Why Bother?
The Effect of Declining Marriage Prospects on Employment of Young Men

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Abstract

Why have so many young men withdrawn from the U.S. labor force since 1965? This paper presents a model in which men invest time in employment to enhance their value as marriage partners. When the marriage market return on this investment declines, young men's employment declines as well, in preparation for a less favorable marriage market. Taking this prediction to data, I show that fewer young men sought employment after 2 interventions that reduced the value of gender-role-specialization within marriage: i) the adoption of unilateral divorce legislation, and ii) demand-driven improvements in women's employment opportunities. I then show, using a structural estimation, that half of the employment effect of a labor market shock to men's wages is determined by endogenous adjustment of the marriage market to the shock. These findings establish the changing marriage market as an important driver of decline in young men's labor market involvement.

JEL codes: E24, J12, J21, J22, J24

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1 Introduction.

Between 1965 and 2015, the share of U.S. men aged 25-34 not participating in the labor force more than tripled (Figure 1). Most of this aggregate change came from noncollege-educated men, for whom non-participation increased nearly seven-fold![1] Rising joblessness of young men poses implications for human capital accumulation, family incomes, investments in children, and inequality in these outcomes.

A leading explanation for this development is that reductions in labor demand curtailed the labor market opportunities of noncollege men and induced their exit from the workforce (Juhn et al., 1991; Juhn, 1992; Bound and Holzer, 2000; Moffitt, 2012; Autor et al., 2013; Acemoglu et al., 2016; CEA, 2016; Acemoglu and Restrepo, 2017; Jaimovich and Siu, 2018; Charles et al., 2018). As shown in Panel A of Figure 2, declines in noncollege men's labor-force participation throughout the 1970s, 80s and 2000s occurred alongside declines in hourly earnings. These declines of quantity and price support the notion that the demand curve has been shifting inward.

Two important features of the data, however, suggest that falling labor demand is not a complete explanation. First, prominent labor demand forces were found in a recent review to account for less than half of observed decline in U.S. employment since 1999 (Abraham and Kearney, 2018). Second, it is not obvious that labor demand shifts should cause large changes to men's employment. Most estimates of the wage elasticity of male labor supply are small,[2] suggesting that male employment responds little to persistent wage changes. And in the 90 years preceding 1970, dramatic wage increases accompanied virtually no change in men's employment (Pencavel, 1986).[3] Therefore, factors beyond falling labor demand appear necessary to explain post-1965 change in noncollege men's employment.

This paper argues that changes in the labor market have interacted with changes in another market—**the marriage market**—and that such interaction provides a more complete explanation of the data. Figure 3 shows that noncollege men experienced a tremendous decline in marriage propensities at the same time that they withdrew from the workforce.[4] Previous

[1] This is according to data from the March supplement to the Current Population Survey (CPS). Throughout this paper I consider noncollege-educated men to be men with at most one year of completed college. I often refer to this group as "noncollege" for brevity.

[2] The relevant elasticity here is the uncompensated (Marshallian) labor supply elasticity, as this describes the effect of a persistent wage change on labor supply. Coglianese (2018) surveys the literature and finds uncompensated elasticity estimates ranging from -0.02 to 0.14 (with a mean of 0.04).

[3] This relationship is evident in Panel B of Figure 2, which uses U.S. Census data to extend the wage and participation series back to 1940.

[4] Some of the secular decline in marriage has been offset by a rise in non-marital cohabitation and a delay in the age at first marriage. However, this is more important before age 35, as many cohabitations either turn into marriages or dissolve by this age (Mernitz, 2018). The graph presents marriage propensities for men aged

reviews of this well-known "retreat from marriage" (e.g. Stevenson and Wolfers, 2007; Cherlin, 2014; Lundberg et al., 2016) have argued that changes to marriage and labor markets have reduced the attractiveness of the gender-role-specialized marriage—the predominant arrangement of working-class families in 1960. This paper argues that these changes have also reduced the value a stably-employed noncollege man could extract from the marriage market. As a consequence, young noncollege men stood to gain less from investing time in employment in 2015 than they did in 1965.

The foundation for this argument is the hypothesis that one reason young men may work hard is to improve their prospects on the marriage market. I begin by deriving such a hypothesis from a general economic framework. Male agents first choose how much time to invest in employment, taking labor market opportunities as given. Then, they participate in a competitive marriage market. The driving assumption is that the economic value of marriage depends positively on the quantity of labor men supply before the marriage market. Thus, men who have sacrificed leisure to build the most promising careers have the most to offer prospective marriage partners. I show that in equilibrium, men who expect to marry work more before entering the marriage market than men who expect to remain single. These men earn a **marriage market return** on pre-marital employment that depends on i) the effect of pre-marital employment on the economic value of marriage; and ii) the terms of marriage—that is, the share of economic value that the husband gets to claim for himself.

The framework generates two implications for secular decline in noncollege men's employment. I illustrate these with comparative statics. First, I consider a marriage market shock that lowers the value of gender-role-specialization within marriage. In response to this shock, the model predicts that i) fewer marriages involving noncollege men form; ii) the shares of marital value claimed by noncollege husbands decline; and iii) the employment propensity of young noncollege men declines. Thus, *a marriage market shock causes a shift of noncollege men's labor supply curve* at a given set of labor market opportunities. Second, I consider a labor market shock that reduces noncollege men's wage offers. The model predicts the same 3 responses. Thus, a labor market shock causes an employment response in part through its effect on marriage prospects. *This endogenous response of the marriage market to a labor market shock rotates noncollege men's labor supply curve*, magnifying men's employment sensitivity to such shocks.

I empirically assess the first implication in the context of two interventions in U.S. marriage markets. One intervention occurred during the 1960s-80s as states switched from consent-based to unilateral divorce regimes—greatly reducing legal barriers to marriage dissolution.

35-39 to avoid some of these complications, and still shows a steady secular decline in marriage. See the beginning of Section 1.3 for further discussion.

Previous work, discussed below, has exploited differential timings of this switch across states to show that unilateral divorce led to less gender-role-specialization within marriage and less marriage formation. A second intervention occurred as technological change in the U.S. economy expanded service-related jobs and contracted manufacturing-related jobs. I exploit the fact that women and men have historically specialized in different industries to identify gender-specific employment shocks, at the local labor market level, over the period 1980-2015.[5] Holding male opportunities constant, a positive local shock to female employment opportunities should also erode the value of gender-role-specialization within marriage.

Difference-in-difference regression designs based on U.S. Census data confirm the model's predictions: following both interventions, young noncollege men married less and worked less. Single men experienced particularly large reductions in labor-force participation, consistent with the marriage market investment channel emphasized by the model. The results pass tests for internal validity and are relatively robust across an array of specifications. These interventions appear to be quantitatively important: a back-of-the-envelope calculation suggests that they were responsible for 29% of the 1965-2015 decline in labor-force participation by young men without college.

The second implication of the framework is that, in addition to the "direct" effect of reduced labor market opportunities on employment emphasized by the literature, a persistent shock to noncollege men's wage offers causes an "indirect effect" that operates through the marriage market. Because a reduced-form evaluation of a shock to noncollege men's labor market opportunities cannot distinguish the two effects, assessing this implication requires a structural approach. Guided by the theoretical framework, I specify an empirical model and estimate its parameters using the Generalized Method of Moments. I confirm that the model successfully replicates the targeted marriage and employment behavior of young men circa 1980. Then, I simulate a 10% reduction in the lifetime wages of noncollege-educated men and solve for the new equilibrium. I find that the indirect employment effect, operating through the marriage market, is roughly as large as the direct effect operating through the labor market.

These empirical results shed new light on the secular decline in employment of young, noncollege-educated men. In an era marked by young women's unprecedented access to the labor market,[6] decline in the relative labor market positions of noncollege men has caused a

[5]This gender-specific variant of the standard Bartik instrument has been applied in several recent papers (e.g. Page et al., 2019).

[6]In addition to the factors I investigate here (liberalized divorce law and an increasingly favorable wage structure), factors driving the rise in women's opportunities include declining significance of gender norms and stigma associated with out-of-wedlock childbearing, increased legal protection against discrimination, increased access to contraceptive methods and abortion, and the rise of labor-saving home production technology. See Goldin (2006) and Stevenson and Wolfers (2007) for discussion, and Goldin (2006) for an argument that these changes dramatically altered the career aspirations and investments of young women.

meaningful decline in their marriage market value. As a consequence, such men have reduced their investments in the labor market. When work is less likely to win a desirable marriage contract, why bother?

The effects emphasized in this paper illuminate a contrast between the period of the late 1800s-mid 1900s and the more recent period. Throughout the former period, young wives and mothers performed almost no paid work (Goldin, 2006), while a large working class of young men decided between working for their fathers in family-owned establishments or pursuing wage labor opportunities that required little formal schooling (Ruggles, 2015). In response to rising opportunities in cities, young men could establish economic independence, although at the likely cost of not inheriting the family home and business. Legal and social enforcement of patriarchal norms also prevailed during this time: women who desired marriage had little ability to dictate its terms (Coontz, 1992). For these reasons, it is plausible that the rise in noncollege men's wage labor opportunities throughout this period exerted little impact on the economic value they could extract from the marriage market. Thus, wage changes may have had less effect on noncollege men's employment because they had less effect on marriage prospects.

2 Related Literature.

This paper is not the first to venture outside of the labor market to explain trends in male employment. For example, much has been written about disability insurance programs.[7] The evidence suggests that rising disability insurance provision contributed importantly to the decline in employment among men older than 45 (Bound and Waidmann, 1992, 2002). Krueger (2017) hypothesized that rising opioid addiction has compromised the abilities of pain-affected individuals to work.[8] It is reasonable that displaced older workers, especially those in relatively poor health, might stand to gain little from remaining attached to the labor force—especially if they qualify for disability insurance. An important contribution of this paper, therefore, is to propose a mechanism for declining male employment that is relevant for younger men. The argument that marriage market forces have *lowered the value of employment* for young men provides a contrast to the recent argument that improved leisure technologies have *raised the value of non-employment* (Aguiar et al., 2017).

Some observers have also posited a link between the declining employment of young noncollege men since 2000 and the growing fraction of such men that have criminal records. (For evidence on the effect of incarceration on post-release employment, see Pager, 2007 and

[7] See Bound and Burkhauser (1999) and Liebman (2015) for reviews.

[8] Initial tests of this hypothesis have reached different conclusions about its magnitude and significance (Currie et al., 2018; Aliprantis et al., 2019; Harris et al., 2019).

Mueller-Smith, 2015.) Introducing the marriage market channel into the discussion helps rationalize why such men's employment began declining decades before the era of mass incarceration. However, the incarceration channel may interact in important ways with the marriage market channel, enhancing the relevance of both to the post-2000 period.

Topically, this paper relates to recent work analyzing the impact of changes in gender-specific wage structures on married men's labor supply (Knowles, 2012; Alon et al., 2018). There is also a "marriage premium" literature that assesses whether men's labor market outcomes improve upon transitioning into marriage (see Ludwig and Br uderl, 2018 for references and a discussion). In contrast to these papers, I focus on the labor supply response of *unmarried* men to anticipated changes in marriage market conditions. While only 15% of noncollege men aged 25-44 were unmarried in 1965, today over half of such men—and 65% of those aged 25-34—are unmarried. Moreover, Binder and Bound (2019) report that declining labor-force participation by husbands accounts for a small share of the total observed decline. To fully understand the decline in labor-force participation by noncollege men of prime working age, it is important to account for their decline in marriage combined with the decline in employment of unmarried men.

Substantively, this paper relates to work on marriage markets with pre-marital investments in human capital. This work has primarily focused on the education decision (Lafortune, 2013; Chiappori et al., 2009, 2018). This paper takes education as given but instead models employment behavior as a pre-marital investment choice. The framework presented in the main text assumes an efficient matching environment, as in Chiappori et al. (2009). In the Appendix, I work through an extended model wherein the arrival of unilateral divorce creates a coordination problem within marriage. This induces an inefficiently low number of men to work hard before the marriage market, consistent with what has been established in theoretical literature on investment-and-matching games (e.g Peters and Siow, 2002; Nöldeke and Samuelson, 2015).

The empirical model used in this paper builds on the transferable-utility matching model developed by Choo and Siow (2006) and extended by Chiappori et al. (2017a).[9] Given a distributional assumption on idiosyncratic preferences, these models apply standard discrete choice techniques to identify marital surpluses based on observed marital matching patterns. My model operates in the same manner. However, the presence of a pre-match employment decision also requires identification of the *division* of the marital surplus between spouses. This is because a man's anticipated surplus share guides his initial employment choice, and this choice in turn affects the total marital surplus. To handle this type of interdependence (between total

[9]For further discussion, see the review of Chiappori and Salanié (2016).

marital welfare and its allocation between spouses), I modify an approach developed by Galichon et al. (2018). With this approach, observed pre-marital employment of noncollege men, together with marital matching patterns, jointly identify marital surpluses and spousal surplus shares.

Finally, this paper furthers the literature on the long-run impacts of unilateral divorce (Rasul, 2003; Stevenson, 2007; Fernández and Wong, 2017; Reynoso, 2019). As noted by Chiappori et al. (2018), beyond their effects on existing families, changes to economic and family policies can have long-run consequences for marriage formation, marital matching patterns and human capital investment incentives. In revealing long-run effects of unilateral divorce on young men's marriage-market investments, the current paper contributes to this new research agenda in family economics (see also Chiappori et al., 2017b; Low et al., 2018).

