality, though I place less emphasis on these as a measure of spousal quality since the empirical evidence of women's preferences over age are mixed.[20]

Table 4 presents effects for spousal education outcomes. The table shows a very consistent pattern: a higher relative wage causes women to be more likely to be married to spouses that are more educated, conditional on marrying. The first three columns measure the share of women that have a spouse that has fewer years of education, the same level of education, or more years of education than themselves, respectively. I find that a 10% increase in the relative wage leads to a 15 percent increase in the probability of marrying a partner more educated than oneself (5.1 p.p.), which results from equal declines in the probability of marrying a partner less-educated and same-educated relative to oneself. In the final column, I find that a 10% increase in the relative

[20] See, e.g., Mansour and McKinnish (2013); Hitsch et al. (2010); Low (2016); Lee and McKinnish (2017).

wage leads to a 0.26 year increase in the difference between husbands and wives.[21]

Appendix Table A.6 indicates that spousal age also responds to the relative wage. A higher relative wage reduces the likelihood a woman has a husband a spouse older than herself ($p<0.1$), and increases the likelihood she has a same-age or younger husband, though the latter effects are not significant. While there is not a consensus in the literature, previous research suggests that same age and younger spouses are associated with having a more attractive spouse and greater initial marital satisfaction for women, respectively (Mansour and McKinnish, 2013; Lee and McKinnish, 2017).

By construction, this implies that husbands are more likely to have a less-educated wife and, suggestively, more likely to have an older wife. Relative to women, men place less weight on partner's intelligence (Fisman et al., 2006), but have a strong preference for having a younger wife (Low, 2016). Thus, these results could be consistent with a decline in the spouse quality for men; however, the lack of precision in the estimates over age makes this more uncertain.

To gain insight into *unobservable* spouse quality, I turn to the National Survey of Families and Households (NSFH), described in Appendix A.5. Unfortunately, the small number of young, married households in the survey (3,000) provide too little power to support an identification strategy with the proxy I construct. Therefore, I follow BKP, and provide descriptive evidence of the relationship between relative wife to husband income and the measures of interest. Motivated by the model, I focus on households where men are the dominant earner (80% of these households). The results show that a higher relative income is associated with greater happiness with the marriage among women, which is mirrored by a decline in reporting of marriage trouble by women and men. This provides speculative evidence that a higher relative wage could also raise the unobserved quality of husbands, on top of the improvement in spousal attributes documented above.

5.3 Labor Market

Table 5 analyzes women's labor market outcomes. In the first column, a 10% increase in the relative wage causes women to work 1 additional hour per week. This is a small change in hours relative to the mean, but is able to explain the entirety of the rise in weekly hours of work. This

[21]Nonetheless, in Appendix Table A.5, I check whether relative education responds to the relative wage, and do not find any effect.

increase in hours worked could be caused by the change in the composition of women, since single women tend to work more hours, or by changes in working behavior conditional on marital status. A back-of-the-envelope calculation suggests that the change in the narital composition of women can explain at most 20% of the increase in hours of work, and the remaining 80% is changes in working behavior among married and single women.[22]

The remainder of Table 5 shows a statistically insignificant effect on weeks worked, but that women earn 5% more weekly income, and a 5% more in annual income (p<.1). In the last column, I find a statistically insignificant effect on employment. This is consistent with the model's prediction that, if there is a sufficiently high lower bound of spouse quality, women who are marginal on the extensive labor margin may be inframarginal to marriage. These estimates suggest that on average a lower relative wage does not deter women from working, but it does reduce hours worked, consistent with specialization within households.

Financial independence is an additional outcome of interest because it may provide a channel by which a higher relative wage can reduce women's susceptibility to emotionally or physically abusive relationships. Appendix Table A.7 shows that a 10% increase in the relative wage leads to a 3.4 percentage point increase in a woman's share of household earnings, a 7% increase. There are also substantial increases in the likelihood that women control all of the income in the household. A 10% increase in the relative wage leads to a 2.4 p.p. decline in the probability that a woman is in a male breadwinner household, a 20% decline, accompanied by an equivalent increase in households where there is a female breadwinner. These effects indicate that a higher relative wage reduces women's reliance on a male earner, which could be a mechanism for previously documented reductions in domestic violence.

5.4 Heterogeneous Responses

Having shown that the relative wage reduces marriage on average, I examine whether differential responses could explain the steeper decline in marriage among low-skilled women shown in Figure 1. Appendix Table A.8 shows that the effects across low- and high skilled women are qualitatively

[22] Conservatively, I assume that the difference in working hours between single and married women over this period is the maximum of the period (4 hours in 1981), and multiply this by the 4.8 p.p. increase in single women. This would imply that the increase in single women could increase the number of working hours by 0.2 hours.

similar, and not statistically different from one another.[23] However, these results may mask heterogeneity in marital responses, if differential behavior emerges at a later age. For example, low- and high-skilled women may place equal importance on the pecuniary incentive to marry at younger ages, but respond differently to the incentive at later ages as marriage norms and joint child-rearing become greater concerns.

In line with this, Table 6 shows that for low-skilled women, a higher relative wage leads to postponement of marriage both at "younger" (22-30) and "older" (31-44) ages; while for high-skilled women, a higher relative wage appears to only delay marriage at younger ages. This pattern of responses can help to explain two salient trends across these groups: increasing age at first marriage for all women, and reduction in marriage between ages 33 to 44 among low-skilled women (Lundberg et al., 2016). As might be expected, a higher relative wage leads to increased divorce between ages 31 to 44, but not 22 to 30, for both groups of women.

Additionally, I check in Appendix Table A.9 whether the effects on marriage and divorce dissipate over time, possibly due to reductions in the stock of marriages with undesirable spouses (Rotz, 2016). I do not find any decline in the coefficients across decades, suggesting that there continue to be marriages that are marginal to the relative wage even as screening standards for spouses have increased over time.

6 Robustness

6.1 Reverse Causation from Unobserved Trends

As discussed earlier, one might be concerned that the effects are driven by reverse causation, which in theory could happen if initial employment shares were correlated with trends in unobserved marital preferences. To test for this, I ask whether markets that are predicted to have an increase relative wages historically had dissimilar trends from other markets. Following Autor et al. (2013), I estimate a first-differenced (10-year differences) specification, using lagged outcomes from 1960-1970, and potential wages and controls collapsed to a marriage-market-by-year-pair panel.[24]

[23] Examining effects across races, I find more precise and larger responses from whites, although I find significant effects for blacks for impacts on first marriage, spousal quality, and hours of work. The confidence intervals for both blacks and Hispanics allow for meaningful impacts across outcomes, though.

[24] Specifically, I estimate: $\Delta Y_{erst'} = \beta_1 \Delta ln Relative\widehat{Potential}Wage_{erst} + \beta_1 \Delta ln Average\widehat{Potential}Wage_{erst} + \delta_{rt} + \chi_{et} + \gamma_{st} + \rho_{rs} + \Delta X_{erst}\phi + \upsilon_{erst'}$

Appendix Table A.10 presents the results for regressions of the relative wage in 1980-1990 (Panel A), 1990-2000 (Panel B), or 2000-2010 (Panel C) on 1960-1970 outcomes. Of the fifteen marriage outcomes analyzed in the first five columns, none of the relationships are statistically significant, and the direction of the relationship is typically inconsistent over time or with the the main results. While some of the coefficients approach the size of the main estimates, the standard error is typically several times larger, such that the 95% confidence interval includes an effect size of comparable magnitude in the opposite direction as the main estimate. The subsequent columns show results for the remainder of the key outcomes as well as for poverty and single motherhood. I continue to find no statistically meaningful evidence for reverse causation.

6.2 Lagged Effects and Migration

Appendix Table A.11 examines the sensitivity of the results to including the one-year lag of the relative and the average wage in addition to the contemporaneous wages. Reassuringly, the main (contemporaneous) effects are relatively unchanged from the main specification, which suggests that present shocks have a distinct and strong impact on marriage and labor market decisions. The effect of the lagged relative wage is usually half the size and statistically less precise than the contemporaneous effect.

Next, in Appendix Table A.12, I examine to what extent selective inter-state migration could influence the results using data from 1980 to 2000.[25] Panel A shows the baseline estimates for this sample, together with the estimated effect of a higher relative wage on migration. I find that a 10% increase in the relative wage is associated with a 2.3 p.p. increase in inter-state migration, suggesting that markets with a higher relative wage are more attractive to women.

In Panels B and C, I separate the effect of the relative wage into the impact on new-arrivals and women that have not migrated in the last 5 years. The change in outcomes among recent migrants gives an upper bound of the role of selective migration in my measured effects.[26] Using this conservative measure, migration could account for up to 52% of the estimated increase in never-married women, 20% of the increase in divorce, 28% of the pairing with higher educated spouses,

[25]Migration is defined by the presence of individuals that moved states in the last 5 years, which is available in the 1980, 1990, and 2000 Censuses.

[26]To prevent concerns of endogenous stratification, the outcomes are a combination of migration status and marriage status, e.g. moved in the last 5 years and never married.

and 38% of the increase in female breadwinners. This ceiling on the role of migration implies that the majority of the impacts is due to changes in behavior among long-standing residents.

7 Discussion

In this section, I examine alternative theories that could generate some of these patterns, and then look to quantify the spillover impacts of the decline in marriage on children.

7.1 Alternative Explanations

A first alternative rationalization of the marriage decline is that women do not leave their partners. Rather, because marriage is costly, when the relative wage increases, women prefer not to incur these costs and substitute towards cohabitation, which is a less costly form of commitment. Under this hypothesis, marriages can decrease even when the marginal spouse quality is positive. Counter to this theory, I find little, if any, substitution towards cohabitation in Section 5.1.

A second possibility is that these effects reflect reactions to the absolute decline male wages, which reflects fewer "marriageable men," rather than the rise in the relative wage. This theory would predict that (i) the effects depend only on the male wage, and (ii) are concentrated in areas with declining men's wages. I first separate the effects of the relative wage into effects of the male wage and female wage. Appendix Table A.13 shows that men's and women's wages have opposite-signed effects on the main outcomes. The effect of men's wages is typically larger and more precisely estimated. Nonetheless, women's wages have a statistically significant impact on the never-married rate, spousal education, and on women's hours of work. This indicates that women's wages are influential for spouse quality and first-marriage decisions, contrary to a theory that emphasizes male wages alone.

In Appendix Table A.14 I probe the importance of declining male wages by testing whether the effects are concentrated in markets where men experienced the least growth in potential wages, in the first quartile of potential wages. It shows that the effects of the relative wage are dispersed throughout the distribution of growth in male potential wages; however, the largest and most-precisely-estimated effects are in the lowest quartile of men's wage growth. This suggests that the decline in men's real wages plays an outsize role in the responses to the relative wage that I document, but does not appear to fully explain the impacts.

A third possibility is that the effect of the relative wage is simply picking up the "aversion to women earning more than men" (BKP). I address this concern using three complementary analyses. To bound the impacts of this aversion, I regress the observed probability that a woman earns more than a man in a marriage market, $PrWomanEarnsMore$, on the potential relative wage, using my main estimating equation.[27] As shown in the first column of Appendix Table A.15, a 10 percent increase in the potential relative wage correlates with a 2.9 p.p. increase in the probability that a woman earns more than a man in the market. Pairing this estimate with the marriage coefficients from BKP, I calculate that the aversion channel could account for 1 p.p. of my 4.8 p.p. effect.[28] This indicates that the majority of the effect that I estimate can not be explained by the aversion channel.