3 Young men's employment as marriage market investment: motivation and theory.

Economists have long recognized the importance of prior job experience and career interruptions in earnings determination (Mincer, 1958, 1962). Building up experience with a specific employer, rather than cycling between jobs, has been shown to confer additional earnings returns (Topel, 1991; Dustmann and Meghir, 2005). Young men thus reap future gains, in terms of the consumption value of future earnings, from pursuing stable employment today. In this section, I argue that there is an additional return to such behavior that is determined in the marriage market. As a result, anticipated changes in the marriage market plausibly affect young men's employment.

Before embarking, it is important to note that as marriage has declined in the United States, non-marital cohabitation and other family arrangements have risen in importance (Bumpass, 1990, Smock and Schwartz forthcoming). Has the "marriage" market actually changed in a meaningful way, or has marriage simply been replaced by equivalent arrangements? Recent work by sociologists on U.S. family structure has revealed the following. First, the median cohabitation duration for less-educated couples was 22-24 months in 2006-2010 data—much shorter than the median marriage duration (Copen et al., 2013). Second, a growing minority of individuals do cohabit for extended periods of time without marrying (Mernitz, 2018), but this population remains quite small. More salient is an increase in "serial cohabitation:" those whose first cohabitation has dissolved are increasingly likely to enter a new cohabitation (Eickmeyer and Manning, 2018). Third, cohabitation has not fully replaced marriage as a childbearing arrangement in the noncollege population: single mothers account for a steadily growing share of births as well (Manning et al., 2015).

As emphasized by Lundberg et al. (2016), a key difference between marriage and these other family arrangements lies in marriage's function as a commitment device. To the extent that the benefits of living with a committed partner accumulate over the medium-to-long term (e.g. through investment in partnership-specific goods like children and housing), I treat the replacement of marriage by unstable cohabitation and single motherhood as a meaningful change that may impact the labor market investments of noncollege men. That is, my purpose is to model the formation of stable partnerships over the long-run. Although a dichotomous married/single framework does not adequately characterize American family structure, especially over a short-to-medium-run horizon, I submit that the dichotomous framework used by economists remains a useful abstraction for my present purpose.

Same-sex marriage has also become a more common joint living arrangement in the United States. However, nearly all marriages formed in the United States have been heterosexual. As my purpose is to consider how the marriage market may have impacted secular developments in men's employment, I restrict focus to heterosexual marriage here.

3.1 What men contribute to marriage.

Economists think of monogamous marriage as a productive partnership between two individuals, in which each individual is better off in the partnership than either could be as single (Becker, 1973). What do men contribute to these partnerships? Gary Becker's seminal framework involves a marital surplus function that is maximized when spouses exploit their comparative advantages within the household economy (Becker, 1981). Given persistent gender gaps in labor market opportunities and the biological demands of childbirth, this tends to result in complementarities between husbands' earnings and wives' time at home in the production of marital happiness. An innovation to the specialization framework recognizes the importance of the jointly-consumed public goods (Lam, 1988). When economies of scale in public consumption outweigh specialization incentives, complementarities arise between husbands' and wives' earnings. Thus, while women's contribution to marriage is determined by competing influences that have changed with time, men who wish to form a stable marriage have had a clear dictate: form a stable career.

The hypothesis that male earning potential is an important determinant of marital value has been subject to numerous quasi-experimental tests in the last decade.[10] To the extent that marital value comes from investing in children, we might expect potential husbands' labor market positions to affect fertility behavior and children's outcomes. Black et al. (2013) found positive male earning shocks, driven by the coal boom of the 1970s, to lead to greater completed fertility. Leveraging variation in industrial business cycles combined with gender differences

[10]See also Wilson (1996) and Cherlin (2014) for illuminating sociological narratives.

in employment by industry, Schaller (2016) found positive male labor demand shocks to predict increased fertility, yet positive female demand shocks to predict decreased fertility. Related work has established a similar pattern of effects on child health outcomes (Stevens and Schaller, 2011; Lindo et al., 2018; Page et al., 2019)—large, positive effects of male demand yet small (and usually negative) effects of female demand. Others have associated negative shocks to fathers' lifetime earnings with decline in educational attainment and earnings of affected children (Oreopoulos et al., 2008).

In addition to their effects on children, the labor market positions of men appear to drive marriage formation and stability itself. Following a similar strategy to Schaller (2016), Autor et al. (2019) partitioned labor market shocks from the rise in Chinese import competition since 1990 into male-specific and female-specific components. Communities receiving particularly negative male shocks experienced a relative decline in marriage and rise in single motherhood, while those receiving negative female shocks saw smaller increases in marriage. Bertrand et al. (2015) found similar results and attributed them to gender identity norms—dictating that the husband out-earn his wife—as well as economic gains from specialization.

It is also plausible that the marriage market rewards men who have worked hard for reasons additional to the effects of working hard on earning potential. For example, Charles and Stephens (2004) found that divorce hazards rose following a husband getting laid off, but not from job loss events outside the husband's control (e.g. suffering a work disability or a plant closure), even though both types of events conferred similar lifetime earnings losses. Such a pattern is consistent with stable employment signaling the man's level of non-economic suitability as a partner. Lafortune and Low (2018) presented a framework in which men who enter marriages with sufficient assets are better able to solve coordination problems within marriage and reap maximum gains from specialization. Men with stable jobs may also signal to prospective wives that they are committed to investing in the marriage rather than other pursuits.

3.2 A simple equilibrium framework with marriage market investment.

I consider a 2-period decision-making environment ($t = 0, 1$) in which men first make a human capital investment in the labor market and then match with women in a frictionless, competitive marriage market. Figure 4 illustrates the environment and shows the relevant payoff functions. There is no uncertainty and households do not save. In Appendix Sections F and G, I work through a more complex framework with marital uncertainty and the possibility of unilateral divorce. I discuss additional implications of this framework in the next section.

Single household's employment choice. To start, consider a single male household making consumption and employment decisions over his two periods of life. Each man m in period t has direct utility function $U(c_{mt}, n_{mt}; \emptyset)$, where c is consumption of a market-purchased good and $n \in [0, 1]$ describes the share of the period that man spends employed.[11] (The argument after the semicolon in the utility function tracks the individual's family status: $\emptyset$ if single, and f if married to woman f.)

A standard result from static labor supply theory is that, given leisure preferences (which are assumed constant across all men of a given education status), an individual's hourly wage is sufficient to characterize his consumption, labor supply, and utility. I therefore use the indirect utility function $V(w_{m1}; \emptyset)$, where w is hourly wage, to summarize period 1. Each man faces the Mincerian wage equation:

$$\ln(w_{m1}) = \ln(w_{m0}) - \delta + (r + \delta) \cdot n_{m0} \tag{1}$$

where initial wages are exogenous, δ is a depreciation factor, and $r + \delta$ captures wage growth from stable employment.

Without saving, the period-0 consumption choice is pinned down by the man's period-0 employment choice: $c_{m0} = w_{m0} n_{m0} + y_{m0}$, where y is exogenous non-labor income. This yields the following employment decision problem:

$$\max_{n_{m0}} U(c_{m0}(n_{m0}), n_{m0}; \emptyset) + \beta V(w_{m1}(n_{m0}); \emptyset) \tag{2}$$

where β is a discount factor capturing the importance of period 1 relative to period 0. For purposes of exposition, I assume a separable utility function:

$$U(c_{mt}, n_{mt}; \emptyset) = \text{VALUE}(c_{mt}) - \text{COST}(n_{mt}),$$

where VALUE is the value of consumption and COST is the effort cost of working. All qualitative results, however, generalize to a non-separable function.

It is straightforward to show that the solution to problem (2) satisfies the following first-

[11] The implicit length of each period in the model is more than one year: period 0 is meant to represent the amount of time the average non-college-educated men spends not in school before becoming stably married. In the 1979 cohort of the National Longitudinal Surveys of Youth, the average noncollege men spent 7 years unmarried between ages 20 and 32. Over such a horizon, I model employment as a continuous choice. Evidence from longitudinal administrative data presented in Appendix Table A.1 indicate that most men who spend significant time out of the labor force in a given year return to gainful employment at some point in the future: that is, men are not either always out or always in the labor force.

order condition:

$$\begin{aligned}\mathrm{MC}(n_{m0}) &= w_{m0}\cdot\left(\mathrm{MV}(c_{m0})+\beta\hat{r}V'(w_{m1})\right)\\ &= w_{m0}\cdot\mathrm{MB}(n_{m0};w_{m0},\hat{r})\end{aligned} \tag{3}$$

where MV and MC denote marginal consumption value and marginal effort cost functions, respectively, and $\hat{r} = r + \delta$. I subsume the expression inside the parentheses into the total marginal benefit function $\mathrm{MB}(n_{m0}; w_{m0}, \hat{r})$.

The marriage market. Now, suppose that men enter a marriage market in period 1. I consider a frictionless marriage market with equal numbers of men and women. Men come in two education types: noncollege-educated (NC) and college-educated (C). In the empirical application, I also consider two education types of women. For now, I consider an arbitrary number $F \geq 1$ of female types f.

As shown in Figure 4, the period-1 utility payoff of a man m who marries woman f can be expressed as the sum of his utility from remaining single and the additional utility he receives from the marriage. I express this additional utility gain as $G_m(w_{m1}, n_{m0}; f)$. This gain is itself a sum of two parts: man m's share in the total economic surplus generated by the marriage, plus an idiosyncratic preference for the given partner's type. I represent idiosyncratic preferences as follows: ϵ_m^f is man m's taste for being married to female type f, ϵ_f^E is woman f's taste for marrying a man of education status E, and $\epsilon_i^{\emptyset}$ is individual i's preference for remaining single. Idiosyncratic tastes ϵ are distributed *iid* according to a mean-0, atomless distribution $H(\epsilon)$. Thus, for a given marriage between noncollege man m and woman f, individual utility gains are:

$$\begin{aligned}G_m(NC;f) &= \theta_m(NC;f)\cdot S(NC;f) + \epsilon_m^f - \epsilon_m^{\emptyset}\\ G_f(NC;f) &= \underbrace{(1-\theta_m(NC;f))\cdot S(NC;f)}_{\textbf{Economic}\text{ gains}} + \underbrace{\epsilon_f^{NC} - \epsilon_f^{\emptyset}}_{\textbf{Non-economic}\text{ gains}}\ .\end{aligned} \tag{4}$$

In (4), $S(NC; f)$ is the total economic surplus generated by the marriage and $\theta_m(NC; f)$ is man m's share in the surplus. The marriage between m and f forms if both utility gains exceed zero and if $G_f(NC; f) > G_f(C; f)$ (which is the utility gain woman f receives from marrying a college man).

It is convenient here to assume transferable utility, wherein the total economic surplus does not depend on how the surplus is shared: spouses always agree on total-surplus-maximizing behavior within marriage. This allows us to abstract from the nature of behavior of within marriage.[12] Marriage market equilibrium consists of an assignment A of individuals and a set Θ of surplus shares such that the assignment is *stable*: no two individuals would prefer to dissolve their current matches and match with each other, and no matched individual would be strictly better off remaining single. See Appendix F for more details.

Lastly, I specify the economic surplus function. Consistent with the fact that virtually all college-educated men in their 20s-40s participate in the labor force, and this has not changed since the 1960s, I assume college men are employed throughout their working lives. Relative to each partner remaining single, a marriage between college-educated man m and woman f produces a surplus of $S(C; f)$. A marriage between noncollege-educated man m and woman f produces a surplus of

$$S(NC; f) = S(w_{NC,1}^{\text{married;f}}, n_{NC,0}^{\text{married;f}}; f). \tag{5}$$

Consistent with the class of marriage theories discussed in the preceding subsection, I assume the surplus function S is strictly increasing in its first two arguments: the earning potential and employment history man noncollege man m brings into the marriage with f.

Marriage market's impact on employment choice. Consider a noncollege man m who desires to marry woman f at the given equilibrium surplus share of $\theta_m(NC; f)$. Based on (4) and (5), the partial derivative of such a man's utility gain from marriage with respect to his employment choice is the following:

$$\frac{\partial G_m(NC; f)}{\partial n_{NC,0}^{\text{married;f}}} = \theta_m(NC; f) \cdot \underbrace{(\hat{r} \cdot w_{NC,0} \cdot S_w(w_{NC,1}^{\text{married;f}}, n_{NC,0}^{\text{married;f}}; f) + S_n(w_{NC,1}^{\text{married;f}}, n_{NC,0}^{\text{married;f}}; f))}_{\frac{dS}{dn_{NC,0}^{\text{married;f}}}}.$$

In the above expression, $S_w(\cdot)$ and $S_n(\cdot)$ are the partial derivatives of the total marital surplus with respect to period-1 wage and period-0 employment, respectively. This expression describes the **marriage market return** to period-0 employment at equilibrium prices (i.e. at the given surplus share $\theta_m(NC : f)$). In words, this is the effect of the man working harder in period 0 on the total economic benefits of marriage realized in the next period, scaled by the man's share in those benefits. For ease of exposition, I shorten the portion of the expression inside the parentheses by using total derivative notation: $\frac{dS}{dn_{NC,0}^{\text{married;f}}}$.