Next, I directly test the sensitivity of my main outcomes to controlling for $PrWomanEarnsMore$. Appendix Table A.16 shows that the coefficient on the relative wage is essentially unchanged by the inclusion of this control. As in BKP, the coefficient on $PrWomanEarnsMore$ indicates that a rise in the probability that a woman earns more reduces the likelihood of marriage.[29] I do not find a statistically significant effect of $PrWomanEarnsMore$ on spouse quality, and the coefficient is negative, which goes in the opposite direction of the effect of the relative wage. Third, more suggestively, I test whether the aversion channel would predict the asymmetry that I find in the effect of male and female wages. The second column of Appendix Table A.15 shows that the increase in $PrWomanEarnsMore$ from male and female wages is in fact symmetric. Thus, if the only channel by which the male or female wage affected marriage was through $PrWomanEarnsMore$, we would expect symmetric effects of these wages.

Finally, to address other potential theories, Appendix Table A.17, I introduce controls for other potential mechanisms highlighted in the literature, such as the rise in incarceration (Panel A) and

[27] Following BKP, I construct the probability that a woman earns more than a man by taking random draws of 100,000 men and women in a marriage market. The means of this variable align with reported means by BKP for the observed probability that a woman earns more.

[28] Calculated as 0.35 p.p. (s.e.: 0.181 p.p.) decline in marriage for a 1 p.p. increase in the probability that a woman earns more than a man (column 9 of Table 1 of BKP) times 3. Using the upper bound of the BKP 95% confidence interval allows for at most a 2 p.p. effect, or 41 percent of my estimate.

[29] BKP also report estimates for the impact of the potential female and potential male wage in the market, however, the reported coefficients are somewhat difficult to interpret or compare to my estimates since BKP also control for the average relative income and deciles of the female and male wage in the market, which are likely to share some collinearity with the average male and female wage.

male wage inequality (Panel B), or the decline of manufacturing (Panel C) (Loughran, 2002; Gould and Paserman, 2003; Charles and Luoh, 2010; Autor et al., 2018). The addition of these controls does not change the qualitative results, although the effects in Panel C are less precisely estimated.

7.2 Spillovers to Children's Family Structure

Understanding the impact of the relative wage on the well-being of children is a complex question that would require evidence on a multitude of outcomes outside the scope of the current paper. Nevertheless, an important piece of this is determining to what extent the effects on marriage that I have documented impact children's family structure. I answer this by examining impacts on the total number of kids, as well as separating the impacts on being married/never-married/divorced by the presence of children.[30]

Column 1 of Appendix Table A.18 shows that a 10% increase in the relative wage reduces the share of women with children present by 3 p.p. or 5 percent. Decomposing this effect, I find that the decline in children is primarily driven by a substantial 5.6 p.p. ($p < 0.05$) reduction in women that are married with children, an 11 percent effect, and, to a lesser extent, by an increase in the share of women who divorce *prior to* having children (1.2 p.p., $p < 0.05$) and who remain childless in marriage. On the other hand, there is also a rise in never-married mothers, which offsets 40% of the decline in married mothers. Hence, a higher relative wage leads fewer women to marry and have children, but also increases the share of single mothers.[31] The net effect on children, then, will depend on the relative welfare implications of each of these circumstances, which is left for future work.

8 Conclusion

The role of women in the American household has undergone a substantial shift over the last three decades. Despite the significant attention given to this trend, particularly the decline in marriage, the counterfactual to this transition has been under-explored. This paper presents new

[30] Outcomes are additive so that the sum of the impact on, e.g., being never-married with kids and never-married without kids sums to the total impact on being never-married.

[31] This is in contrast to recent studies that utilize changes in the sex ratio as an instrument for changes in women's bargaining power and find that increases in the male-to-female sex ratio increases women's marriage and reduces single motherhood (Brainerd, 2017; Abramitzky et al., 2011). However, unlike those settings, an increase in the relative wage raises women's bargaining power while also reducing the pecuniary gains to marriage.

theoretical predictions and evidence on the significance of the declining gender wage gap for spouse quality, marriage, and women's labor market outcomes. For identification I rely on variation from shifts in demand over this period, which favored traditionally "female" occupations, and affected marriage markets differentially due to historical patterns of industry location.

I provide empirical support for each of four theoretical predictions. First, I find that a 10% increase in the relative (potential) wage increases the likelihood that women marry a higher-educated spouse by 16%. I also find suggestive evidence that marital satisfaction increases when wives earn a higher share of household income. Second, I show that the marriage rate declines by 7%. The reduction in marriage is explained by reduction in first-marriages as well as increased propensity to divorce. Third, consistent with the marginal husband being undesirable, I find that 65% of women that do not marry opt to live with a female roommate or alone, and I do not find strong evidence for substitution towards cohabitation. Fourth, I find that a higher relative wage increases women's labor supply.

These results suggest that relative earnings power is an influential factor in the family formation and labor market decisions of women. This indicates that reducing the gender wage gap is not only a matter of "fairness in the workplace," but also places men and women on more equal footing in the marriage market. Moreover, this paper provides an important first step towards building an understanding of the welfare effects of the gender wage gap by highlighting empirical channels for improvements in welfare. I leave advancing the evidence on this question for future research.

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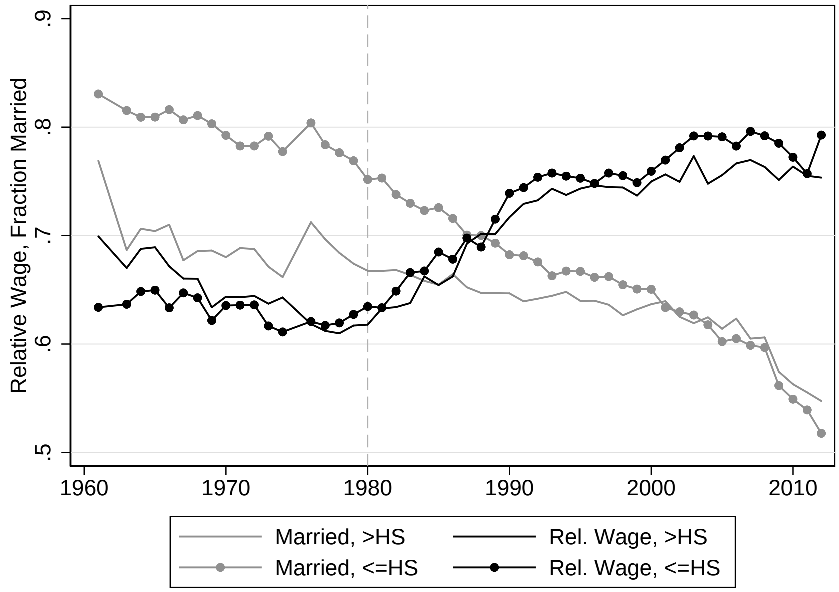
9 Figures

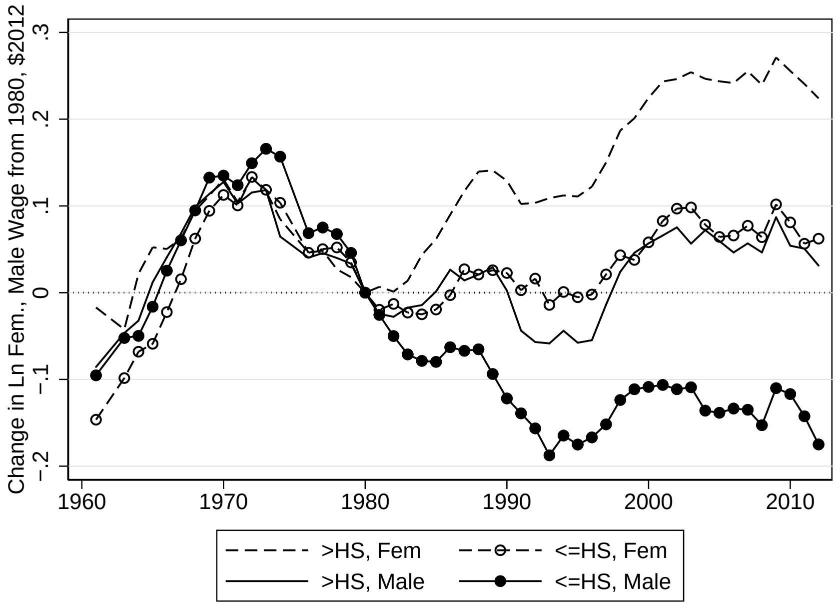
Figure 1: Women's Hourly Wage as a Fraction of Men's Wage,

and Marriage Rates



Notes: This figure depicts the relative wage, defined as the ratio of average female hourly wage to average male hourly wage, together with marriage rates. Average hourly wages are calculated from the March Annual Demographic files (1962-2012) as annual earnings divided by total hours worked. Sample for wage calculation includes individuals age 18 to 64 with positive hours worked and positive earned income; for marriage includes women 22-44 years old.

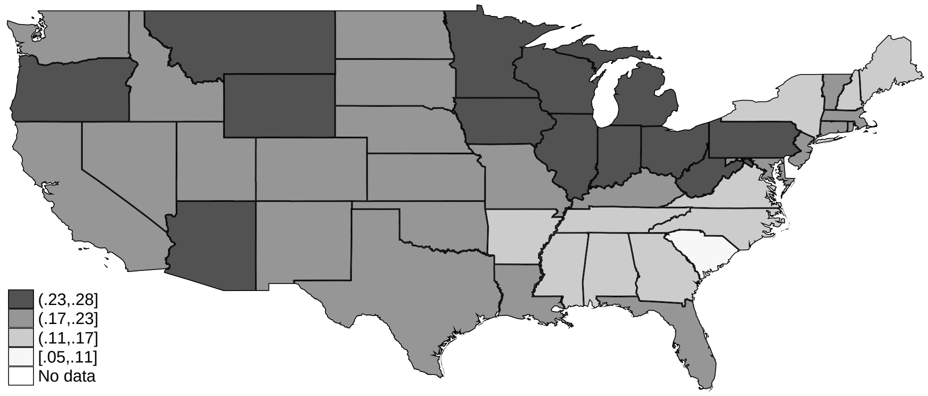
Figure 2: Change in Female, Male Ln Wage from 1980



Notes: This figure depicts the growth in log female hourly wage and log male hourly wage relative to 1980. Average hourly wages are calculated from the March Annual Demographic files (1962-2012) as annual earnings divided by total hours worked. Data include individuals age 18 to 64 with positive hours worked and positive earned income.

Figure 3: Variation Across States in Closing the Gap -

Change in $\log(\frac{\text{female wage}}{\text{male wage}})$, 1980-2010



This figure shows the state-level growth in the log female to male wage ratio between 1980 and 2010. Source: 1980-2000 decennial censuses, 2010 ACS; author's calculation.

10 Tables

Table 1: Relationship between Potential Wages and Observed Wages

	Corr. w/ Actual			Cross-Effects?	
	Relative	Female	Male	Female	Male
ln Rel. Wage (Potential)	0.833***				
	(0.225)				
ln Female Wage (Potential)		0.426**		0.571***	-0.232
		(0.202)		(0.186)	(0.255)
ln Male Wage (Potential)			0.481***	-0.228	0.613***
			(0.156)	(0.277)	(0.203)
Partial R-Squared	0.067	0.039	0.041		
Obs	1064	1064	1064	1064	1064

Notes: This table shows the coefficients from estimating Equation 1, omitting cohort controls. The dependent variable is shown in the column heading. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01 Sources: Potential wage: 1970 decennial census, 1980 - 2011 March CPS, Wages: 1980-2000 decennial censuses, 2010 ACS.

Table 2: Impact of Relative Wage on Marriage

	(1) Married	(2) Divorced	(3) Never Married
A: Relative only			
Effect of 10% Increase in Rel. Wage	-0.051***	0.019***	0.032***
	(0.014)	(0.006)	(0.010)
Obs	23573	23573	23573
B: Relative controlling for Average			
Effect of 10% Increase in Rel. Wage	-0.048***	0.017***	0.031***
	(0.009)	(0.006)	(0.008)
Effect of 10% Increase in Avg. Wage	0.079***	-0.044***	-0.027***
	(0.011)	(0.007)	(0.009)
Mean Y	0.645	0.102	0.245
Obs	23573	23573	23573

Notes: This table shows the coefficients from estimating Equation 1 rescaled to represent the effect of a 10% increase in the relative (potential) wage. The dependent variable is shown in the column heading. Standard errors clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

Table 3: Impact of Relative Wage on Cohabitation and Platonic Living Arrangements

	Cohab.	Only Other Adult in HH is:			Live Alone	2+ Other Adults
	(1)	(2)	(3)	(4)	(5)	(6)
	Official Rept.	Husband	Single Male	Female		
Effect of 10% Increase in Rel. Wage	-0.004	-0.040***	0.009**	0.012***	0.014	0.006
	(0.018)	(0.011)	(0.004)	(0.003)	(0.013)	(0.012)
Mean Y	0.159	0.457	0.066	0.059	0.259	0.159
Obs	16925	23573	23573	23573	23573	23573
Average Wage	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table shows the coefficients from estimating Equation 1 rescaled to represent the effect of a 10% increase in the relative (potential) wage. The dependent variable is shown in the column heading, and the unit of observation is a cell defined by an education x race x state x birth cohort x year. Direct cohabitation is an indicator for whether the head of household reports living with an unmarried partner (only available from 1990 on). The outcomes in columns 2, 3, and 4 are indicator variables that take on the value of 1 if an individual lives in a two adult (over 18) household where the other adult is her husband, a single male, or female, respectively. The outcomes in columns 5 and 6 are indicators for living alone or with 2 or more other adults. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

Table 4: Impact of Relative Wage on Spousal Education

	Spouse Ed., Relative to Own			Spouse Minus Own Ed.
	(1)	(2)	(3)	(4)
	Less	Same	More	
Effect of 10% Increase in Rel. Wage	-0.023*	-0.028	0.051***	0.258***
	(0.012)	(0.017)	(0.013)	(0.064)
Mean Y	0.319	0.357	0.324	0.017
Obs	22663	22663	22663	22663
Average Wage	Yes	Yes	Yes	Yes

Notes: This table shows the coefficients from estimating Equation 1 rescaled to represent the effect of a 10% increase in the relative (potential) wage. The dependent variable is shown in the column heading. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Source: Census 1980, 1990, 2000, and ACS 2010.

Table 5: Impact of Relative Wage on Women's Labor Market Outcomes

	Conditional On Working				Unconditional	
	(1)	(2)	(3)	(4)	(5)	(6)
	Wkly Hrs	Weeks Worked	ln(Wkly Inc)	ln(Inc)	Any Earnings	In Labor Force
Effect of 10% Increase in Rel. Wage	1.021***	-0.274	0.059**	0.054*	-0.011	0.001
	(0.224)	(0.441)	(0.023)	(0.030)	(0.015)	(0.013)
Mean Y	36.823	43.487	5.747	9.420	0.723	0.718
Obs	23222	23222	23186	23188	23573	23573
Average Wage	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table shows the coefficients from estimating Equation 1 rescaled to represent the effect of a 10% increase in the relative (potential) wage. The dependent variable is shown in the column heading. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

Table 6: Postponing or Opting Out? Differential Responses by Age and Education

	22-30	31-44
A: Never Married		
Effect of 10% Increase in Rel. Wage x Low Skill	0.033**	0.038***
	(0.013)	(0.011)
Effect of 10% Increase in Rel. Wage x High Skill	0.091***	-0.029*
	(0.017)	(0.016)
Obs	9286	14287
Mean Y - Low-Skill	0.322	0.125
Mean Y - High-Skill	0.469	0.145
B: Divorce		
Effect of 10% Increase in Rel. Wage x Low Skill	-0.005	0.022**
	(0.007)	(0.010)
Effect of 10% Increase in Rel. Wage x High Skill	0.009	0.042***
	(0.009)	(0.015)
Obs	9286	14287
Mean Y - Low-Skill	0.076	0.130
Mean Y - High-Skill	0.050	0.129

Notes: This table shows the coefficients from estimating Equation 1 interacted with indicators for education rescaled to represent the effect of a 10% increase in the relative (potential) wage. Interactions of the average potential wage with education are also included. The age of the sample is shown in the column heading. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

ONLINE APPENDIX:
Lowering Standards to Wed? Spouse Quality, Marriage, and Labor Market Responses to the Gender Wage Gap

Na'ama Shenhav

January 2020

A.1 Illustrative Model

This section provides a model to support the Beckerian intuition provided in Section 2. I adapt the static marriage and household decision making framework in Bertrand et al. (2018), which studies the trade-off between women's work and home production in the presence of gender norms.[32] Whereas Bertrand et al. (2018) use this model to examine how societal gender norms influence the skilled-unskilled marriage gap and women's education decisions, I derive four new theoretical predictions of the effect of the gender wage gap on spouse quality, marriage, and the labor market participation of women. The model is kept intentionally simple to advance the intuition of these predictions.

I assume that an individual i meets a potential match j and makes two decisions (i) whether to marry j; and (ii) if she marries, how much time, t_i, to allocate to home production of children, n, and time to allocate to market production, $1-t_i$. She perceives j to have spouse quality q_{ij}, which is drawn from a differentiable distribution F with continuous and positive density over the support $[\underline{q}, \overline{q}]$.[33,34] Spouse quality perceived by i and j are allowed to be independent, i.e. $q_{ij} \perp q_{ji}$.

I allow for the presence of societal norms, α_i, that inform the utility obtained from a spouse's career, following Bertrand et al. (2018). When $\alpha_i < 1$, i has some displeasure with spousal work, such as a male perception that a woman's career challenges traditional gender roles. The utility from marriage is given by:

$$\max_{0 \leq t_i \leq 1} (1-t_i)\, w_i + \alpha_i\,(1-t_j) w_j + \beta\, n\, \left(\gamma\, t_i - \frac{t_i^2}{2} + \gamma\, t_j - \frac{t_j^2}{2}\right) + q_{ij} \tag{2}$$

where $\beta > 0, \gamma \geq 1, \alpha_f = 1, 0 \leq \alpha_m < 1$, and t_j is taken as given.

From here, I apply this model to a single marriage market with homogeneous wages for men and women in the market, which reflects the empirical focus on within-market behavior. The results are unchanged when I allow for wage variation in the market. Corresponding to the data, and as in Bertrand et al. (2018), I presume that men have an advantage in market production such that $w_m > \beta\, n\, \gamma > w_f$[35]. This makes it optimal for married men to work full time. Married women, then, either (1) completely specialize in home work if w_f is too low, $w_f < \beta\, n\,(\gamma-1)$; or (2) work in the market part time, $t_f = \gamma - \frac{w_i}{\beta n}$, if $w_f > \beta\, n\,(\gamma - 1)$. Single men and women work full time

[32] The model in Bertrand et al. (2018) is closely related to the dynamic household model in Fernandez et al. (2002), both of which I follow closely. One deviation is that I model utility as quadratic in household production rather than the log of household production because it produces a slightly more straightforward prediction regarding spouse quality.

[33] Spouse quality is an inherently relative concept, as it represents the additional non-pecuniary benefits of marriage relative to remaining single. An alternative interpretation of spouse quality is as a transfer required to enter into marriage.

[34] This formulation is slightly different than in Bertrand et al. (2018), where quality is inherent to the match rather the individual, and allows for the realistic possibility that each partner in a married couple may experience different non-pecuniary gains from one's spouse.

[35] Consistent with this, husbands earn more than wives in nearly three-quarters of couples (BKP). Moreover, the potential wages that I utilize in the empirical strategy also conform to this pattern - the relative wage in the marriage market is never predicted to be above 1.

and obtain utility w_i.

Individual i marries j if her utility in marriage is greater than the outside option. Gains from marriage then derive from two sources: pecuniary gains, given by the difference between the total household earnings in marriage and her own wage; and non-pecuniary gains, which reflect the utility experienced from the public good and spouse quality. This condition produces a reservation spouse quality, q_i^*, for men and women, q_m^* and q_f^*, which is necessary and sufficient for an individual to agree to marry.

If the wife does not work ($w_f < \beta\, n\,(\gamma - 1)$), the reservation spouse qualities for men and women, q_m^* and q_f^*, respectively, are:

$$q_m^* = -\beta\, n\,(\gamma - \frac{1}{2}) \tag{3a}$$

$$q_f^* = w_f - w_m - \beta\, n\,(\gamma - \frac{1}{2}) \tag{3b}$$

whereas, if the wife works part time ($w_f > \beta\, n\,(\gamma - 1)$) they are given by:

$$q_m^* = -\alpha\, w_f\,(1 - \gamma + \frac{w_f}{\beta n}) - \beta\, n \left[\gamma\,(\gamma - \frac{w_f}{\beta n}) - \frac{1}{2}\,(\gamma - \frac{w_f}{\beta n})^2\right] \tag{4a}$$

$$q_f^* = w_f(\gamma - \frac{w_f}{\beta n}) - w_m - \beta\, n \left[\gamma(\gamma - \frac{w_f}{\beta\, n}) - \frac{1}{2}\,(\gamma - \frac{w_f}{\beta\, n})^2\right] \tag{4b}$$

Predictions

With this set up, I develop predictions about the effect of an increase in the female to male wage gap, $\Gamma(w_f, w_m) = w_f - w_m$ on women's spouse quality, marriage and labor market decisions. I provide intuition for the predictions here and proofs below. As in the empirical specification, I consider the effect of a rise in Γ that leaves the average wage constant, i.e. raises w_f and reduces w_m.[36] Unless otherwise noted, I maintain that $\underline{q} < q_i^* < \overline{q}$ for men and women, such that some, but not all matches agree to marry.

Prediction 1 *An increase in* Γ *raises average husband quality,* $E\left[q_f | q_f > q_f^*, q_m > q_m^*\right]$.

The first-order effect of a higher Γ is to reduce the pecuniary gains to marriage for women by raising the opportunity cost of marriage, single women's earnings relative to married household's earnings. A second-order effect is that it reduces the time married women spend in household production, which further lowers the value of marriage relative to being single. Together, these lead women to require greater non-pecuniary gains to offset the fewer gains of marriage, which raises the spouse quality threshold. As a result, women no longer marry men at the lower end of the spouse quality distribution, and average husband quality rises.

Prediction 2 *An increase in* Γ *unambiguously causes individuals to marry less if the gender*

[36] This "compensated" wage increase corresponds nicely to the thought experiment used as a proof for the theoretical predictions in Becker (1973), in which the combined output of the single households is kept constant.

norm is sufficiently strong ($\alpha < \frac{1}{2}$).

Marriage declines with certainty if both men and women deem a lower share of potential spouses to be unmarriageable. This occurs when the reservation spouse quality of men and women increases. As discussed above, a higher Γ raises women's reservation spouse quality. For men, a higher Γ generates two opposing effects on married utility and, in turn, on reservation quality; women's earnings increase, but household production declines. The net effect depends on the strength of the gender norm, which scales men's utility from women's earnings. When men have a strong gender norm ($\alpha < \frac{1}{2}$), an increase in Γ reduces married utility from household production more than it increases women's earnings, which raises the reservation spouse quality. The prediction is ambiguous for weaker gender norms, however.

Similar forces predict that couples will choose to divorce, though this is not possible to illustrate in a static model. One way to incorporate this would be to assume that an individual chooses to marry based on a noisy measure of spouse quality, $\widetilde{q_{ij}}$, and divorces if she learns that her true spouse quality falls below the threshold quality. As a result, when Γ increases and threshold spouse quality rises, more individuals choose to divorce.