This expression facilitates an important comparison of employment first-order conditions between a man who chooses to remain single and an otherwise identical man who chooses to

[12]The more complex environment considered in the Appendix takes a stance on behavior within marriage and results in *imperfectly* transferable utility, where the magnitude of the total surplus (in an *ex-ante* sense) depends on how it is shared. That model nests the qualitative predictions of this more restrictive model.

marry:

$$\text{ALWAYS}-\text{SINGLE}: \ \text{MC}(n_{NC,0}^{\text{single}}) = w_{NC,0} \cdot \text{MB}(n_{NC,0}^{\text{single}}; w_{NC,0}, \hat{r}). \tag{6}$$

$$\begin{aligned} \text{TO}-\text{BE}-\text{MARRIED}: \ \text{MC}(n_{NC,0}^{\text{married;f}}) &= \underbrace{w_{NC,0} \cdot \text{MB}(n_{NC,0}^{\text{married;f}}; w_{NC,0}, \hat{r})}_{\text{Marginal benefits from } \textbf{labor market}} \\ &+ \underbrace{\beta\theta_m(NC; f)\frac{dS}{dn_{NC,0}^{\text{married;f}}}}_{\text{Marginal benefits from } \textbf{marriage market}}. \end{aligned} \tag{7}$$

Both men share the same marginal effort cost curve, which simply depends on period-0 preferences for employment. However, relative to the always-single man, the man who will marry faces a marginal benefit curve that is shifted upward by the additional marginal benefits the man expects to receive in marriage. Recall that, because these benefits arrive in the next period, they must be scaled by the discount factor β.

Equilibrium. I consider an environment where initial male wage offers and employment preferences vary only according to education attainment. The initial wage offer for a noncollege man is $w_{NC,0}$ and for a college man is $w_{NC,0}(1+p)$ (where p is the college wage premium). The economic surplus in a marriage involving a college-educated man is some constant number S^C, while the economic surplus in a marriage involving a noncollege-educated man is given by (5). And, the distribution function of idiosyncratic tastes, $H(\epsilon)$, is type I extreme value. Equilibrium is defined as follows:

A rational-expectations equilibrium consists of an assignment A *of individuals in the marriage market; a set of vectors of economic surplus shares*

$$\{\Theta_f\}_{f\in F} = (\theta_m(NC; f), \theta_m(C; f), \theta_f(NC; f), \theta_f(C; f))$$

for each type of woman; and a vector of period-0 *employment choices for noncollege-educated men* $N = (n_{NC,0}^{\text{single}}, (n_{NC,0}^{\text{married;f}})_{f\in F})$*; satisfying the following conditions:*

1. $\theta_m(NC; f)+\theta_f(NC; f) = 1 = \theta_m(C; f)+\theta_f(C; f)$ *for all* $f \in F$*. That is, the divisions of marital surpluses between partners are feasible.*

2. *The assignment is stable.*

3. *Period-*0 *employment choices satisfy first-order conditions (6) and (7) for all* $f \in F$*.*

Existence and uniqueness. In the model, noncollege men make labor market investments and then move to the marriage market where they are valued in terms of these prior investments. A rational-expectations equilibrium occurs when noncollege men's investment choices are consistent with a set of prices Θ that also, at the given the investment choices, clear the marriage market (Chiappori et al., 2009). Uniqueness of equilibrium is not generally guaranteed in these environments. (See Chiappori et al. (2018) for an involved discussion on this point.) However, one can show a unique equilibrium exists in this context under a reasonable boundary condition. I provide a proof in Appendix C.

Figure 5 illustrates equilibrium outcomes for noncollege men, assuming $F = 1$ for ease of exposition (i.e. women are homogeneous). The upper graph depicts the period-0 employment choices of noncollege men who will remain single (dotted MB curve) and noncollege men who will marry (solid MB curve). The steep-sloping blue line in the middle graph traces the locus of points at which the solid marginal benefit curve intersects the marginal effort cost curve. That is, it traces the points at which the period-0 employment choice of to-be married men is rational, as the surplus share $\theta_m(NC)$ varies. The left graph plots demand and supply curves for noncollege men in the marriage market, given a period-0 employment choice. The shallow-sloping orange line in the middle graph traces the locus of points at which these curves intersect. That is, it traces the points at which the marriage market assignment A is stable, as the employment choice of to-be-married men $n_{NC,0}^{\text{married}}$ varies. Equilibrium occurs where the two loci in the middle graph intersect: where the employment choice of to-be married men satisfies first order condition (7), given marriage market conditions; and the marriage market is stable, given the employment choice.

I can now express the central result of this section: *population employment behavior of noncollege men depends on i) the economic surplus function and ii) the equilibrium surplus shares*. A standard application of the Implicit Function Theorem to first-order conditions (6) and (7) yields the following equilibrium employment functions:

$$\begin{aligned}
n_{NC,0}^{\text{single}} &= n\left(w_{NC,0}, \hat{r}\right) \\
n_{NC,0}^{\text{married;f}} &= n\left(w_{NC,0}, \hat{r}, \theta_m(NC; f), \frac{dS}{dn_{NC,0}^{\text{married;f}}}\right).
\end{aligned}$$

That is, the employment rate for always-single men depends on labor market conditions only ($w_{NC,0}$ and $\hat{r}$), while the employment rate for to-be-married men depends on both labor market and equilibrium marriage market conditions $\left(\theta_m(NC; f), \frac{dS}{dn_{NC,0}^{\text{married;f}}}\right)_{f \in F}$.

With idiosyncratic preferences distributed type I extreme value, it is straightforward to show that the population employment rate for noncollege men, $n_{NC,0}$, takes the following logistic form:[13]

$$n_{NC,0} = \frac{n_{NC,0}^{\text{single}} + \sum_f \exp\left(\theta_m(NC;f) \cdot S(w_1^{NC}, n_{NC,0}^{\text{married;f}}; f)\right) \cdot n_{NC,0}^{\text{married;f}}}{1 + \sum_f \exp\left(\theta_m(NC;f) \cdot S(w_1^{NC}, n_{NC,0}^{\text{married;f}}; f)\right)}. \quad (8)$$

Comparative static. For ease of exposition, return to the case where women are homogeneous: $F = 1$. Consider a shock that reduces the economic surplus by reducing non-college men's marginal contribution $\frac{dS}{dn_{NC,0}}$. The shock of interest is a reduction in the gains from specialization, driven by an improvement in women's relative labor market opportunities; a change in the legal framework surrounding marriage; or a reduction in the strength of "male breadwinner" norms. Several changes occur. First, the reduction in $\frac{dS}{dn_{NC,0}}$ induces noncollege men to work less in period 0. Second, because the marital value of noncollege *relative* to college men has gone down, the new equilibrium must occur at a lower share for noncollege men.[14] This further erodes the marriage market return to period-0 employment. Third, the combination of the first two forces increases the number of noncollege men remaining single, leading more such men to "opt out" of the high-employment path dictated by future marriage. In the language of equation (8), the first two forces lead to a reduction in $n_{NC,0}^{\text{married}}$, while the third force reduces $\exp(\cdot)$, hence giving $n_{NC,0}^{\text{single}}$ more weight in the expression. The overall result is a lower population employment rate, $n_{NC,0}$, in equilibrium.

Figure 6 provides an illustration. The initial shock leads to a downward shift of to-be married men's marginal benefit curve. That is, for a given surplus share $\theta_m(NC)$, less pre-marital employment occurs in the new equilibrium, which implies a leftward shift of the blue locus in the middle graph. Because marriage is no longer as attractive at the given surplus share, both marriage market curves in the left graph shift inward, but prospective wives' demand curve shifts inward more, since college-educated men have become a better bargain relative to noncollege men. This causes a downward shift of the orange locus, as a given employment level is now associated with a lower surplus share. Equilibrium is restored at a lower value of $n_{NC,0}^{\text{married}}$, a lower share of noncollege men married, and a lower surplus share $\theta_m(NC)$.

3.3 *Prima facie* evidence from cohort data.

The theoretical framework's predictions are consistent with the patterns shown in Figure 3. As less-educated men entered their prime years of potential labor-force activity with diminished expectations of forming stable marriages they may also have found less to gain from

[13]For a derivation, see Appendix C.
[14]See Appendix C for a proof.

forming strong attachments to the labor market. Equivalently, as secular changes reduced non-college men's marginal contribution to the marital economic surplus, fewer marriages formed and fewer of these men built up stable attachments to the labor market while young.

Co-variation between individual employment profiles and marriage outcomes, within a given set of birth cohorts, conveys a similar message. Figure 7 and Table 1 record employment and family structure cross-tabulations based on data from the 1979 cohort of the National Longitudinal Surveys of Youth (NLSY79). The NLSY79 contains weekly labor market histories and annual information on family structure for a population-representative sample of men who were 14-22 years old when first surveyed in 1979. I divide the sub-sample of men with no more than one year of completed college into two groups. The "always-married" group consists of individuals who reported being married at all interviews between the ages of 32 and 40; the "always-single" group consists of those not reporting being married, or cohabiting with an unmarried partner, at any interview over the same age range.[15]

Figure 7 plots age profiles of participation and employment for each of the two groups. The difference in participation rates between the two groups is substantial: the average difference over the 21-31 age range is around 11 percentage points. (This is close to the cumulative decline in labor-force participation between the 1937-39 and 1982-84 cohorts observed in Figure 3.) The difference in employment rates between the two groups is even larger.

Table 1 reports the same comparison after adjustment for differences in initial labor market opportunities. Considering the original sample of less-educated men, I estimate regressions of the following form:

$$\overline{\mathrm{LABOR}}_{i,21-31} = C_0 + C_1 \overline{\mathrm{married}}_{i,32-40} + C_2 \ln(\mathrm{initial\ wage}_i) + \mathrm{error}_i. \tag{9}$$

That is, I model young male employment behavior as a linear function of future marriage propensity and one's initial log hourly wage offer. Such a control is meant to proxy for persistent differences between individuals in labor market opportunities as well as labor supply preferences (e.g. motivation to work hard). To construct this control, I average hourly wages over the first 3 years after the individual leaves school and take the log.[16] As shown in the

[15] I identified non-marital cohabitations in the NLSY79 using the method of Oppenheimer (2003). The "always-married" group contains 659 individuals, while the "always-single" group contains 289 individuals. See Appendix B for further NLSY data processing information.

[16] For some individuals, initial wage information was missing, due to either insufficient employment during the reference period or survey non-response during the reference period. Wage information for many of these individuals was available later in their career cycles. Using later-in-life wage information, I impute wages for these individuals based on a Mincerian wage equation. For individuals with chronically missing wage information due to insufficient employment, I impute wage offers using techniques developed by Juhn et al. (1991). See Appendix B for further detail.

table (which presents estimates of C_1), a 0-to-1 increase in marriage propensity over ages 32-40 is associated with a 7.3 percentage-point increase in labor-force participation and an 11.9 percentage-point increase in employment during ages 21-31 (columns 1 and 5). Controlling for wages reduces these associations to 6.7 and 10.8 percentage points—still large and statistically significant (columns 2 and 6). Adding a control for non-marital cohabitation propensity slightly strengthens the results, as to-be-cohabiters work slightly more than to-be-singles (remaining columns). Thus, even among similar initial earners, young men who end up maintaining stable marriages build stabler employment histories than young men who remain single.

These descriptions of the data suggest the empirical relevance of marriage market investment to the employment decisions of young men. However, to attribute the observed variation in employment behavior to exogenous variation in the value of marriage, all other determinants of employment behavior must be held constant. In the next section, I leverage two sources of plausibly exogenous variation in the marriage market values of less-educated men to provide causal interpretations of the marriage market investment channel.

4 Young men's employment as marriage market investment: evidence from two interventions in U.S. marriage markets.

To isolate marriage market incentives to seek employment in the data, it is necessary to leverage changes in the marriage market occurring independently of changes in the labor market. Such a context does not readily arise: as discussed above, men's labor market opportunities appear to influence marriage market outcomes. In this section, I propose and empirically assess two interventions in U.S. marriage markets that plausibly avoid this identification problem.

4.1 Intervention 1: the no-fault divorce revolution.

Between the late 1960s and mid 1980s, divorce legislation liberalized dramatically across many U.S. states. In states without mutual consent requirements for divorce, the introduction of no-fault grounds for divorce—such as "irreconcilable differences" or "irremediable breakdown of the marriage"—effectively allowed one spouse to initiate a divorce without consent of the other. These laws changed on a state-by-state basis for a variety of reasons; family law experts have argued that the changes were effectively random in nature. Friedberg (1998) and Voena (2015) provide further discussion.

Theoretical predictions. The extended theoretical model presented in Appendices F and G offers clear predictions regarding the impact of a switch in the divorce regime on the employment behavior of less-educated men. When spouses must mutually consent to a divorce, an unhappy spouse cannot credibly exercise the threat of leaving the marriage. But in a unilateral regime, the utility a spouse could achieve in a unilateral divorce becomes a credible threat point within marriage. Thus, under a unilateral regime, a wife may choose to invest in her own career for two related reasons. The first is to insure against being poor in the event that the marriage turns out badly and the husband initiates a unilateral divorce. The second is to insure against the husband not sharing his earnings with her within marriage—if he doesn't, she can credibly exercise the threat of unilateral divorce. This action results in lower gains from specialization in the production of marital public goods, such as children's welfare and housing quality. To ensure the efficient division of household tasks, the husband must promise to transfer to the wife a larger share of household resources—a commitment that lowers his welfare in marriage and may not be enforceable. The overall effect is to lower the attractiveness of the traditionally-specialized marital arrangement.[17] This results in *ex-ante* low-surplus marriages no longer forming, and fewer young men investing in stable employment to prepare for their traditional marital role.

Previous empirical research on unilateral divorce has found evidence supporting these behavioral channels. Stevenson (2007) found evidence that marriages forming after exposure to unilateral divorce featured less specialization and a decreased willingness to invest in not-easily-divisible assets (such as having a child or supporting a spouse through school). Moreover, wives realized higher rates of labor-force participation and full-time work in marriages formed under a unilateral divorce regime. Consistent with these channels lowering the attractiveness of the traditional marital arrangement, Rasul (2003) found a persistent decline in the marriage rate (new marriages per thousand adults, and new marriages per thousand single adults of marriage age) upon unilateral divorce adoption. Reynoso (2019) echoed these results and also found an increase in assortative matching on earning potential, as spouses became less able to realize specialization incentives after the shift in individual property rights.

In the language of the theoretical framework introduced above, by reducing specialization gains and raising the wife's threat point in the marriage relative to the husband's, unilateral divorce results in a combination of a reduction in noncollege men's marginal contributions to marriage $\left(\frac{dS}{dn_{NC,0}}\right)$ and a reduction in their surplus shares $(\theta_m(NC))$. This results in the additional prediction that noncollege-educated men should gain less on the marriage market from seeking stable employment while young. Using standard difference-in-difference methodology, I extend the literature on unilateral divorce by estimating the impact of this change in the marital environment on young noncollege men's participation in the labor force.

[17] The combination of marital uncertainty and the fact that specialization requires the wife to let her labor market skills depreciate leads to imperfect (i.e. costly) contracting. This implies a failure of the Coase theorem, which establishes that when contracting is costless, a shift in property rights should not affect contracting outcomes.

Data. Using 1960-1990 U.S. Census samples, I construct a main sample of non-institutionalized men, not currently enrolled in school, at least 18 years old, with at most one year of completed college, and with 0-20 years of potential labor market experience. When estimating labor supply regressions I focus on a slightly younger sub-sample of men with 0-15 years of potential experience. I consider *single* men as well as all men within this sample, consistent with the theory's emphasis on the pre-marital investment value of employment. When estimating marriage regressions I focus on a slightly older sub-sample of men with 5-20 years of potential experience. I adopt the coding of divorce laws presented in Appendix F of Voena (2015). See Appendix section B for further data details.

Regression specification. I adopt the following baseline linear probability model specification:

$$\begin{aligned}\mathbf{1}\{\text{outcome}_{ist}\} = \alpha \ + \ \beta \cdot \text{UD}_{st} \ & + \ \gamma \cdot \text{demographic controls}_{it} \\ & + \ \text{state FE} \\ & + \ \text{time FE} \\ & + \ \text{error}_{ist}.\end{aligned} \tag{10}$$

The dependent variable is a binary indicator taking the value 1 if male i, living in state s at time t, obtained the given outcome. The explanatory variable of interest, UD_{st}, is a binary indicator taking the value 1 if unilateral divorce is available in state s at time t. A standard requirement of difference-in-difference models is the inclusion of area and time fixed effects. I also control for a set of individual characteristics: race, ethnicity, education, potential experience level, nativity (foreign- or US-born) and urban/rural status.

The baseline specification also controls for the prevailing property division regime on divorce (title-based, community or equitable). The estimates proved robust to property division controls; thus, I only present estimates that include these controls.[18] For robustness, I also augment the baseline specification with region-by-year fixed effects or state-specific linear trends. Because marriage and labor market outcomes have been trending over time according to individual demographics, I also sometimes control for interactions between individual demographic characteristics and linear time trends.

[18] I do not test for interactions between unilateral divorce and the prevailing property division regime, as in some previous work. This is because I focus on human capital incentives, neither of which are directly affected by the property division regime. Modeling physical capital investment (assets), on the other hand, would warrant a focus on the property division regime in interaction with unilateral divorce (Voena, 2015).

4.2 Intervention 2: shocks to young women's employment opportunities.

Gender gaps in employment and wages in the United States labor market have narrowed considerably since World War II (Goldin, 2006; Blau and Kahn, 2017). For married women and mothers with young children, relative gains in employment were particularly strong after 1960 Goldin (2006).

Young women and mothers entered the labor market as it became increasingly dominated by service-sector jobs. Previous studies have emphasized the role of technological change, which lowered the relative cost of service provision and consumption, in the growth of the service economy (Lee and Wolpin, 2006; Buera and Kaboski, 2012). It is therefore likely that secular shifts in demand for services played an important role in accommodating the secular rise in female employment. According to 1980 U.S. Census data, women greatly outnumbered men in a variety of service sectors. This was true among all prime-age workers but especially among noncollege workers. For example, women accounted for 44% of the less-educated workforce, but 63% of retail trade workers and 80% of those employed in finance, insurance and real estate sectors.

It is likely that the national rise of the service economy affected female employment differently in different local areas. Although services are on average less tradable than manufactured goods, recent work has estimated that certain service sectors face relatively low trade costs and high degrees of geographical concentration across labor market areas (Gervais and Jensen, 2019). National technological shifts impacting a local economy specializing in tradable services also raise local demand for less-tradable, personal services (Mazzolari and Ragusa, 2013). If there exists spatial variation in less-tradable services, for example due to local tastes or local production advantages, a national shock to these sectors exerts differential local impacts as well (Bartik and Sotherland, 2019). Thus, in the context of technological change and growing national demand for services, areas more heavily concentrated in services should experience larger shocks to demand for female employment. Additionally, Page et al. (2019) report variation across areas in the extent of female specialization in services. This results in further area-level variation in female-specific employment shocks driven by national service sector expansions.[19]

In addition to services, women have also historically specialized in certain manufacturing

[19] Appendix Table A.2 presents cross-commuting-zone (CZ) variation in the 1980 degree of female specialization in service-related sectors—both in absolute terms as well as net of male specialization. For example, among the noncollege population, the share of total female workers engaged in business services ranged from .35 to .51 between the 10th and 90th percentile CZs. The share of total female workers *net* of the share of total male workers engaged in business services ranged from .26 to .41 between the 10th and 90th percentile CZs. For all service workers, the $10-90$ range was: .61 to .85 for females, and .39 to .64 for females net of males.

sectors, such as textiles. The same types of technological innovations that expanded services resulted in contraction of routine-task occupations (Autor and Dorn, 2013). Thus, while changes in national demand may have facilitated female employment on average, female employment likely grew far less rapidly, or even declined, in areas concentrated in female manufacturing sectors.

Theoretical predictions. An expansion of young women's labor market opportunities reduces specialization gains and compliance with "male breadwinner norms" within the marriage market, but also raises the gains associated with joint consumption economies. To the extent that specialization gains and social norms are a dominant force in marriages involving less-educated men,[20] increased labor market demand for female workers lowers such men's contribution to marriage, both in absolute terms as well as relative to the contributions of college-educated men. As predicted by the model, these forces should reduce the equilibrium number of marriages involving noncollege-educated men, and also reduce the labor market activities of such men before the marriage market.

Data. I utilize the commuting zone concept (Tolbert and Sizer, 1996) to define local labor markets. Reliable mappings from county group identifiers in Census to 1990-defined commuting zones can be constructed starting with 1970 Census samples.[21] I begin the analysis in 1980 for two reasons. First, 5 percent (rather than 1 percent) samples are available starting in 1980, which allows for a more precise computation of base-period employment concentrations by sector. Second, starting the analysis in 1980 makes 1970 data available for use in a pre-trends test to gauge internal validity of the design. Accordingly, using Census and American Community Survey samples, I create commuting-zone-level-average data for each of the following years: 1980, 1990, 2000, and 2014-17 (referred to as 2015 in the analysis). Thus, the total number of observations is 4 time periods $\cdot 722$ commuting zones in the contiguous U.S. $= 2,888$. The underlying population of men is the same as in the unilateral divorce investigation.

Regression specification. The baseline specification regresses the male outcome level (such as the share of men currently married or in the labor force), observed in commuting

[20] As reported by Bertrand et al. (2015), gender identity norms, dictating that the husband should be the primary breadwinner in the household, are also stronger among noncollege-educated men.

[21] Code is available on David Dorn's website: `https://www.ddorn.net/data.htm`.

zone z at time t, on an index of demand for female employment D^F_{zt} and other controls:

$$\begin{aligned} \text{outcome}_{zt} \;&=\; \alpha \;+\; \beta_F D^F_{zt} \;+\; \beta_M D^M_{zt} \\ &\quad+\; \text{commuting zone FE} \\ &\quad+\; \text{time FE} \\ &\quad+\; \text{error}_{zt}. \end{aligned} \tag{11}$$

The baseline regression controls for an index of male labor market demand D^M_{zt}: to isolate the marriage market investment channel of interest, we require that male labor market opportunities do not change when female labor market demand is varied. Commuting zone and time fixed effects are controlled, as the underlying experiment is to compare long-run changes in male behavior within commuting zones receiving different long-run shocks to female labor market demand. As in the unilateral divorce experiment, I gauge robustness by augmenting the baseline specification with time-varying regional controls. Additionally, I sometimes control for base year demographics (cell-level averages of racial, Hispanic ethnicity, nativity, education and potential experience characteristics) interacted with linear time trends.

The demand shifters D^F_{zt} and D^M_{zt} are "Bartik instruments," constructed using shift-share methodology popularized by Bartik (1991). Considering the sample of noncollege-educated young workers, I first compute commuting-zone-level shares of the workforce employed in each of 25 different industry sectors s in the 1980 base year.[22] Then, for each year t, I interact these shares with national changes in employment of noncollege young workers by industry. I repeat this process for each gender. Thus, D^G_{zt} describes the predicted change in the employment-to-population ratio of noncollege-educated individuals of gender G in commuting zone z, between 1980 and t, due to national shifts in industry-specific demand. Equation (12) illustrates:

$$D^G_{zt} = \sum_s \underbrace{\left(\frac{E^G_{zs,1980}}{E^G_{z,1980}}\right)}_{\text{Base-year share, sector } s} \cdot \underbrace{\left(\frac{E^G_{s,t}/P^G_t}{E^G_{s,1980}/P^G_{1980}} - 1\right)}_{\text{National shift, sector } s} \tag{12}$$

where $E^G_{zs,t}$ is the total year-t employment in commuting zone z and sector s; and P^G_t is year-t total national population. (Recall that the underlying population is less-educated individuals with 0-20 years potential experience.) By construction, the instruments take the value 0 in 1980.

Recent work has clarified the identification assumptions underlying shift-share research designs (Goldsmith-Pinkham et al., 2018; Borusyak et al., 2018). In this application, we are

[22] See Appendix B for a description of these sectors, which vary slightly by gender. Consistent with the above discussion, these sectors distinguish between manufacturing and services, and among broad types of each.

concerned about the exogeneity of the female Bartik instrument with respect to *residual area-level movements in male outcomes after controlling for the male Bartik instrument*. The preferred identifying assumption is that female base-year industry shares are exogenous with respect to residualized movements in male outcome variables.

4.3 Effects of the interventions.

Main results: reductions in marriage and labor-force participation. Previous literature has found a temporary increase in divorce rates upon the passage of unilateral divorce (Friedberg, 1998; Wolfers, 2006), but also a persistent reduction in marriage rates (Rasul, 2003). Appendix Figure A.1 presents an event-study graph confirming, consistent with the theoretical model, that unilateral divorce precipitated a long-run reduction in both ever- and currently-married propensities. Appendix Table A.3 presents regressions of ever-married propensities on both interventions. It reports statistically significant reductions of close to the same magnitude as those found for currently-married propensities. Thus, both interventions reduced marriage in the long-run primarily by preventing or delaying marriage formations.

Regardless, for a young man deciding whether to maintain stable employment, both whether he will marry and how long he expects to remain married have implications for his decision. Accordingly, the main outcomes of interest are current marriage and single men's labor-force participation. Results for these outcomes are presented in Table 2 and Table 3. In each table, the top panel considers the unilateral divorce intervention, while the second panel considers the female employment shock intervention—defined as a 10 percentage-point increase in the female Bartik instrument. Each table contains 6 columns corresponding to 6 different regression specifications. All specifications include the baseline controls, while each contains a unique combination of additional control variables.

Note the fourth row in the unilateral divorce panel. This row reports results of pre-trends tests. For a given specification, this is an F-test of the hypothesis that the effect of unilateral divorce on the outcome is 0 before the passage of unilateral divorce. I accomplish this by grouping the data into 5-year bins defined by event time and estimating event-study coefficients relative to the bin containing 5-to-1 years before law passage. (See Appendix Figure A.1 for an illustration of the binning.) The pre-trends test, then, tests whether the coefficients corresponding to "10-to-6" and "at least 11" years before law passage are jointly zero. In each table, only in one case can we reject the hypothesis of no pre-trend at the 5 percent level. Most estimated p-values are above 20 percent. These results support the internal validity of the research design.

Looking at Table 2, estimated effects of the interventions on current marriage are negative and statistically significant. The average of the 6 point estimates is $-1.9 p.p.$ for unilateral divorce and $-1.8p.p.$ for female Bartik shocks. Looking at Table 3, estimated effects for labor-force participation are also negative, and generally reach statistical significance at conventional levels. The average estimate is $-1.4p.p.$ for unilateral divorce and $-1.2p.p.$ for female Bartik shocks. Considering that base rates of non-participation in this population of men are $13 - 14$ percent (third row of each panel), each intervention is estimated to cause roughly a 10% increase in non-participation behavior. This pattern of results lends credence to the marriage market investment channel emphasized by the theory. As changes to the legal structure of marriage and women's labor market opportunities threatened efficient cooperation within marriage and incentivized young women to pursue their own careers, the value of marital specialization declined. This led fewer marriages to form and fewer noncollege-educated men to invest in stable employment.