Prediction 3 *For women, marginal marriages involve a potential husband with undesirable spouse quality: $q_f < 0$.*

Utility gains from pecuniary sources and household production create a positive incentive to enter into marriage. Women are thus willing to accept a negative spouse quality to obtain the other benefits of marriage.

Prediction 4 *An increase in Γ increases women's hours of work conditional on employment, even holding women's wage constant.*

In the model, married women work less than full time due to substitution from market work to household production. A higher Γ attenuates this substitution effect through two channels. First, a higher share of women remain single (Proposition 2), even holding women's wage constant, and spend no time in home production. Second, the opportunity cost of household production increases, and married women choose to work more hours.

Prediction 4′ *An increase in Γ has a zero or positive effect on women's labor force participation, depending on $\underline{q}$. The effect will be positive, unless $\underline{q}$ is high enough such that women who are on the margin of employment are inframarginal to marriage, i.e. $\underline{q} > q_f^*$ for all non-working wives.*

Extensive employment effects are determined entirely by the behavior of non-working married women, whose low wages cause them to work only when single. The reduction in marriage in Prediction 2, then, implies that employment will increase under a higher Γ. Importantly, however, the poor outside option for this group generates sizable pecuniary gains to marriage and drives down the reservation spouse quality. It is feasible, then, that the reservation spouse quality may fall below the lower bound of spouse quality in the market, counter to the maintained assumption of Prediction 2. In that case, these women become *inframarginal* to marriage and to employment, and labor force participation will not increase under a higher Γ.

A.1.1 Proofs of Predictions

Proof of Prediction 1

The relationship between q_f^* and Γ depends on the net effects of w_f and w_m on q_f^*, which are obtained by taking partial derivatives of Equations 3b and 4b with respect to w_f and w_m. For all women,

$$\frac{\partial q_f^*}{\partial w_m} = -1.$$

For working women,

$$\frac{\partial q_f^*}{\partial w_f} = \gamma - \frac{w_f}{\beta\, n}.$$

This is positive by the assumption that $w_f < \beta\, n\, \gamma$.
For non-working women,

$$\frac{\partial q_f^*}{\partial w_f} = 1$$

Hence, q_f^* is increasing with Γ.
Now suppose that Γ increases from Γ_0 to Γ_1 such that q_f^* rises to $q_f^*(\Gamma_1)$ from $q_f^*(\Gamma_0)$. As the quality threshold increases, women no longer marry men at the low end of marriageable spouse quality (i.e with $q_f > q_f^*(\Gamma_0)$, but $q_f < q_f^*(\Gamma_1)$), and husband quality rises.[37]

Proof of Prediction 2

Marriage declines unambiguously if q_f^* and q_m^* both increase with Γ, such that both men and women simultaneously become pickier, and there are fewer mutually-acceptable matches. The proof of Prediction 1 affirms that q_f^* is positively related to Γ. For q_m^*, I take partial derivatives of Equations 3a and 4a. For all men,

$$\frac{\partial q_m^*}{\partial w_m} = 0.$$

If women work when married ($w_f > \beta\, n\, (\gamma - 1)$),

$$\frac{\partial q_m^*}{\partial w_f} = \frac{w_f}{\beta\, n}\,(-2\,\alpha + 1) + \alpha(\gamma - 1).$$

This term is always positive when $\alpha < \frac{1}{2}$, since $\gamma > 1$. If $\alpha \geq \frac{1}{2}$, q_m^* may decrease, increase, or be unchanged with w_f, depending on the values of β, n, and γ.

[37]Note that a change in men's reservation wife quality does not affect the mean husband quality because q_f is orthogonal to q_m.

If women do not work when married $(w_f < \beta\, n\,(\gamma - 1))$

$$\frac{\partial q_m^*}{\partial w_f} = 0.$$

Thus, q_m^* and q_f^* are non-decreasing with Γ when $\alpha < \frac{1}{2}$.

Proof of Prediction 3

For women that do not work if married, it is simple to show that q_f^* in Equation 3b is negative under the assumptions of the model.

For women that work if married, q_f^* is given by Equation 4b. Analyzing the first two terms in this expression, $w_f(\gamma - \frac{w_f}{\beta n}) - w_m$,

$$\begin{aligned}
&= w_f\left(\frac{\beta n\gamma - w_f}{\beta n}\right) - w_m \\
&< w_f\left(\frac{\beta\, n\gamma - \beta\, n(\gamma - 1)}{\beta n}\right) - w_m, \text{ by } w_f > \beta\, n\,(\gamma - 1) \\
&< w_f\left(\frac{1}{\beta n}\right) - w_m \\
&< 0, \text{ by } w_f < w_m
\end{aligned}$$

Then, the last two terms, $-\beta\, n\left[\gamma(\gamma - \frac{w_f}{\beta\, n}) - \frac{1}{2}\,(\gamma - \frac{w_f}{\beta\, n})^2\right]$. This will be less than 0 if the bracketed term is positive, when:

$$\begin{aligned}
&\gamma > \left(\frac{\beta n\gamma - w_f}{\beta n}\right)\frac{1}{2} \\
&2\,\beta\, n\,\gamma > \beta n\gamma - w_f \\
&w_f > -\beta\, n\gamma, \text{which is true by the assumption that } w_f > 0.
\end{aligned}$$

Since both these terms are negative, I have shown that $q_f^* < 0$ for women that would work when married, and more broadly for all women.

Proof of Prediction 4

The proof of Prediction 3 documents that a higher Γ reduces marriage and increases the share of single women with certainty when $\alpha < \frac{1}{2}$. This mechanically increases hours of work because single women work full time, while married women (at most) work part-time. For women that work when married, increases in w_f also cause married women to increase hours of work through the substitution effect: $\frac{\partial(1-t_f)}{\partial w_f} = \frac{1}{\beta\, n}$.[38]

Proof of Prediction 5

[38] If women's bargaining power also increases in the household, hours of work may increase less (Knowles, 2012).

Under the maintained assumptions, the marriage decline in Prediction 2 is expected to increase employment of non-working married women. However, for this subgroup, the assumption that women are marginal to marriage, i.e. $q_f < q_f^*$, may be overly restrictive. In particular, among married women $w_f^{*,\text{non-working}} < w_f^{*,\text{working}}$, which implies that

$$q_f^{*,\text{non-working}} < q_f^{*,\text{working}}$$

since $\frac{\partial q_{f^*}}{\partial w_f} > 0$ (see proof of Prediction 1). Non-working married women have a lower threshold spouse quality than working women. It may be the case, then, that in some markets, the reservation quality of non-working married women is below the lower bound of spouse quality, i.e $q_f^{*,\text{non-working}} < \underline{q}$. In that case, non-working married women are *inframarginal* to marriage, and also inframarginal to working.

A.1.2 Additional Theoretical Predictions

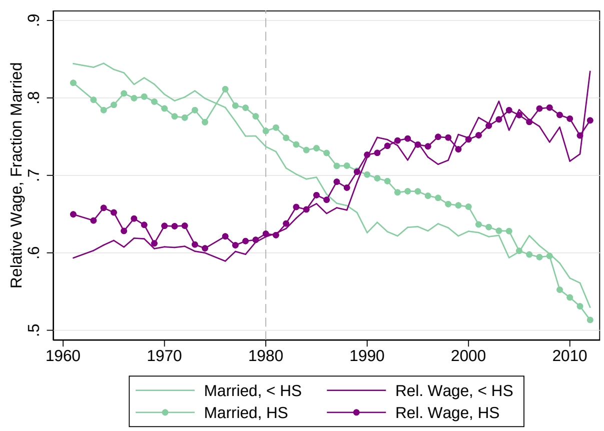
Prediction $1'$ *An increase in* $\Gamma(.)$ *has an ambiguous effect on average wife quality,* $E\left[q_m | q_f > q_f^*, q_m > q_m^*\right]$.

The relationship between q_m^* and $\Gamma(.)$ is ambiguous, since q_m^* is invariant to w_m, increasing with w_f if $\alpha < \frac{1}{2}$ and is indeterminant with w_f if $\alpha > \frac{1}{2}$ (see proof of Prediction 2.) Hence, wife quality increases if $\alpha < \frac{1}{2}$ and is indeterminant when $\alpha > \frac{1}{2}$.

A.2 Further Tables and Figures

Figure A.1: Women's Hourly Wage as a Fraction of Men's Wage, and Marriage Rates, Separating Education Categories

(a) Less than High School or High School



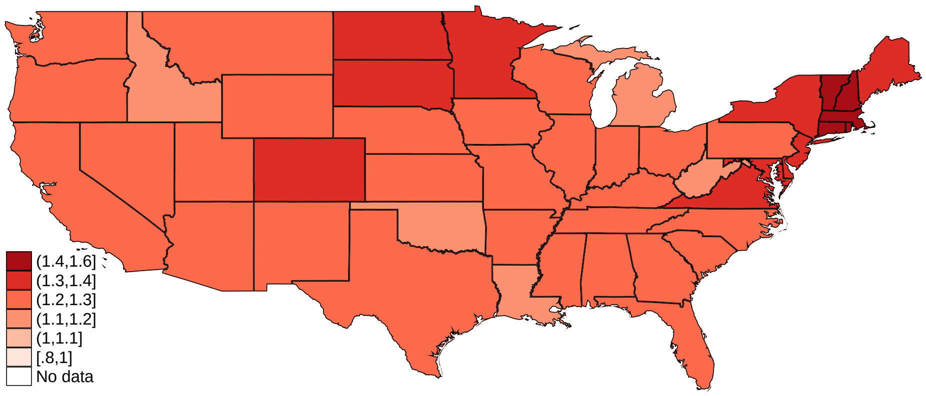
(b) Some College or College

Notes: This figure depicts the relative wage, defined as the ratio of average female hourly wage to average male hourly wage, together with marriage rates. Average hourly wages are calculated from the March Annual Demographic files (1962-2012) as annual earnings divided by total hours worked. Sample for wage calculation includes individuals age 18 to 64 with positive hours worked and positive earned income; for marriage includes women 22-44 years old.