One alternative interpretation of the data is that the interventions impacted the participation rate of singles simply by changing the composition of whom is single, rather than because of lower marriage market investment. This interpretation, however, does not seem plausible. The conventional wisdom is that married men are positively selected on labor market skill and motivation (Antonovics and Town, 2004): if the interventions simply led some men who would have been married to become single, such a development would presumably *raise*, not lower, the participation rate of singles. A calculation presented in Appendix D shows that, for selection effects to be completely responsible for the unilateral divorce results, the men induced to remain single by unilateral divorce would require a non-participation rate of roughly 42.5 percent. This is around *triple* the pre-reform rate of non-participation among singles.[23] Moreover, if composition effects were dominant, one would expect to find a null effect on participation in the overall population of men. Appendix Table A.4 reports participation estimates for all men and continues to find negative overall effects.

Testing the identification assumption: small effects on wages. To attribute observed effects of these marriage market interventions to the marriage market channel of interest, we must be sure that men's labor market opportunities are orthogonal to intervention exposure. Failure of this condition can be interpreted as a failure of the identification assumption.

While it is impossible to directly test the identification assumption, the current context admits a reasonably informative test. This test involves investigating wages as an outcome. If the given intervention is found to "cause" substantial reductions in both employment and wage rates, then it is probable that intervention exposure is correlated with a negative shock to male

[23] A similar calculation can be done for the female Bartik shock results, following the formula presented in Appendix D.

labor demand. On the other hand, if male labor demand did not change with the intervention, we should not find large negative wage effects.[24]

Table 4 reports estimated effects of the interventions on log weekly wages of single men.[25] As in Table 2, the top panel considers the unilateral divorce intervention, while the second panel considers the female employment shock intervention. In the second case, log weekly wages are measured as commuting-zone-year averages, where individual observations are weighted by weeks worked. For reference, the effect of a 10 percentage-point male Bartik shock on wages is precisely estimated at 9 to 11 percent across all specifications. Against this benchmark, the estimated wage effects are small, and are always statistically insignificant. Effects of unilateral divorce range from -2.4 to 0.5 percent across specifications, and effects of a female Bartik shock range from -1.6 to 1.9 percent. These findings suggest that the interventions are uncorrelated with non-trivial changes to male labor demand.

Relevance for secular decline in male employment. Table 5 demonstrates the importance of the two interventions in explaining secular decline in employment of young, noncollege-educated men. Consider the first column. According to the average of the 6 estimates reported in Appendix Table A.4, unilateral divorce is associated with a $.65$ percentage-point decrease in the labor-force participation rate of all noncollege-educated men with $0-15$ years potential experience. Between 1965 and 1980, around 54 percent of this population was exposed to unilateral divorce,[26] implying that unilateral divorce caused a $0.65 \cdot 0.54 = 0.35$ percentage-point decline in participation. This amounts to 23% of the observed 1.5 percentage-point decline that occurred during the period. An analogous exercise for the female Bartik shock intervention finds that female employment shocks can account for $1.89 p.p.$, or 30%, of the observed $6.3 p.p.$ decline in labor-force participation observed between 1980 and 2015.[27]

Because the two interventions happened in non-overlapping time periods, we can compute the joint effect of the two interventions simply by adding the two individual effects together. According to rows 3 and 4 of Table 5, this accounting exercise yields $\frac{-0.35-1.89}{-1.5-6.3} = .287$. That is, the two interventions can account for 28.7 percent of the total observed 1965-2015 decline in labor-force participation of young noncollege men.

[24] A marriage-market-caused reduction in employment at a given set of opportunities implies an inward shift of the labor supply curve: if wages are flexible and capital is inflexible, we should expect an increase in wages. But if capital also adjusts in the medium-to-long run time frame captured by the regressions (10-year periods), the initial wage impact of the supply shift may be diffused. In addition, if the marriage market effect causes less employment and hence less accumulation of labor market skills, we might expect a decline in wages. The overall expected effect of these marriage market interventions on wages is thus ambiguous. That said, a substantial negative effect likely implies a failure of the identification assumption.

[25] Results for hourly wages are similar. See Appendix B for information on wage processing.

[26] 3 states had unilateral divorce regimes in place before 1965: Alaska, Oklahoma and New Mexico. Around 30 states adopted unilateral divorce regimes between 1965 and 1980.

[27] The average commuting zone experienced a $14 p.p.$ increase in the female Bartik instrument: hence the 1.40 average exposure to a $10 p.p.$ shock reported in the table.

5 The marriage market as amplifier of men's labor market shocks.

The results of the last section suggest that young men's employment responds to a decline in marriage market prospects. In this section, I examine the effects on young men's employment of a decline in labor market opportunities. By reducing marriage market prospects, such a shock might reduce employment through a *marriage market effect*, in addition to the standard *labor market effect* that has been emphasized by the labor demand literature.

Figure 8 illustrates these two effects. Returning to the theoretical framework of Section 3, consider a reduction in noncollege men's earning potential. This is driven either by a reduction in the initial wage offer $w_{NC,0}$ or a reduction in returns to experience $\hat{r}$. Given a positive uncompensated employment elasticity, such a shock reduces employment via standard labor/leisure substitution.[28] This *labor market effect* is represented as a downward shift of the average man's marginal benefit curve (and a corresponding leftward shift of the steep blue locus in the bottom graph). But the shock also reduces the economic surplus ($S(w_{NC,1}^{\text{married;f}}, n_{NC,0}^{\text{married;f}}; f)$) generated by a noncollege marriage, both in absolute terms and relative to that generated by a college marriage. This leads to fewer marriages forming at a lower surplus share ($\theta_m(NC)$) for noncollege men. These dynamics shift the orange locus in the bottom graph downward, leading to a further downward shift of the marginal benefit curve. This further downward shift is the *marriage market effect*.

The goal of this section is to separately quantify these marriage market and labor market effects, and thus apprehend an additional implication of the marriage market channel for young men's employment. To do so, I specify an empirical model based on the theoretical framework and structurally estimate its parameters. Then, I impose a negative shock to noncollege men's lifetime earning potential and solve for the new model equilibrium. The structure of the model enables a decomposition of equilibrium responses into labor market versus marriage market channels.

5.1 Empirical setup.

I consider the investment-and-matching problem laid out in Section 3. Agents come in two education types: noncollege-educated (NC) and college-educated (C). The shares c^M of men and c^F of women are college-educated. There are equal total numbers of men and women to be matched in period 1, after men have made their labor market investments. As stated in Section 3, college men are assumed always to be in the labor force. Thus, I abstract from their

[28]When returns to experience $\hat{r}$ decline, it is possible to observe a reduction in employment even if the uncompensated employment elasticity is zero. See Imai and Keane (2004).

initial wage offer and wage growth process; they arrive in the marriage market with wage $w_{C,1}$. Noncollege men, on the other hand, receive a period-0 wage offer of $w_{NC,0}$ and face Mincerian wage equation (1) when deciding how much to work in period 0. Moreover, noncollege men in period 0 receive an amount $\hat{y}$ in non-labor income. This is consistent with the fact that many out-of-work young men live with and rely on family members for income support (Binder and Bound, 2019). I do not model heterogeneity in non-labor income receipt.

Empirical specification of utilities. Single men face the following direct utility function in period t:

$$U(c_{mt}, n_{mt}; \emptyset) = \ln(c_{mt}) - \lambda \cdot \frac{n_{mt}^{1+\gamma}}{1+\gamma} \tag{13}$$

where λ and γ are parameters to be estimated. This function belongs to the class of separable utility functions assumed in Section 3. Now, define $\underline{w} = \exp(\ln(w_{NC,0}) - \delta)$. This is the wage offer in period 1 realized by a man who does not work at all in period 0. Normalizing the utility of his hypothetical man to 0, it is easy to show that the normalized indirect utility function for single men in period 1 is simply $\tilde{V}(w_{m1}) = V(w_{m1}; \emptyset) - V(\underline{w}; \emptyset) = \ln(w_{m1}) - \ln(\underline{w})$. (See Appendix E.)

The economic surplus for a marriage between man m and woman f, for $m, f \in \{NC, C\}$, is specified as

$$S(w_{m1}, n_{m0}; m, f) = \alpha_f \cdot (1 + \mu_m n_{m0}) \cdot (\ln(w_{m1}) - \ln(\underline{w})) - \xi(m; f) \tag{14}$$

where α_f, μ_m and $\xi(m; f)$ are parameters to be estimated. I assume $\mu_C = 0$ and $\mu_{NC} = \mu$; thus, μ is a signaling parameter that captures the degree to which noncollege men can compensate for their lower earning potential by working hard in period 0. To the extent that noncollege men have lower marriage propensities than college men, μ is lower than the college wage premium.

The function $\xi(m; f)$ is specified as follows:

$$\xi(m; f) = \begin{cases} 0 & m = f \\ \xi & m \neq f \end{cases} . \tag{15}$$

That is, the economic surplus declines by ξ in a marriage between two individuals of different education types. This captures assortative matching behavior on the marriage market.

As specified in Section 3, an individual's gain in a marriage between m and f equals the individual's share in the economic surplus, plus a non-economic component capturing idiosyncratic tastes. Each side of the market contains two education types of agents: thus, in equilibrium, there is a 4-vector of male surplus shares that stabilizes the marriage market.

These shares, $\theta_{\mathbf{m}}(\mathbf{m}; \mathbf{f})$, are not parameters to be estimated, but rather are endogenous objects that result from the equilibrium conditions of the model. Idiosyncratic tastes (for singlehood, for marriage to a noncollege individual, and for marriage to a college individual) follow a Type I Extreme Value distribution, with scaling parameter σ_ϵ to be estimated.

It is instructive at this point to compare the period-1 marginal benefits of period-0 employment between to-be-single and to-be-married men. It is trivial to show that the marginal benefits realized by a to-be-single man are $\beta\hat{r}$. (See Appendix E.) A noncollege man marrying woman f receives these marginal benefits plus $\theta_m(NC; f)$ of the total marginal benefits to the marriage. This yields the following expression:

$$\begin{aligned} & \beta\hat{r} && + \quad \beta\theta_m(NC; f) \cdot \frac{dS}{dn_0^{\text{married;f}}} \\ = \quad & \underbrace{\beta\hat{r}}_{\text{Marginal \textbf{labor market} benefits}} && + \quad \underbrace{\beta\theta_m(NC; f) \cdot \alpha_f \hat{r}(1 + 2\mu n_{m0})}_{\text{Marginal \textbf{marriage market} benefits}}. \end{aligned} \tag{16}$$

Given a positive surplus share and positive parameter values, it is clear that to-be-married men enjoy higher marginal benefits to period-0 employment than to-be-single men.

Preset parameters. The baseline model aims to replicate the environment of the early 1980s in the United States. A number of model parameters are preset, consistent with this baseline, based on external sources of data. First, the model abstracts from education decisions, so I preset the college shares c^M and c^F based on data reported by Autor and Wasserman (2013). I set the earning potential of college men in period 1, $w_{C,1}$, based on data reported by Binder and Bound (2019). The initial wage offer for noncollege and wage growth process—$w_{NC,0}$, δ and $\hat{r}$—are set based on estimates in the NLSY79 data reported by Braga (2018) and to ensure a college wage premium of 0.4 (its value in the early 80s inferred from Binder and Bound, 2019). Finally, nonlabor income $\hat{y}$ is inferred based on data reported by Binder and Bound (2019). Appendix Table A.5 records the preset parameters, and further information on their calibration can be found in Appendix E.

This leaves 7 parameters to estimate: noncollege men's preferences for leisure (λ and γ), marital value scalars for each type of woman (α_{NC} and α_C), noncollege men's signal value of working hard (μ), the penalty for marrying the opposite education type (ξ) and the idiosyncratic taste scale parameter (σ_ϵ).

Identification. I estimate these 7 parameters using the Generalized Method of Moments (Hansen, 1982). I choose 7 informative moments, based on 1980s U.S. data, for identification. Thus, the model is exactly identified: the GMM estimates are the parameter choices that make model-generated behavior exactly coincide with the 7 observed behaviors in the data.

I provide a heuristic argument that the following moments identify the model. To start, note that the only parameters that govern the employment behavior of to-be-single men are the preference parameters λ and γ. The parameter λ is identified by targeting the labor-force participation rate of "always-single" noncollege men in the NLSY79, over ages 21-31 (recall Section 3.3). The parameter γ is related to noncollege men's willingness to substitute between consumption and leisure. Thus, I identify γ by targeting an uncompensated labor supply elasticity. I produce this elasticity within the model by measuring the responsiveness of period-0 employment of to-be-single men to a 10% decline in $w_{NC,0}$.[29] Consistent with small uncompensated elasticities estimated in the literature, I target a value of 0.1.[30]

Four remaining parameters are identified by marriage outcomes in the data. Suppose for the moment that the scale parameter on idiosyncratic tastes (σ_ϵ) is unity: as is standard in discrete choice models, the following argument identifies payoff parameters *relative* to this scale. Consider a woman of education type f. All else constant, the larger α_f is, the more marriages will form involving type-f women. Thus, I identify α_f for $f \in \{NC, C\}$ by targeting the matching statistic

$$\Pi_f = \frac{\text{marriages}^{NC,f} + \text{marriages}^{C,f}}{\sqrt{\left(\text{singleMen}^{NC} + \text{singleMen}^{C}\right) \cdot \text{singleWomen}^{f}}}.$$

This is the ratio of the number of marriages forming involving type f to the geometric average number of men and type-f women who remain unmarried. See Choo and Siow (2006) for further discussion of this statistic. The signaling parameter for noncollege men, μ, is identified by the observed *gap* in marriage propensities between college and noncollege men. The larger μ is, the smaller this gap will be in the model. The parameter ξ is identified by observed *assortative matching* behavior in the marriage market. The larger ξ is, the stronger will be the degree of positive assortative matching on education. I capture assortative matching with the correlation coefficient between married couples' college statuses.

The last parameter—σ_ϵ—is identified by the *difference in period-*0 *employment behavior between to-be-single and to-be-married men*. (The observed difference is reported in column 4 of Table 1.) Why should the dispersion of idiosyncratic tastes for marriage be at all related

[29] Note that the structure of direct utility in the model forces the responsiveness of period-0 employment to $w_{NC,0}$ to be 0—that is, an exact canceling of the income and substitution effects—unless non-labor income is present. The existence of non-labor income in period 0 thus not only matches reality, but also generalizes the model.

[30] Important to the interpretation is that this 0.1 value captures the effect of a persistent wage change while holding marriage market forces constant. This is a reasonable interpretation, since microeconometric studies in the literature tend to leverage changes in the income tax code that *implicitly hold family structure constant*. For example, the labor supply of married individuals in response to a change in the rate schedule facing married couples—or the labor supply of single individuals in response to an expansion of Earned Income Tax Credits for single individuals—is measured and cited as an uncompensated elasticity.

to employment behavior? The answer is relatively straightforward. Note that lifetime utility in this model is denominated in period-0 log consumption units. Noncollege men in period 0 convert expected period-1 marginal benefits into this scale when deciding how hard to work. But when deciding whom to marry in period 1, scale does not matter: one simply picks the option associated with the highest period-1 utility. Thus, σ_ϵ is chosen to convert the marriage market parameters that influence to-be-marrieds' period-0 employment choice—α and μ—into values consistent with this choice.

The following example is instructive. Suppose there is only one type of woman, one type of man, and μ is zero. Consider one world in which $3/4$ of men end up married and to-be-marrieds work only *slightly more* than to-be-singles. Consider another world in which $3/4$ of men marry and to-be-marrieds work *much more* than to-be-singles. Since marriage outcomes are the same in both worlds, α/σ_ϵ must be the same in both worlds. But, as stipulated by equation (16), σ_ϵ (and thus α) must be higher in the second world in order to generate the higher employment of to-be-married men. Thus, we see that α/σ_ϵ is identified by marriage outcomes and σ_ϵ is identified by the employment behavior of to-be-married men.

Baseline estimation. The presence of a pre-match investment decision makes the present econometric framework more complex than the standard transferable-utility matching framework (used in Choo and Siow, 2006; Chiappori et al., 2017a). This is because an interdependence exists between the surplus shares that stabilize the marriage market and the overall surpluses—and hence marital matching patterns—generated in equilibrium. To see this, recall that surplus shares are inputs into the period-0 employment decision of to-be-married men (by first order condition 7), yet this employment decision affects the overall marital surplus and marriage formation (by equations 4 and 5). Such an interdependence does not arise in the former models. To handle this complexity, I apply the algorithm designed by Galichon et al. (2018) for matching models with *imperfectly* transferable utility. In such models, interdependence between surplus shares and total surpluses arises through spousal bargaining processes (e.g. Reynoso, 2019; Gayle and Shephard, 2019). Though the structure of my model differs from these, the interdependence arises for the same reason: because an equilibrium action taken by a prospective spouse affects both the overall surplus and its distribution. Following is a description of the GMM estimation procedure:

1. Guess a parameter vector.
2. Guess $n_{NC,0}^{\text{married;f}} = 1$. This is the period-$0$ employment rate of noncollege men who will marry female education type f.
3. Given the guess of $n_{NC,0}^{\text{married;f}}$, use the fixed-point algorithm of Galichon et al. (2018) to solve for the surplus shares $\theta_m(m; f)$ that stabilize the marriage market.

4. Use first-order condition (7) to solve for the values of $n_{NC,0}^{\text{married;f}}$ consistent with these surplus shares $\theta_m(NC; f)$. This becomes the new guess of $n_{NC,0}^{\text{married;f}}$.

5. Repeat steps 3 and 4 until the new guess of $n_{NC,0}^{\text{married;f}}$ is the same as the old guess.

6. The model is now at equilibrium. Compute the normed distance between the seven moments predicted by the model and those observed in the data.

7. Repeat steps 1-6 (using a computerized search algorithm) until this distance approaches zero.

Table 6 presents the baseline estimation results and confirms that the model replicates the 1980s environment of interest.

5.2 Quantifying the marriage market multiplier.

With the baseline model, we can now quantify the marriage market channel associated with a shock to noncollege men's earning potential. This quantification is straightforward. Because the employment behavior of to-be-single men is not affected by marriage market forces, the response of to-be-single men to the shock pins down the labor market channel. The response of *all* men to the shock, by definition, includes both labor and marriage market channels. The size of the marriage market channel is simply the difference between the response of all men and the response of to-be-single men.

To see this, consider the following decomposition. For illustrative purposes, suppose there is just one type of woman in the marriage market. Define $\eta_{NC,0}^{\text{married}}$ as the difference in period-0 employment rates between to-be-married men and always single men. This yields the following expression for the noncollege male employment rate in period-0:

$$n_{NC,0} = n_{NC,0}^{\text{single}} + s_{NC}^{\text{married}} \cdot \eta_{NC,0}^{\text{married}},$$

where s_{NC}^{married} is the share of noncollege men who marry. Then, the change in the noncollege male employment rate due to a wage shock is:

$$\Delta n_{NC,0} = \underbrace{\Delta n_{NC,0}^{\text{single}}}_{\textbf{labor market}\text{ channel}} + \underbrace{s_{NC}^{\text{married}} \cdot \Delta \eta_{NC,0}^{\text{married}} + \Delta s_{NC}^{\text{married}} \cdot \eta_{NC,0}^{\text{married}}}_{\textbf{marriage market}\text{ channel}}. \tag{17}$$

Alternatively, the *marriage market multiplier* can be computed as the *ratio* of the response of all men to the response of to-be-single men: $\Delta n_{NC,0}/\Delta n_{NC,0}^{\text{single}}$. This describes how much the labor market shock is magnified by the endogenous response of the marriage market.

The model allows for two different types of labor market shocks to be simulated. One is a *downward shift* of the life-cycle wage profile, driven by a reduction in the initial wage offer $w_{NC,0}$. Another is a *flattening* of the wage profile, driven by a reduction in returns to experience $\hat{r}$. One can interpret a reduction in $\hat{r}$ as reflecting fewer opportunities for career growth among stably-employed men, or an increase in labor market imperfections that prevent stable job-holding. For example, if increased automation and import competition from China raises the probability of job displacement—and job displacement results in lost returns to tenure and involuntary depreciation of skills—then a given amount of time spent working or looking for work will result in lower wage growth. I remain agnostic about the underlying cause of a decline in $\hat{r}$.

It is important to note that such a simulation is an out-of-sample exercise. The aggregate responsiveness of noncollege men's employment and marriage outcomes to wage profile shocks was not targeted in the estimation. Hence the simulation exercise can be seen as a test of the theoretical model's predictions. In the next subsection I show that the simulated responses match up rather well with some recent empirical estimates in the literature. Both sets of responses lend credence to the marriage market channel emphasized by the theory.

Table 7 reports the equilibrium effects of a 10% reduction in noncollege men's earning potential, driven by a combination of a reduction in initial wage offers ($w_{NC,0}$) and a reduction in wage growth ($\hat{r}$).[31] All other agents' labor market opportunities are held constant. Looking at the first row of Panel B, the shock reduced the share of noncollege men that married in period 1 by 3.9 percentage points. This was driven by reductions both in noncollege men marrying noncollege women and in noncollege men marrying college women, although the former effect dominated. (This is not surprising given that most noncollege husbands were married to noncollege wives at baseline.) The second row shows that the shock lowered the economic surplus shares claimed by noncollege men—particularly in marriages with college women. The third row reports that the shock reduced the employment of to-be-singles by 1.3 percentage points and aggregate employment by 2.3 percentage points. Thus, had marriage prospects remained constant, the effect of the shock on employment would have been a full percentage point—or $1/2.3 = 43.5\%$—smaller. In other words, the marriage market multiplied the original employment effect of the labor market shock by a factor of $2.3/1.3 = 1.77$.

In Appendix Table A.6, I consider different 5 different shocks to noncollege men's wage profiles. All shocks reduce present-discounted lifetime wages by 10%, but they vary in their emphasis on reduced returns to experience ($\Delta\hat{r}$) versus reduced initial wage offers ($\Delta w_{NC,0}$).

[31] Specifically, I reduce initial wage offers by 9.15% and wage growth by $1.5p.p.$. The importance of period 1 relative to period 0, β, is calibrated to 1.33 (see Appendix E for details on this choice). This implies that the present-discounted lifetime wage reduction is $9.15\% \cdot \frac{1}{2.33} + (9.15 + 1.5)\% \cdot \frac{1.33}{2.33} = 10\%$.

I find that a shock that places more emphasis on reduced returns to experience results in a smaller marriage multiplier. Specifically, as reduced returns to experience go from accounting for none of the overall wage shock to all of it, the marriage market multiplier falls from around 2.0 to 1.5. However, such a shock creates a larger period-0 employment response, as both labor market and marriage market effects rise in absolute terms.[32] Thus, labor market shocks that reduce the wage growth of noncollege men play a particularly important role in their falling marriage market value, and in marriage-market-induced withdrawal from the workforce.

5.3 Some external validation.

Recent work by Autor et al. (2019) has revealed economically significant relationships among labor market demand, young men's employment and marriage. These authors estimated that rising import competition from China in male-dominated sectors led to lower marriage and a greater share of men living without children in the affected communities. They additionally found an increase in the shares of young men not employed and not in the labor force. Table A3 of their study reports that a 1-unit male trade shock, over the period of a decade and holding constant female trade shocks, is associated with a $\$3,737$ loss in annual earnings for the median-earning man, a $3.06 p.p.$ (or 3.7%) decline in male employment, and a $1.97 p.p.$ (or 2.2%) decline in male labor-force participation. Under an assumption described in Appendix E, I convert this earnings loss into an 8.5% decline in hourly wages. The elasticities implied by these numbers are 0.41 for employment and 0.26 for participation—larger than nearly all uncompensated labor supply elasticity estimates reported in the literature.

In Table 8, I compare the model-simulated effects of a 10% male wage shock to the estimated effects of a 1-unit male trade shock. The effects are quite similar. Scaling the trade shock estimates by a factor of $10/8.5$, we see that a male trade shock that induces a 10% decline in wages results in a $1.97 \cdot 10/8.5 = 2.32 p.p.$ decline in male labor-force participation, while the model predicts a $2.30 p.p.$ decline. The trade shock results in a $3.57 \cdot 10/8.5 = 4.20 p.p.$ decline in marriage, while the model predicts a $3.93 p.p.$ decline. Perhaps most important, the trade shock estimates imply a young male participation elasticity of 0.26, while the simulation estimates imply an elasticity of 0.25. The parity of these results suggests that a substantial portion of the young male employment effects of rising import competition from China was generated by marriage market forces. It also suggests that the model's predictions have some degree of external validity, at least with respect to the 1990-2014 period examined by Autor et al. (2019).

[32] See Elsby and Shapiro (2012) for a model of the labor market effect of a reduction in the experience-earnings profile.

6 Conclusion.

This paper identifies the changing marriage market as a partial explanation for the concerning decline in employment of young men in the United States since the 1960s. To illustrate why the marriage market might incentivize young men to seek employment, I present a marital matching framework in which men take a pre-match employment decision. When gains from traditional gender role specialization drive the economic benefits of marriage, the framework predicts that the men who work the hardest before marriage enter the highest-surplus marriages and claim the largest shares of these surpluses. Such men thus earn a **marriage market return**—in addition to the usual labor market return—from investing in stable employment. Changes in the marriage market that affect the economic benefits of marriage affect this return and, consequently, young men's equilibrium level of employment.

I develop and test two implications of this marriage market channel. First, a reduction in the gains from specialization makes noncollege men less attractive as marriage partners, and hence lowers the marriage market return they earn from investing in employment. I test this implication by leveraging two specific marriage market interventions that plausibly reduced gains from specialization: the adoption of unilateral divorce legislation, and shocks to young women's employment opportunities (holding men's opportunities constant). I estimate that these interventions generated 29% of the observed 1965-2015 decline in labor-force participation by young noncollege men. Second, a reduction in noncollege men's labor market opportunities not only reduces labor market returns to employment, but also reduces marriage market returns through its effect on gains from specialization. Simulations of a calibrated structural model find that the "indirect" effect of a 10% reduction in noncollege men's wages on employment, operating through the marriage market, is roughly as large as the "direct" labor market effect. These results establish the marriage market channel as a quantitatively important driver of secular decline young men's employment.

These findings enhance our understanding of secular decline in prime-age men's employment. Observers of this trend have tended to cite falling labor demand as its primary cause. This explanation is problematic because it requires a larger responsiveness of men's employment to wages than is revealed by the historical record (and in quasi-experimental studies of wage changes generated by tax policy). An explanation that features interaction between the labor market and the marriage market helps resolve this problem, particularly for younger men, given that older displaced workers have greater access to savings and disability benefits. In addition, the marriage market channel emphasized here likely interacts with the rising fraction of noncollege men with prison records. (See Charles and Luoh, 2010 and Schneider et al. (2018) for arguments that mass incarceration has disrupted family formation). Young men released from prison may invest less in employment in part because they face lower marriage prospects—especially if discrimination in the labor market makes the securing of stable employment harder for such men.