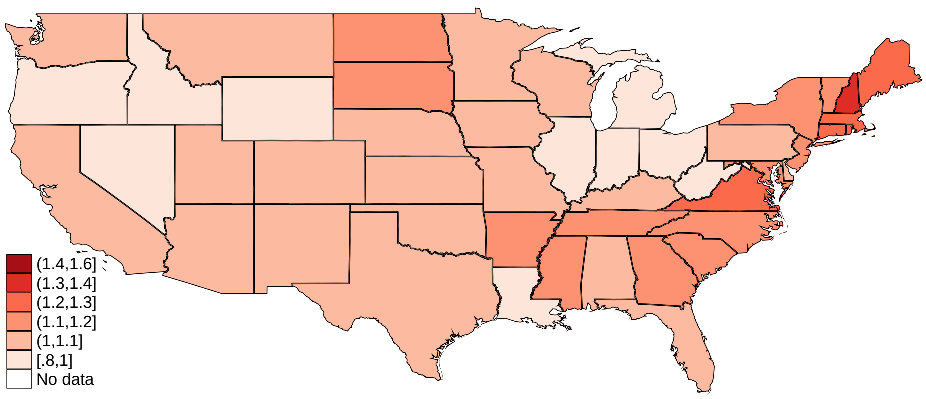
Figure A.2: Variation Across States in Change in -

log Female and log Male Wages, 1980-2010

A. Log female wage ($2012)

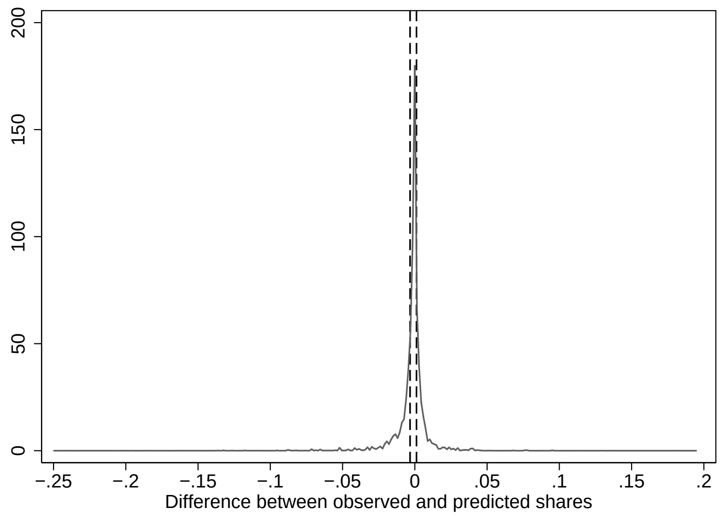


B. Log male wages ($2012)



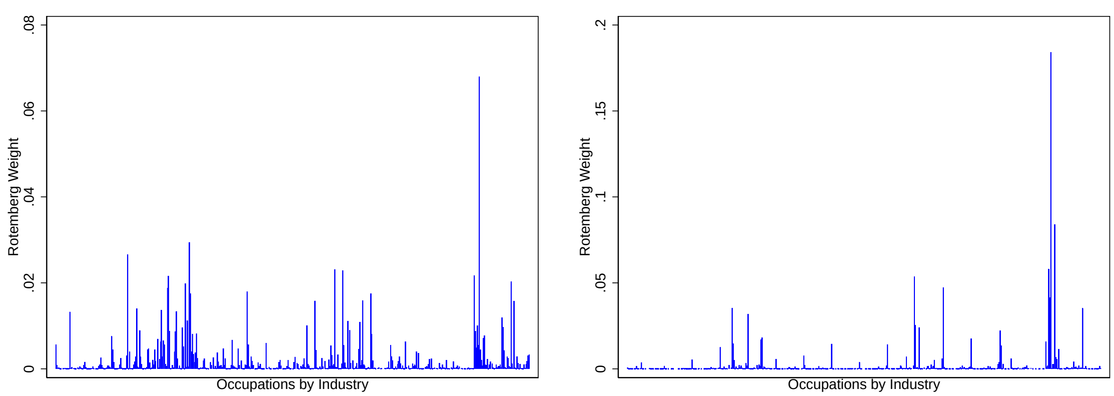
Source: 1970-2000 decennial censuses, 2010 ACS; author's calculation.

Figure A.3: Difference between Actual $\frac{E_{oj\mu g,1970}}{E_{\mu g,1970}}$ and Prediction



Notes: This figure presents the difference between the actual shares in each occupation and industry, $\frac{E_{oj\mu g,1970}}{E_{\mu g,1970}}$ and the prediction $\frac{E_{jersg,1970}}{E_{ersg,1970}} \times \frac{E_{ojerg,1970}}{E_{jerg,1970}}$. See text for details. Source: 1970 Census

Figure A.4: Rotemberg Weights for Each Industry and Occupation

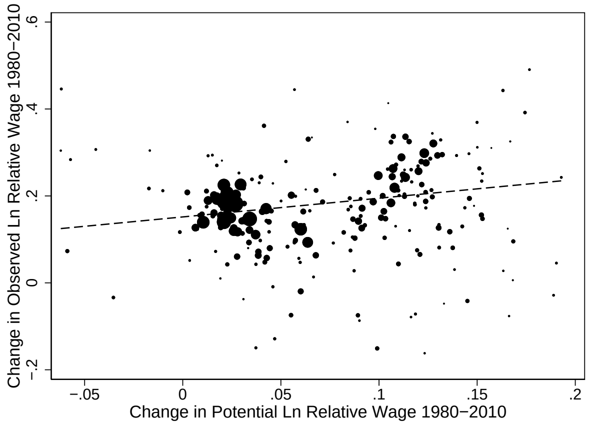


(a) Men

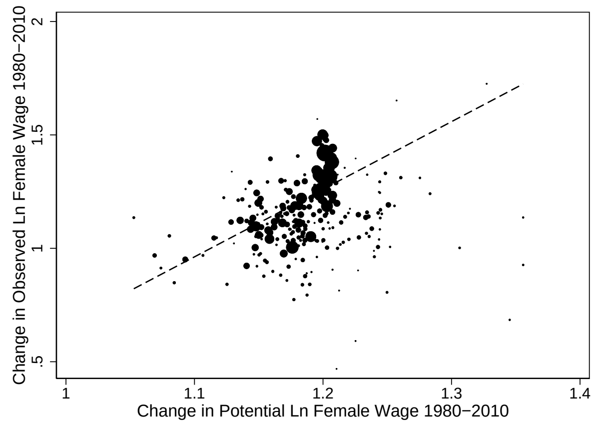
(b) Women

Notes: This figure shows the Rotemberg weights for each occupation and industry for men (panel a) and women (panel b), which quantifies the contribution of each of each occupation-industry to the identification. These are constructed using the Stata "bartik_weight" command available from the supplemental material to Goldsmith-Pinkham et al. (2018), where the endogenous variable is the observed log wage in the marriage market for men or women and the outcome in the structural equation is the share of women married in the market. By construction, the weights sum to 1 for each sex. The top 5 occupation-industries for men include: school teachers (6.8%), machine operators in basic manufacturing (2.9%), construction trades (2.6%), retail managers (2.3%, and retail salesmen (2.3%). For women these include: school teachers (18.4%) administrative support for professional service (8.4%), doctors and nurses (5.8%), retail sales (5.3%), and administrative support in finance (4.7%).

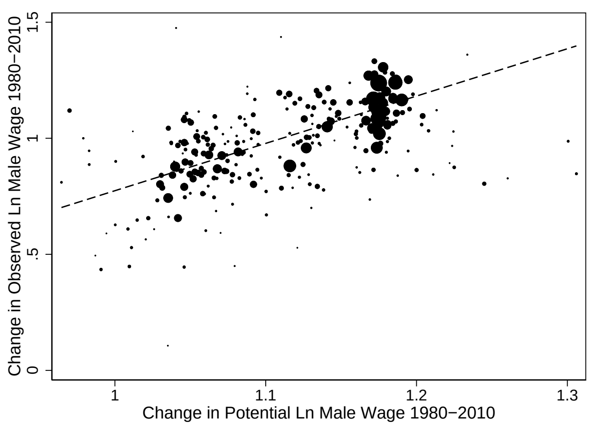
Figure A.5: Correlation between Growth in Potential Wage and Observed Wages, 1980-2010



(a) Relative



(b) Female



(c) Male

Note: This figure shows the correlation between the change in the observed wage between 1980 and 2010 in a marriage market and the corresponding change in the potential wage proxy. Size of the marker is proportional to the population in the marriage market. Extremes omitted for ease of illustration. Sources: Potential wage: 1970 decennial census, 1980 - 2011 March CPS, Observed wages: 1980-2000 decennial censuses, 2010 ACS.

Table A.1: Sample Composition, by Year

	All		1980		2010	
	Mean	SD	Mean	SD	Mean	SD
Age	32.86	6.53	31.67	6.44	33.17	6.64
Year of Birth	1962.67	12.55	1947.58	6.45	1976.83	6.64
Years of Education	13.21	2.72	12.62	2.62	13.62	2.83
White (%)	76.10	42.65	83.47	37.14	67.07	47.00
Black (%)	11.83	32.29	10.36	30.47	13.26	33.92
Hispanic (%)	12.07	32.58	6.17	24.06	19.67	39.75
Married (%)	64.86	47.74	73.83	43.95	55.98	49.64
Never Married (%)	24.09	42.76	15.69	36.37	33.88	47.33
Divorced (%)	10.26	30.34	9.44	29.23	9.57	29.42
Cohabitation (official)(%)	13.38	34.05	–	–	15.75	36.42
Spouse More Ed. (%)	33.35	47.15	39.22	48.82	27.54	44.67
Spouse Less Ed. (%)	31.06	46.27	26.89	44.34	38.17	48.58
Spouse Older (%)	70.08	45.79	73.54	44.11	68.04	46.63
Spouse Younger (%)	17.18	37.72	13.72	34.41	18.86	39.12
Single Mom (%)	17.99	38.41	12.30	32.84	24.66	43.10
Employed (%)	66.89	47.06	59.80	49.03	67.51	46.84
Weekly Hours	36.94	11.02	35.71	10.75	36.77	11.19
Weekly Earnings ($2012)	699.31	1062.57	599.15	522.97	713.84	874.77
Annual Earnings ($2012)	22997.44	29507.63	17173.24	19850.84	24653.49	36491.92
Female Breadwinner (%)	23.28	42.26	21.45	41.05	23.74	42.55
Male Breadwinner (%)	10.67	30.87	15.23	35.93	9.45	29.26
Multiple Earner (%)	61.43	48.68	58.09	49.34	62.76	48.34
Sex Ratio	1.12	0.40	1.13	0.26	1.16	0.65
Log Rel. Wage (Potential)	-0.22	0.06	-0.26	0.05	-0.18	0.06
Log Avg. Wage (Potential, $2012)	2.85	0.13	2.81	0.10	2.90	0.14
Log Rel. Wage (Actual)	-0.30	0.11	-0.43	0.09	-0.22	0.07
Log Avg. Wage (Actual, $2012)	2.87	0.24	2.82	0.17	2.88	0.29
Observations	4915368		1401324		320493	

Notes: This table shows summary statistics for white non-Hispanic, black non-Hispanic, and Hispanic women ages 22-44. Female (male) breadwinner is defined as a household with a single female (male) contributor to household income. Reported cohabitation is unavailable in 1980. Statistics are weighted by census-provided weights. Source: 1980-2000 decennial censuses and 2010 ACS.

Table A.2: Occupations with the Highest Share of Men and Women

	Share of Men	Share of Women	Top 10 Men	Top 10 Women
Management	11.9	3.4	1	0
Admin. Support	8.2	35.5	1	1
Sales	7.3	9.5	1	1
Mechanical/Electronic Repair	7.2	0.2	1	0
Misc. Operator	7.1	4.7	1	1
Construction, Mover	7.0	1.0	1	0
Vehicle Operator	6.4	0.4	1	0
Construction Trades	6.2	0.1	1	0
Metal/Wood Work	6.0	0.7	1	0
Engineers and scientists	4.1	0.3	1	0
Teacher/Social Wkr.	3.9	9.1	0	1
Assemblers	3.7	3.5	0	1
Cleaning Services	2.6	4.7	0	1
Food Service	2.2	6.7	0	1
Textile Machine Operator	1.2	5.5	0	1
Physicians/Nurses	0.7	3.7	0	1
Health Asst.	0.5	4.6	0	1

Share of men/women is calculated the number of men/women in the occupation relative to the total number of employed men/women in 1970. Weighted by census person weights. These occupations account for the majority of workers, 71.4% of male workers in 1970 and 87.4% of female workers. Source: Census 1970 - 2000, ACS 2010.