This paper expands a growing body of theory and evidence linking marriage market forces to human capital investments. The ground seems fertile for seeding further expansions. For example, health can be thought of as human capital (Grossman, 1972). An important narrative posits that adverse labor demand shocks have increased drug-abuse-related morbidity and mortality among noncollege men (Case and Deaton, 2015; Coile and Duggan, 2019; Autor et al., 2019). Such a narrative is potentially too crude: we may have much to learn from incorporating interactions between labor demand and marriage prospects into the study of risky health behavior.[33] Investments in housing have also recently been linked to marriage formation (Lafortune and Low, 2017), but a framework that considers the joint determination of both outcomes is yet to be seen.

Future research should consider extending the modeling framework used in this paper. The reduced-form results shown here on unilateral divorce causally demonstrate that a change in contracting technology over an uncertain future affects pre-marital investments. This suggests a fruitful extension of the matching environment to allow for uncertainty, limited commitment, and unilateral divorce. Such an extension also pairs with modeling the choices of individuals to enter non-marital cohabitation—an arrangement that features low exit costs but also low commitment. Extending econometric matching models in these ways will likely offer richer quantitative predictions on the forces determining human capital investments and the socioeconomic returns such investments receive.

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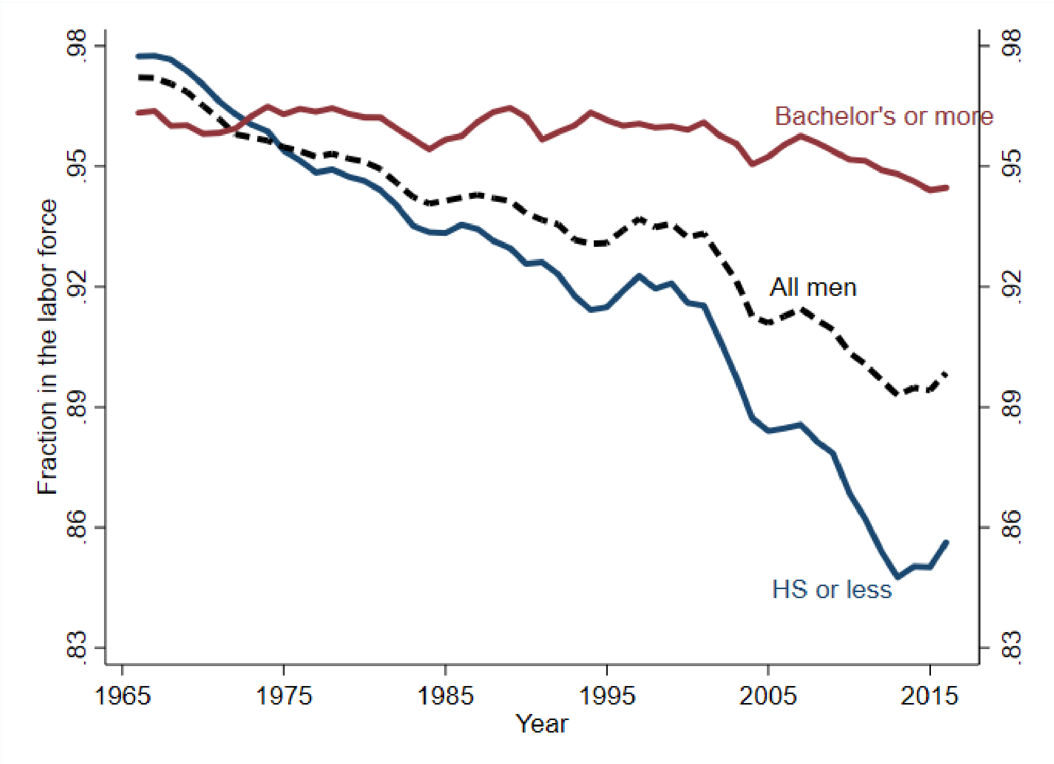
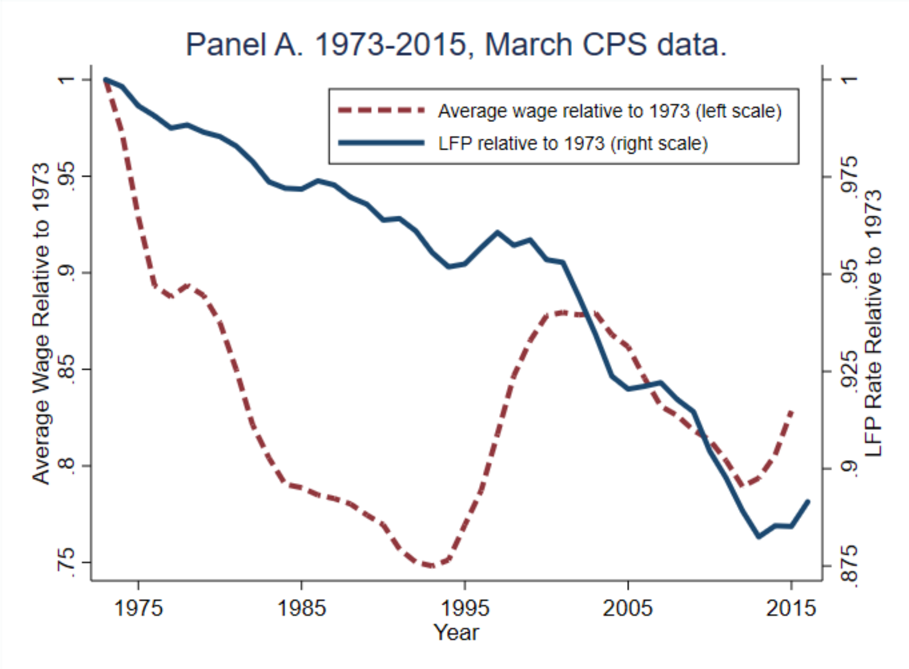
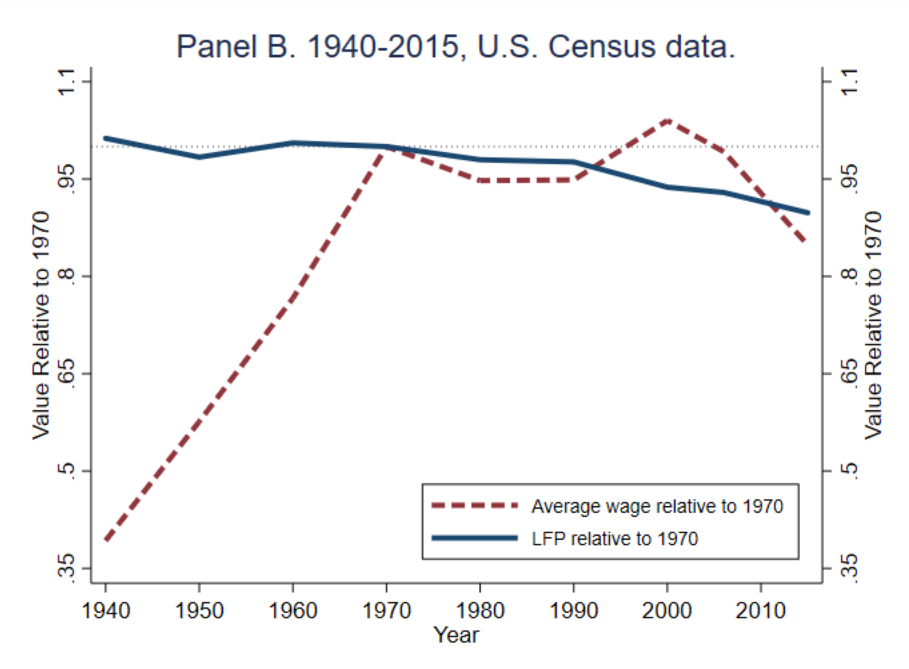
Figure 1: **Labor-force participation rates by education status. Men aged 25-34.**



Source: March CPS data, 1964-2017. Overall sample is white or black non-Hispanic men aged 25-34. Individuals in the “HS or less” sub-sample completed at most one year of college education. Individuals in the “BA or more” sub-sample completed at least 4 years of college education.

Figure 2: **Average wage and participation trends in modern U.S. history. Men without college, ages 25-34.**



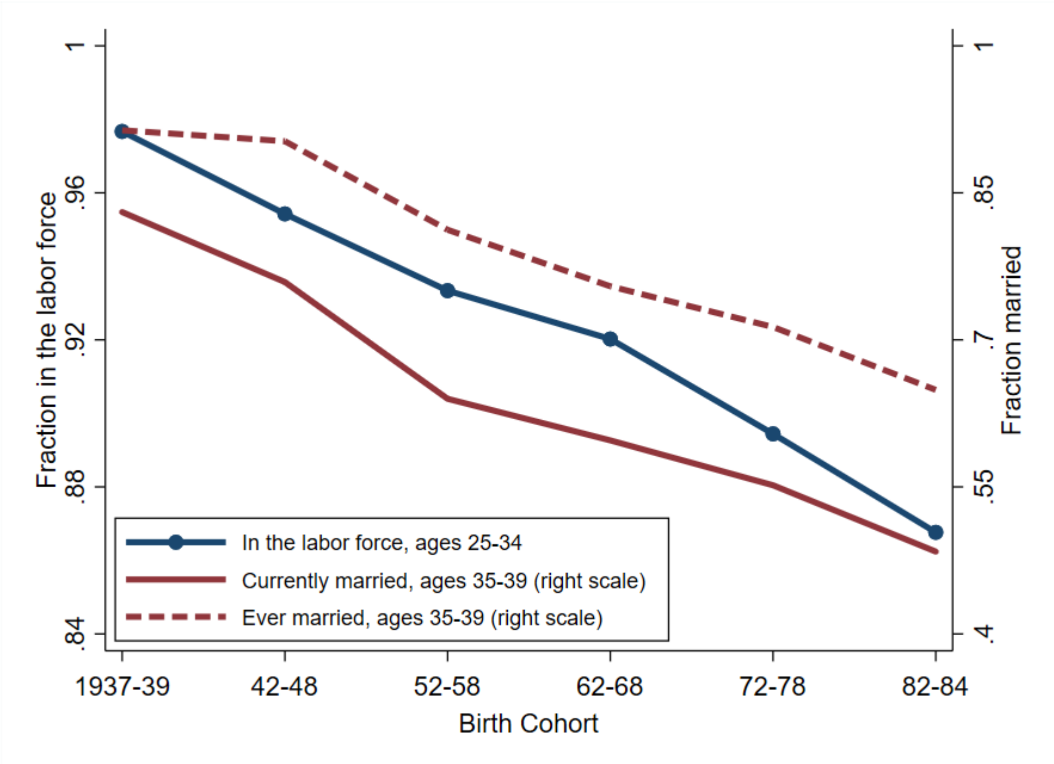


Both panels: Sample is white or black non-Hispanic men, aged 25-34, with at most one year of completed college. Reported values are relative to the base year: for example, 0.9 means a 10% decline since the base year.

Panel A: March CPS data, 1973-2016. Graph displays 3-year moving averages. Average hourly earnings from wage-and-salary income are constructed in a manner described in Appendix B. Wage offers for non-workers are imputed using the method of Juhn et al. (1991), described in Appendix B. Wage trends are not sensitive to whether non-workers are included or excluded, or to whether business income is included.

Panel B: U.S. Census data, 1940-2000. American Community Survey data, 2005-2007 and 2014-2016. Average weekly earnings from wage-and-salary income are constructed in a manner described in Appendix B. Wage trends are not sensitive to whether business income is included.

Figure 3: **Falling employment and marriage propensities across birth cohorts of noncollege-educated men.**



Source: March CPS data, 1962-2017. Sample consists of men with at most one year of completed college and who are not currently enrolled in school. Age 35-39 marriage values for the 1982-84 cohort are not yet available: these values are predicted based on age 30-33 values in a manner described in Appendix B.