Table A.3: Ex. of Variation in Potential Wage: Growth Rate of Management across Industries

	Share (%)	Within Growth	Natl. Occ. Growth
Agriculture	29.9	1.4	1.2
Mining	4.9	2.0	1.2
Construction	8.0	1.5	1.2
Low Tech Manuf.	4.7	1.9	1.2
Basic Tech Manuf.	5.2	2.3	1.2
High Tech. Manuf.	6.4	2.2	1.2
Transportation	6.3	1.2	1.2
Communication	7.7	1.7	1.2
Utilities	5.3	2.1	1.2
Wholesale Trade	13.2	0.6	1.2
Retail Trade	12.8	0.5	1.2
Finance	17.5	1.2	1.2
Business and Repair	9.4	1.4	1.2
Personal Services	6.9	1.4	1.2
Entertainment	19.1	0.7	1.2
Professional Services	6.3	1.3	1.2
Public Administration	9.5	0.9	1.2
Total	10.2	1.4	1.2

Management was the occupation with the most males in 1970. Column 1 displays the share of the occupation in each industry in 1970. Columns 2-3 present $\pi^W_{oj,2010}$ and $\pi_{o,2010}$. I define the unexpected shock to occupation growth as the ratio of Columns 2 and 3. Source: Census 1970 - 2000, ACS 2010.

Table A.4: Correlation of Potential Wage with Observed Wages: Sensitivity to Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
A: Relative							
ln Rel. Wage (Potential)	0.916***	0.477***	0.432***	0.544***	0.630***	0.612***	0.833***
	(0.075)	(0.098)	(0.050)	(0.100)	(0.204)	(0.194)	(0.225)
Partial R-Squared	0.258	0.076	0.103	0.182	0.043	0.040	0.067
Obs	1064	1064	1064	1064	1064	1064	1064
B: Female							
ln Female Wage (Potential)	1.022***	1.791***	2.375***	2.260***	0.786***	0.574***	0.426**
	(0.009)	(0.349)	(0.411)	(0.310)	(0.172)	(0.155)	(0.202)
Partial R-Squared	0.920	0.117	0.257	0.308	0.091	0.059	0.039
Obs	1064	1064	1064	1064	1064	1064	1064
C: Male							
ln Male Wage (Potential)	0.917***	1.995***	1.983***	1.962***	0.928***	0.569***	0.481***
	(0.012)	(0.120)	(0.116)	(0.111)	(0.219)	(0.188)	(0.156)
Partial R-Squared	0.920	0.494	0.732	0.803	0.124	0.054	0.041
Obs	1064	1064	1064	1064	1064	1064	1064
StandYr FE	No	Yes	Yes	Yes	Yes	Yes	Yes
StEdRace FE	No	Yes	Yes	Yes	Yes	Yes	Yes
YrState FE	No	No	Yes	Yes	Yes	Yes	Yes
YrRace FE	No	No	No	Yes	Yes	Yes	Yes
YrEd FE	No	No	No	No	Yes	Yes	Yes
Controls	No	No	No	No	No	Yes	Yes
RaceStTrend	No	No	No	No	No	No	Yes

This table shows the sensitivity of the correlation between the potential wage and observed wage to the addition of controls, shown at the bottom of the table. Each panel shows a set of regressions where the dependent variable is the observed wage indicated in the panel title. The unit of observation is a cell defined by an education x race x state x year. Sources: Proxy: 1970 decennial census, 1980 - 2011 March CPS, Wages: 1980-2000 decennial censuses, 2010 ACS. Standard errors clustered at the state level. * p<0.10, ** p<0.05, *** p<0.01

Table A.5: Effects of the Relative Wage on Marriage Market Education Composition

	(1) Male/Fem Ed	(2) Male-Fem Ed
Effect of 10% Increase in Rel. Wage	-0.011	-0.095
	(0.009)	(0.087)
Mean Y	0.998	-0.020
Obs	23255	23267

Notes: This table shows the coefficients from estimating Equation 1 rescaled to represent the effect of a 10% increase in the relative (potential) wage. The dependent variables are the ratio of the average male education to the average female education in a cell (column 1) and the difference between the average male education and the average female education in a cell (column 2). Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

Table A.6: Impact of Relative Wage on Spousal Age

	Spouse Age, Relative to Own			Spouse Older by		Spouse Younger by		Age Gap
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Younger	Same	Older	Up to 3 Yrs	4+ Yrs	Up to 3 Yrs	4+ Yrs	Absolute
Effect of 10% Increase in Rel. Wage	0.007	0.014	-0.021*	-0.031**	0.010	0.010	0.001	0.069
	(0.010)	(0.009)	(0.012)	(0.012)	(0.013)	(0.010)	(0.004)	(0.092)
Mean Y	0.165	0.127	0.707	0.366	0.315	0.186	0.042	3.347
Obs	22673	22673	22673	22673	22673	22673	22673	22673
Average Wage	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table shows the coefficients from estimating Equation 1 rescaled to represent the effect of a 10% increase in the relative (potential) wage. The dependent variable is shown in the column heading. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

Table A.7: Impact of Relative Wage on Women's Contribution to Household Income

	Own Share of Earnings in	Income Contributor(s) in Household:		
	(1)	(2)	(3)	(4)
	Household	Fem. Breadwinner	Male Breadwinner	Multiple
Effect of 10% Increase in Rel. Wage	0.034***	0.038**	-0.024***	-0.001
	(0.009)	(0.015)	(0.006)	(0.012)
Mean Y	0.462	0.233	0.106	0.614
Obs	23423	23573	23573	23573
Average Wage	Yes	Yes	Yes	Yes

Notes: This table shows the coefficients from estimating Equation 1 rescaled to represent the effect of a 10% increase in the relative (potential) wage. The dependent variable is shown in the column heading. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

Table A.8: Heterogeneous Responses to the Relative Wage Across Subgroups

	(1) Marr.	(2) Nev. Marr.	(3) Divorced	(4) Cohab	(5) Sp. More Ed.	(6) Fem. Earner	(7) Hrs. Work
A: Interaction with Education							
Effect of 10% Increase in Rel. Wage x Low Skill	-0.043***	0.035***	0.011	0.058***	-0.005	0.026*	0.970***
	(0.009)	(0.009)	(0.007)	(0.015)	(0.020)	(0.015)	(0.238)
Effect of 10% Increase in Rel. Wage x High Skill	-0.059***	0.021	0.033***	0.032	-0.004	0.064***	1.153**
	(0.014)	(0.013)	(0.011)	(0.024)	(0.021)	(0.020)	(0.433)
Equality P-value	.283	.364	.082	.323	.952	.036	.691
B: Interaction with Race							
Effect of 10% Increase in Rel. Wage x Black	-0.005	0.023**	-0.010	0.039**	-0.001	-0.006	1.088***
	(0.010)	(0.011)	(0.007)	(0.019)	(0.020)	(0.015)	(0.361)
Effect of 10% Increase in Rel. Wage x Hispanic	-0.008	0.008	0.001	0.000	0.006	-0.001	0.278
	(0.011)	(0.011)	(0.009)	(0.017)	(0.024)	(0.013)	(0.384)
Effect of 10% Increase in Rel. Wage x White	-0.075***	0.044***	0.028***	0.042***	0.024	0.054***	1.226***
	(0.011)	(0.010)	(0.006)	(0.014)	(0.018)	(0.012)	(0.277)
Obs	23573	23573	23573	22663	16925	23573	23222
Equality P-value	0.000	0.018	0.000	0.102	0.582	0.001	0.052

Notes: This table shows the coefficients from estimating Equation 1 interacted with indicators for education (Panel A) or race (Panel B) rescaled to represent the effect of a 10% increase in the relative (potential) wage. Interactions of the average potential wage with education (Panel A) or race (Panel B) are also included. The dependent variable is shown in the column heading. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

Table A.9: Effects of the Relative Wage on Marriage by Decade

	(1) Marr.	(2) Nev. Marr.	(3) Divorced
S.S. Rel Wage x 1980	-0.053***	0.037***	0.017***
	(0.010)	(0.009)	(0.006)
S.S. Rel Wage x 1990	-0.057***	0.033***	0.022***
	(0.011)	(0.010)	(0.006)
S.S. Rel Wage x 2000	-0.056***	0.032***	0.022***
	(0.011)	(0.009)	(0.006)
S.S. Rel Wage x 2010	-0.063***	0.038***	0.023***
	(0.013)	(0.011)	(0.006)
Obs	23573	23573	23573

Notes: This table shows the coefficients from estimating Equation 1 including interactions between the relative wage and a dummy for each decade, and rescaling to represent the effect of a 10% increase in the relative (potential) wage. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

Table A.10: Does the Change in the Future Relative Wages Predict the Change in Past (1960-1970) Outcomes?

	Dep. Var: 60-70 Change in:							
	Marr.	Nev. Marr	Divorced	Sp. Less Ed	Sp. More Ed	Single Mom	Hours Work	Poverty
A: 1980-1990 Relative Wage								
Effect of 10% Increase in Rel. Wage	-0.022	0.058	-0.014	0.124	-0.127	-0.019	0.652	0.075
	(0.099)	(0.089)	(0.039)	(0.103)	(0.104)	(0.051)	(4.369)	(0.138)
Obs	231	231	231	224	224	230	202	230
B: 1990-2000 Relative Wage								
Effect of 10% Increase in Rel. Wage	0.060	-0.084	0.042	0.026	-0.118	0.021	2.005	0.178
	(0.093)	(0.098)	(0.047)	(0.164)	(0.152)	(0.064)	(6.743)	(0.149)
Obs	231	231	231	224	224	230	202	230
C: 2000-2010 Relative Wage								
Effect of 10% Increase in Rel. Wage	-0.102	0.133	-0.030	0.059	-0.056	0.028	1.149	-0.010
	(0.097)	(0.109)	(0.049)	(0.146)	(0.153)	(0.051)	(5.393)	(0.127)
Obs	231	231	231	224	224	230	202	230

Notes: This table shows the coefficients from estimating a first-differences specification described in the text rescaled to represent the effect of a 10% increase in the relative (potential) wage. The unit of observation is a marriage market, as defined in the text. The dependent variable is the difference between 1960 and 1970 in the outcome shown in the column heading. The independent variable of interest is the change in the future potential relative wage (1980 to 1990, 1990 to 2000, or 2000 to 2010) shown in the panel heading. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Pre-exposure outcomes observed in the 1960 & 1970 Censuses.

Table A.11: Insensitivity of Results to Inclusion of Lagged Wages

	(1) Marr.	(2) Nev. Marr.	(3) Divorced	(4) Cohab	(5) Sp. More Ed.	(6) Fem. Earner	(7) Hrs. Work
ln Rel. Wage Option	-0.035***	0.021**	0.012*	0.057***	0.017	0.024	0.729**
	(0.010)	(0.010)	(0.007)	(0.018)	(0.013)	(0.015)	(0.294)
Avg. ln Wage Option	0.043**	-0.001	-0.043***	-0.023	0.004	-0.017	-0.376
	(0.020)	(0.016)	(0.016)	(0.029)	(0.031)	(0.022)	(0.668)
L. ln Rel. Wage Option	-0.017**	0.013*	0.007	-0.008	-0.033*	0.018	0.382*
	(0.008)	(0.007)	(0.006)	(0.016)	(0.017)	(0.012)	(0.217)
L. Avg. ln Wage Option	0.037*	-0.026	-0.000	-0.014	-0.003	-0.031	0.525
	(0.020)	(0.016)	(0.019)	(0.035)	(0.033)	(0.021)	(0.687)
Obs	0.645	0.245	0.102	0.324	0.159	0.233	36.823
N	23573	23573	23573	22663	16925	23573	23222

Notes: This table shows the coefficients from estimating a modified version Equation 1 which includes the one-year lag of the relative and average potential wage, rescaled to represent the effect of a 10% increase in the potential wage. The dependent variable is shown in the column heading. Weighted by female population in cell. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

Table A.12: Impact of Relative Wage on Moving States

	(1) Married	(2) Nev. Marr.	(3) Divorced	(4) Sp. More Ed	(5) Fem. Earn	(6) Moved States
A: Total						
Effect of 10% Increase in Rel. Wage	-0.050***	0.027***	0.022***	0.058***	0.042***	0.023**
	(0.009)	(0.008)	(0.005)	(0.013)	(0.010)	(0.010)
B: Moved States and...						
Effect of 10% Increase in Rel. Wage	0.005	0.014***	0.004*	0.016***	0.016***	
	(0.008)	(0.004)	(0.002)	(0.005)	(0.003)	
C: Did not Move and...						
Effect of 10% Increase in Rel. Wage	-0.055***	0.013	0.018***	0.042***	0.026***	
	(0.008)	(0.008)	(0.005)	(0.011)	(0.009)	
Pct. Effect among Stayers	109.497	47.646	82.355	72.076	62.244	

Notes: This table shows the coefficients from estimating Equation 1 rescaled to represent the effect of a 10% increase in the relative (potential) wage. The dependent variable is shown in the column heading. "Moving states" is defined as having moved states in the last five years. Percent effect among stayers is calculated as Panel B divided by Panel A times 100. Weighted by female population in cell. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

Table A.13: Impacts of Male, Female Wage Potential Wage on Main Outcomes

	(1) Marr.	(2) Nev. Marr.	(3) Divorced	(4) Sp. More Ed.	(5) Cohab	(6) Fem. Earner	(7) Hrs. Work
Effect of 10% Increase in Male Wage	0.087***	-0.045***	-0.039***	-0.069***	0.010	-0.062***	-0.980***
	(0.009)	(0.009)	(0.007)	(0.015)	(0.021)	(0.018)	(0.300)
Effect of 10% Increase in Female Wage	-0.008	0.017*	-0.004	0.033**	0.002	0.014	1.062***
	(0.011)	(0.009)	(0.006)	(0.015)	(0.017)	(0.015)	(0.252)
Test Equal,Oppos:							
P-value	0.000	0.006	0.000	0.019	0.335	0.000	0.804
F-statistic	56.508	8.233	33.694	5.897	0.947	15.926	0.062

Notes: This table shows the coefficients from estimating Equation 1, substituting the potential wages for male and female wages for the relative wage, rescaled to represent the effect of a 10% increase in the male/female wage. The bottom two rows of the table show the p-value and F-statistics associated with the test that the male and female potential wages are equal in magnitude and opposite in sign. Weighted by female population in cell. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

Table A.14: Impacts of Relative Wage

Interacted with Quartile of Growth in Male Wage Potential Wage

	(1) Marr.	(2) Nev. Marr.	(3) Divorced	(4) Cohab	(5) Sp. More Ed.	(6) Fem. Earner	(7) Hrs. Work
10% Increase in Rel. Wage x Q1 of D. Male Wage	-0.042**	0.036**	0.007	0.055***	-0.024	0.034**	0.101
	(0.016)	(0.015)	(0.007)	(0.014)	(0.022)	(0.015)	(0.359)
10% Increase in Rel. Wage x Q2 of D. Male Wage	-0.021	0.019	0.003	0.043**	0.016	0.013	-0.002
	(0.015)	(0.013)	(0.008)	(0.017)	(0.020)	(0.013)	(0.326)
10% Increase in Rel. Wage x Q3 of D. Male Wage	-0.007	0.019	-0.004	-0.021	0.022	0.030*	0.429
	(0.021)	(0.019)	(0.010)	(0.022)	(0.022)	(0.017)	(0.540)
10% Increase in Rel. Wage x Q4 of D. Male Wage	-0.031*	0.031**	0.002	-0.013	-0.012	0.030*	-0.304
	(0.016)	(0.015)	(0.007)	(0.025)	(0.024)	(0.016)	(0.424)
Mean Y	0.645	0.245	0.102	0.324	0.159	0.233	36.823
Obs	795	795	795	795	525	795	795

Notes: This table shows the coefficients from a first-differenced equation, described in the text, which includes interactions between the change in the relative wage with indicators for the quartile of the distribution of growth in the male wage potential wage, rescaled to represent the effect of a 10% increase in the relative (potential) wage. The dependent variable is shown in the column heading. Quartile of growth is defined separately for each year. The first quartile generally ranges from 0 to 0.02 log points; second from 0.02 to 0.08; third from 0.08 to 0.085; and fourth from 0.085 to 0.09. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

Table A.15: Benchmarking the Effect of PrWomanEarnsMore

	PrWomanEarnsMore	
Effect of 10% Increase in Rel. Wage	0.029**	
	(0.014)	
(mean) lncpsaveshiftwage	0.005	
	(0.015)	
Effect of 10% Increase in Male Wage		-0.026
		(0.019)
Effect of 10% Increase in Female Wage		0.031***
		(0.011)
Obs	1064	1064
Mean Y	0.259	0.259

Notes: This table shows the coefficients from estimating Equation 1, omitting unnecessary cohort controls, when the outcome is the probability that a woman earns more than a man in the market. Construction of this variable is described in the text. The dependent variable is shown in the column heading. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

Table A.16: Distinguishing the Effect of the Relative Wage from PrWomanEarnsMore

	(1) Marr.	(2) Nev. Marr.	(3) Divorced	(4) Cohab	(5) Sp. More Ed.	(6) Fem. Earner	(7) Hrs. Work
Effect of 10% Increase in Rel. Wage	-0.044***	0.027***	0.017***	0.052***	-0.006	0.042**	0.822***
	(0.009)	(0.008)	(0.006)	(0.013)	(0.019)	(0.016)	(0.206)
Effect of 10 p.p. Increase in PrWomanEarnsMore	-0.009*	0.009*	0.001	-0.003	0.003	-0.009	0.518***
	(0.005)	(0.005)	(0.003)	(0.007)	(0.006)	(0.006)	(0.146)
Mean	0.645	0.245	0.102	0.324	0.159	0.233	36.823
Obs	23573	23573	23573	22663	16925	23573	23222

Notes: This table shows the coefficients from estimating Equation 1 when the probability that a woman earns more is included as a control. Construction of this variable is described in the text. The dependent variable is shown in the column heading. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Source: Census 1980, 1990, 2000, and ACS 2010.

Table A.17: Effects of the Relative Wage, Controlling for Alternative Mechanisms

	Marr.	Nev. Marr.	Divorced	Cohab	Sp. More Ed.	Fem. Earner	ln Rel. Wage
A: + ln(Pop.), Share Incarc.							
Effect of 10% Increase in Rel. Wage	-0.039***	0.035***	0.005	-0.006	0.024**	0.021*	0.059***
	(0.008)	(0.008)	(0.005)	(0.014)	(0.010)	(0.012)	(0.018)
B: + Male Wage Variance							
Effect of 10% Increase in Rel. Wage	-0.040***	0.030***	0.010**	-0.006	0.021**	0.026**	0.059***
	(0.007)	(0.007)	(0.004)	(0.014)	(0.010)	(0.013)	(0.018)
*C: + 1970 Manuf.*Yr. FE*							
Effect of 10% Increase in Rel. Wage	-0.037***	0.026***	0.011**	-0.008	0.017	0.028**	0.055***
	(0.009)	(0.008)	(0.005)	(0.016)	(0.014)	(0.013)	(0.020)
Obs	23278	23278	23278	16805	22465	23278	1057

Notes: This table shows the coefficients from estimating Equation 1 rescaled to represent the effect of a 10% increase in the relative (potential) wage. The dependent variable is shown in the column heading. Panel A adds controls for the log population and shares of men and women incarcerated in the marriage market. Panel B adds a control for the 50-10, 90-50, and 90-10 gap in men's log wages for all outcomes except the observed relative wage. Panel C adds a control for the share of individuals in the marriage market employed in manufacturing in 1970 interacted with year fixed effects. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

Table A.18: Marriage Effects by Whether Have Children in Household

	Any Kids	Married w/		Nev. Married w/		Divorced w/	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Kids	No Kids	Kids	No Kids	Kids	No Kids
Effect of 10% Increase in Rel. Wage	-0.030***	-0.056***	0.008	0.022***	0.009	0.006	0.012***
	(0.008)	(0.009)	(0.005)	(0.007)	(0.006)	(0.005)	(0.003)
Mean Y	0.634	0.511	0.135	0.054	0.191	0.063	0.039
Obs	23573	23573	23573	23573	23573	23573	23573
Average Wage	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table shows the coefficients from estimating Equation 1 rescaled to represent the effect of a 10% increase in the relative (potential) wage. The dependent variable is shown in the column heading. "Any children" is defined as having at least one child (biological, adopted, or stepchild) of any age in the household. The outcomes in columns 2-7 are the share of women that have a particular marital status and children/no children in the household. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

A.3 Data Appendix

Tables A.19 and A.20 show the 17 industries and 28 occupation groupings used in the analysis. I define occupations using the broad groupings by type of work in IPUMS. Industries are classified similarly to Katz and Murphy (1992), with manufacturing disaggregated into three industries.

I follow Autor et al. (2008) closely to construct wage variables in the Census and CPS. I drop all imputed wage observations, and multiply top coded earnings are multiplied by 1.5 and hourly earnings are set not to exceed top coded earnings multiplied by 1.5 divided by 1400 hours. The hourly wage is then set as annual earnings divided by weeks worked times usual hours worked. Wages are averaged using CPS sample weights multiplied by hours worked.

Table A.19: Industry Groupings

1. Agriculture, forestry, and fishing
2. Mining
3. Construction
4. Low Tech Manufacturing
5. Basic Tech Manufacturing
6. High Tech Manufacturing
7. Transportation
8. Communication
9. Utilities
10. Wholesale Trade
11. Retail Trade
12. Finance
13. Protective services
14. Personal Services
15. Entertainment and Recreation
16. Professional Services
17. Public Administration

Table A.20: Occupation Groupings

1. Management
2. Engineers and scientists
3. Other technicians
4. Physicians/Nurses
5. Health assistants
6. Teachers and social workers
7. Lawyers and judges
8. Entertainment
9. Sales
10. Administrative support
11. Cleaning services
12. Other personal service
13. Protective services
14. Food service
15. Farm and forestry workers
16. Mechanical and electronic repair
17. Construction trades
18. Mining extraction
19. Metal or wood work or calibrators
20. Plant operator
21. Metal work operator
22. Textile work
23. Misc machine operator
24. Assemblers/fabricators
25. Vehicle operators
26. Construction, movers
27. Financial specialists
28. Management support

A.4 Alternative Constructions of Potential Wage

A.4.1 Comparison of Potential Wage with Previous Methods

In this section, I create two additional, alternative, proxies for potential wages which use variation slightly different from that used in the paper, which I will refer to as the dynamic occupation-industry proxy, in order to understand the importance of each source of variation.

In particular, the first alternative proxy, which I will refer to as the demographic-industry proxy, eliminates any variation in occupation in the fixed share of workers, but adds demographic by industry variation in wages. This approach is akin to that taken in Bertrand et al. (2015) to generate a wage proxy at the mean, with four important differences; (1) the marriage market is defined as education-race-state cells, instead of education-race-state-age cells; (2) national wages are defined in the CPS instead of the Census; (3) national wages are hourly rather than annual (4) the base year is 1970 instead of 1980.

$$\widehat{w_{\mu gt}} = \sum_j \frac{E_{j\mu g,1970}}{E_{\mu g,1970}} \times w_{j,\mu g,t,-s}$$

The second proxy, the "static occupation-industry proxy", simply removes the dynamic updating of the shares, π_t^W from the instrument used in this paper:

$$w_{\mu gt} = \sum_o \sum_j \frac{E_{oj\mu g,1970}}{E_{\mu g,1970}} \times w_{ojt,-s}$$

In Table A.21, I show the results of estimating Equation 1, removing cohort-varying controls, for relative wages using the demographic-industry proxy (Panel A), or the static occupation-industry proxy (Panel B), together with the dynamic occupation-industry proxy (Panel C).[39] To test the sensitivity of the correlations, I increasingly add more controls, and show the full specification in Column 6.

Comparing estimates across panels, it is clear that conditional on national time varying race and education controls, the proxy which takes advantage of occupation variation is more highly correlated (four-fold) with the observed relative wage than that which relies on industry and demographic variation in wages. In particular, when year by race fixed effects are added in Column 4, the coefficient on the proxy in Panel A drops substantially in magnitude and the standard error doubles. The estimate does not recover when year by education group fixed effects or controls are added. This suggests that there may not be enough variation within race and education groups in wage growth by industry to be able to generate a significant correlation with the observed relative wage net of the time-varying fixed effects. Another thing to note is that the coefficients are not very different between the dynamic occupation-industry proxy and the static occupation-industry. Nonetheless, the standard errors are lower (by 10%) and the coefficients are higher (by 12%) for

[39] I focus on the sensitivity of the proxy for the relative wage because it is the key regressor in the analysis. I have previously looked at the sensitivity of the gender-specific wage proxies when created in these three manners, and found that there is a much smaller difference in their predictive power across specifications.

the dynamic occupation-industry proxy, suggesting that adding the dynamic updating of shares is helping increase the correlation between the proxy and observed wages.

Table A.21: Correlation with Observed Wages: Bridge with Other Variation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
A: Variation by demographic-industry							
ln Rel. Wage (Potential)	0.861***	0.397***	0.286***	0.142	0.166	0.180*	0.174*
	(0.039)	(0.068)	(0.040)	(0.094)	(0.100)	(0.093)	(0.095)
Partial R-Squared	0.642	0.089	0.075	0.009	0.014	0.017	0.018
Obs	1064	1064	1064	1064	1064	1064	1064
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
B: Variation by occupation-industry							
ln Rel. Wage (Potential)	0.993***	0.521***	0.438***	0.566***	0.591**	0.579**	0.745***
	(0.088)	(0.104)	(0.055)	(0.109)	(0.238)	(0.218)	(0.249)
Partial R-Squared	0.305	0.077	0.090	0.166	0.027	0.027	0.039
Obs	1064	1064	1064	1064	1064	1064	1064
C: Add dynamic shares							
ln Rel. Wage (Potential)	0.916***	0.477***	0.432***	0.544***	0.630***	0.612***	0.833***
	(0.075)	(0.098)	(0.050)	(0.100)	(0.204)	(0.194)	(0.225)
Partial R-Squared	0.258	0.076	0.103	0.182	0.043	0.040	0.067
Obs	1064	1064	1064	1064	1064	1064	1064
StandYr FE	No	Yes	Yes	Yes	Yes	Yes	Yes
StEdRace FE	No	Yes	Yes	Yes	Yes	Yes	Yes
YrEd FE	No	No	No	No	Yes	Yes	Yes
YrRace FE	No	No	No	Yes	Yes	Yes	Yes
YrState FE	No	No	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No	Yes	Yes
RaceStTrend	No	No	No	No	No	Yes	Yes

The unit of observation is a cell defined by an education x race x state x year. Sources: Proxy: 1970 decennial census, 1980 - 2011 March CPS, Wages: 1980-2000 decennial censuses, 2010 ACS. Standard errors clustered at the state level. * p<0.10, ** p<0.05, *** p<0.01

Finally, Table A.22 shows the main results of the paper re-estimated using the static occupation-industry proxy described above. Although I show that including dynamics in the construction of the potential wage increases precision above, this variation may be undesirable if it is correlated with local marriage market decisions. If this form of endogeneity was influential for the results, we might expect the findings to be significantly different when the dynamics are removed. In contrast to this, the results in Table A.22 are quite similar to the estimates with my preferred proxy. The only important departure is that the effects on divorce are attenuated, which then also reduces the effects on marriage rates by construction. Nonetheless, the effects are are within the 95 percent confidence interval of the main estimates.

Table A.22: Effects of the Relative Wage, Removing Dynamic Updating from Potential Wage Constuction

	(1) Marr.	(2) Nev. Marr.	(3) Divorced	(4) Cohab	(5) Sp. More Ed.	(6) Fem. Earner	(7) Hrs. Work
ln Rel. Wage (Potential)	-0.036**	0.031***	0.006	0.047***	0.002	0.027**	1.108***
	(0.015)	(0.010)	(0.007)	(0.016)	(0.016)	(0.013)	(0.296)
Mean Y	0.645	0.245	0.102	0.324	0.159	0.233	36.823
Obs	23573	23573	23573	22663	16925	23573	23222
Average Wage	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table shows the coefficients from estimating Equation 1 rescaled to represent the effect of a 10% increase in the relative (potential) wage using the static occupation-industry proxy described in Section A.4.1. The dependent variable is shown in the column heading. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

A.4.2 Sensitivity of Potential Wage to Census Wages and Alternative Education Groupings

The baseline results use a potential wage which relies on variation from 28 occupations; wages from the March CPS supplement; and varies across two education groups that are separated by any college participation. Nonetheless, the results are robust to defining education categories by non-college attainment/college-attainment, fewer occupations, and the use of the Census-reported income. Table A.23 shows the power of three alternative wage proxies where all three rely on variation from 21 occupations[40], the second and third utilize Census wage information, and the third utilizes the alternative categorization of education groups.

Table A.23: Sensitivity to Fewer Occupations, Census Wages, College-Education Groupings

	(1) 21 Occs	(2) + Census	(3) + Col. Groups
ln Rel. Wage Option	0.712***	0.608***	0.650***
	(0.220)	(0.223)	(0.176)
Partial R-Squared	0.481	0.054	0.030
Obs	1064	1064	23091

This table estimates Equation 1, removing cohort-varying controls, where the outcome is wages from the Census and the wage proxy is constructed as described in Section 4 with the above modifications. Standard errors clustered at the state level. * p<0.10, ** p<0.05, *** p<0.01. Sources: 1970-2000 Censuses, 2010 ACS.

I use the last potential wage to investigate whether the effects of the relative wage differ for individuals with a college education. This speaks to the assertion that differential responses to changes in the incentive to specialize might explain the gap in marriage across college- and non-college-educated individuals (Lundberg et al., 2016). Table A.24 provides some support for this claim: an increase in the relative wage has a smaller impact on the likelihood that a college-educated woman remains unmarried compared with less-educated women. For other outcomes, the effects are of similar magnitude or larger, in the case of hours worked, for college-educated women.

[40] The occupations combine technicians and engineers/scientists; construction and protective services and mining extraction; personal services and food services; metal work operator and plant operator; textile operator with assemblers; motor vehicle operation and moving

Table A.24: Do Effects of Relative Wage Differ For College-Educated?

	(1) Marr.	(2) Nev. Marr.	(3) Divorced	(4) Cohab	(5) Sp. More Ed.	(6) Fem. Earner	(7) Hrs. Work
ln Rel. Wage x Col+	-0.023**	0.017*	0.007	-0.010	0.007	0.024**	0.280
	(0.009)	(0.009)	(0.009)	(0.012)	(0.015)	(0.010)	(0.457)
ln Rel. Wage x HS-	-0.057***	0.059***	-0.001	0.051***	-0.001	0.036***	-0.334
	(0.009)	(0.010)	(0.008)	(0.014)	(0.016)	(0.010)	(0.464)
Obs	0.645	0.245	0.102	0.325	0.159	0.233	36.785
N	45371	45371	45371	42279	31551	45371	43963

Notes: This table shows the coefficients from estimating Equation 1 on a sample of women ages 22-44. "HS-" indicates having up to some college education, "Col+" indicates having at least a college degree. The dependent variable is shown in the column heading. Standard errors are clustered at the state level, and cells are weighted by the female population in cell. * p<0.10, ** p<0.05, *** p<0.01. Source: Census 1980, 1990, 2000, and ACS 2010.

A.5 Descriptive Evidence with NSFH

This section uses Wave 1 (collected 1987-1988) of the NSFH to provide descriptive estimates of the relationship between relative wife to husband income in the household and reported marital satisfaction. Under the assumption that happiness in marriage rises with spouse quality, this provides corroborating evidence that husband quality improves with the relative wage. Although the survey contains rich data over preferences and happiness among married couples, the relatively few households in the survey provide insufficient power to perform estimation with the exogeneous proxy for the relative wage. Therefore, I provide cross-sectional estimates of this relationship, which I believe are informative, although susceptible to biases.

The NSFH is a national survey of 13,000 households that collects comprehensive information regarding the marital history and cohabitation of a primary respondent and his or her spouse, if applicable. For the most part, I treat the data similarly to Bertrand et al. (2015), who use this data to study the change in marital satisfaction when women earn more than men.[41] Their sample includes 4,000 married couples where at least one person earns positive income. I further hone in on households where the wife is between the ages of 22 and 44 (to match my Census sample) and where she earns less than her husband (to fit the set-up of the theoretical model). This conveniently also allows me to abstract from the aversion mechanism that forms the focus in Bertrand et al. (2015). There are 3,000 married households with relevant ages, and I remain with 80% of these (2,400) after the income restriction.

I analyze responses to three survey questions that capture marital happiness to varying degrees. The first two, which were also used in Bertrand et al. (2015), measure whether a respondent describes her marriage as very happy (7 on a scale of 1 to 7) and whether during the past year the respondent ever thought that marriage might be in trouble. To supplement these and address the prior literature on domestic violence (Aizer, 2010), I also examine the responses to whether an argument with her partner became physical in the past year.

I estimate

$$Y_i = \beta_1 lnRelativeIncome_i + \beta_2 lnTotalIncome_i + \beta_3 X_i + \epsilon_i \tag{5}$$

where Y_i is a binary variable based on the survey response by either the wife or husband, $lnRelativeIncome$ is the difference between $lnWifeIncome$ and $lnHusbandIncome$[42] and X_i is a vector that includes an indicators for region of residence, whether the wife is working, whether the husband is working, race and ethnicity of the wife and husband, education category; quadratics in the wife's and husband's ages; and a linear term in years of education.

Table A.25 reports that when the relative income is more equal (higher) a woman is more likely to describe her marriage as very happy and less likely to have thought her marriage was in trouble

[41] In results not reported, I replicated the NSFH results in Bertrand et al. (2015).

[42] Following Bertrand et al. (2015), I set lnWifeIncome equal to 0 if wife's income is 0, and similarly for husband's income. Results are robust to replacing $lnRelativeIncome$ with $WifeShareIncome = \frac{\text{WifeIncome}}{TotalIncome}$.

in the last year. The effect on physical violence is statistically insignificant; however, the baseline incidence of violence is quite low (7.5%), which could make it difficult to detect an impact, in addition to the fact that misreporting could be more prevalent for this question. Interestingly, a higher relative wage is also associated with less marital strife for husbands. Since men do not report being happier, this could be a reflection of less distress among women. Taken together with the estimates of improvements in spousal characteristics in Section 5.1, this helps to provide a unified picture of that a higher relative wage leads to greater husband quality, as predicted in the model.

Table A.25: Correlation Between Relative Wife to Husband Income and Marital Satisfaction

	V. Happy	Marr. Trouble	Physical Last Year
A: Wife's Response			
Ln(Wife Income/Husband Income)	0.027**	-0.018*	0.002
	(0.011)	(0.010)	(0.005)
Mean Y	0.477	0.298	0.075
Obs	2433	2391	2369
B: Husband's Response			
Ln(Wife Income/Husband Income)	0.011	-0.026***	-0.003
	(0.010)	(0.010)	(0.006)
Mean Y	0.437	0.254	0.074
Obs	2435	2407	2388

Responses of married men and women in households where the wife is between the ages of 22 and 44 and earns less than her husband. Survey questions are described in the test. Regressions weighted by married couple case weight ("spweight") and robust standard errors are shown. Source: Wave 1 of NSFH.