Figure 4: **2-period model of men's pre-marital employment and marriage.**

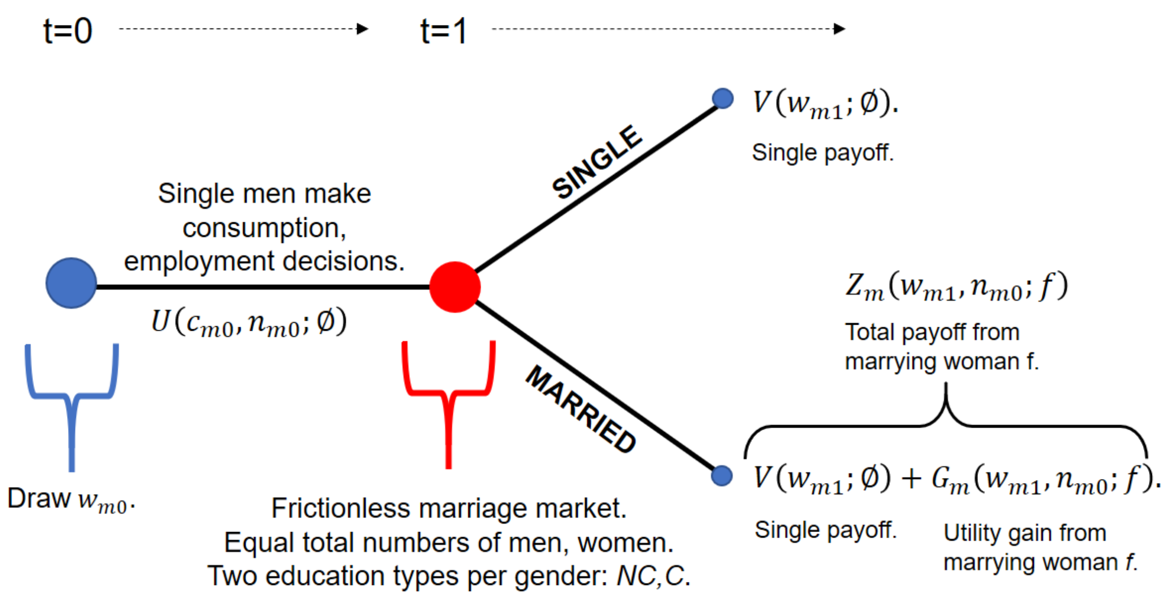
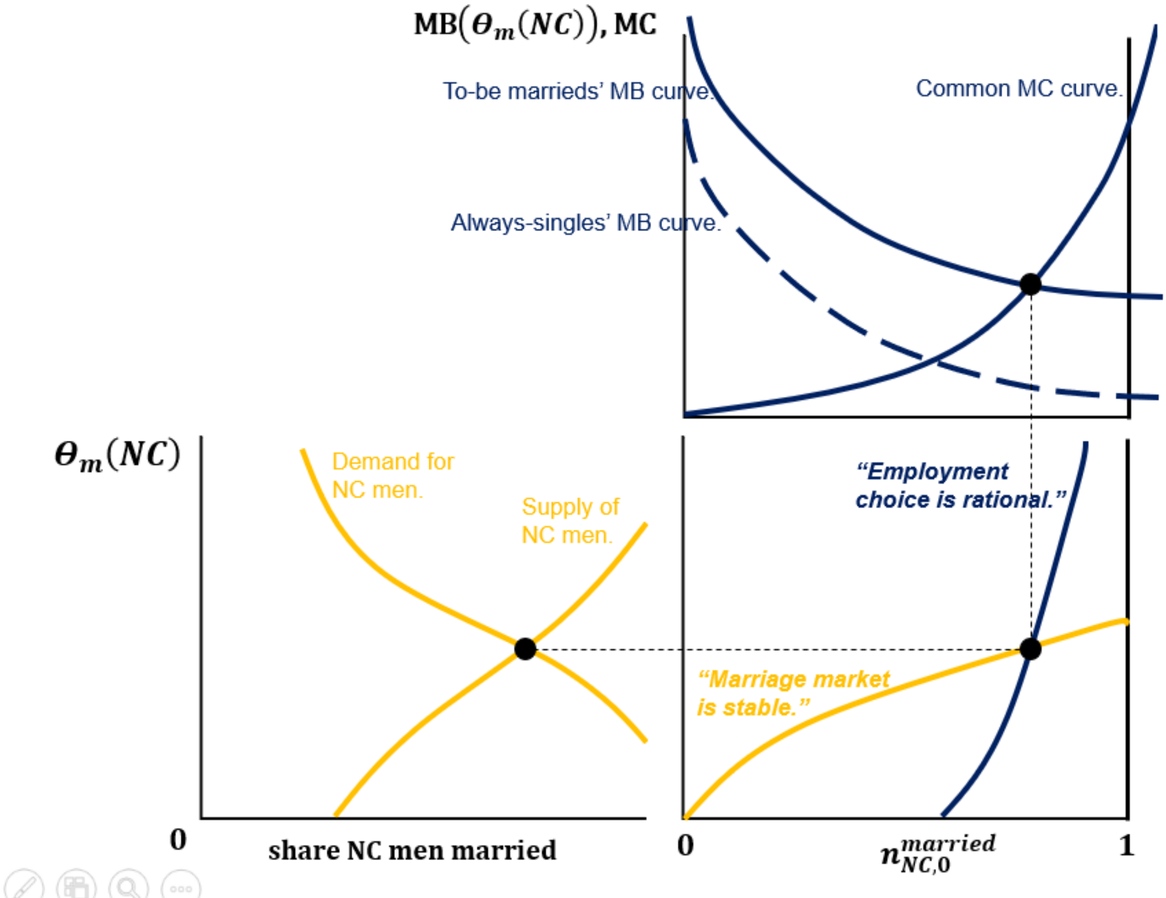
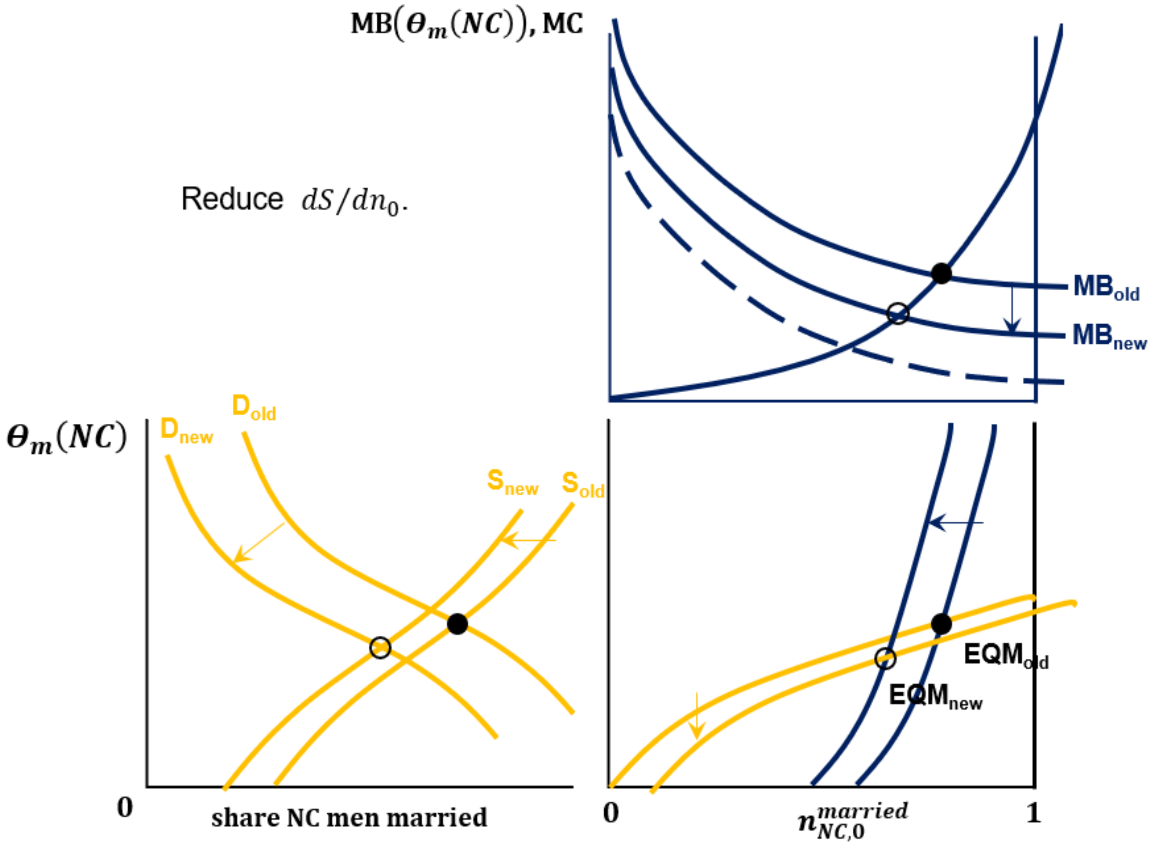


Figure 5: **Equilibrium employment and marriage for noncollege-educated men.**



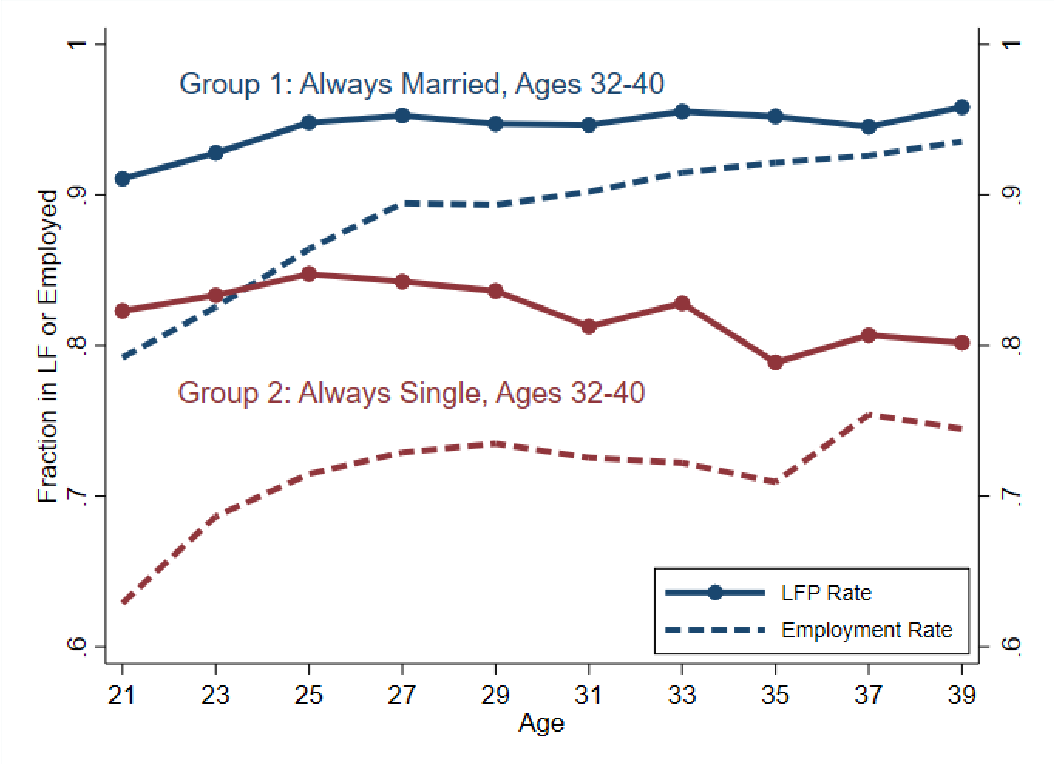
See discussion in Section 3.2

Figure 6: **Comparative static: reduction in marital surplus added by noncollege men.**



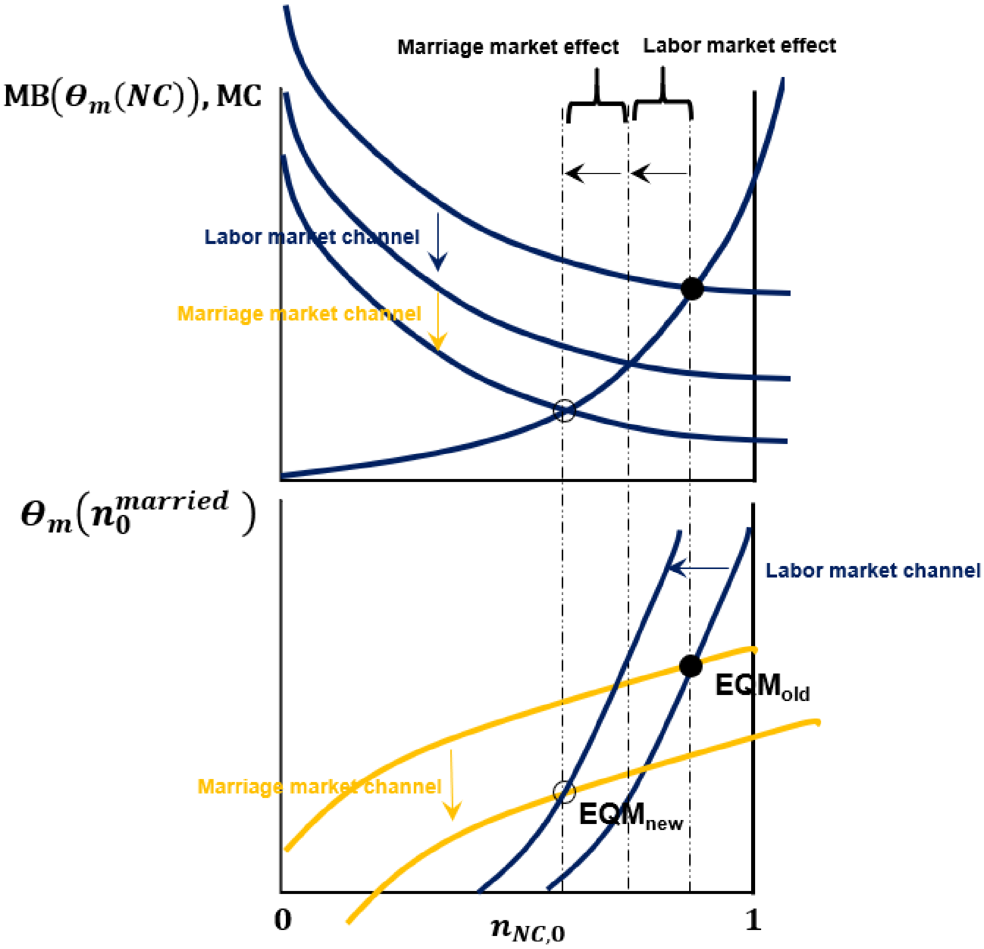
See discussion in Section 3.2

Figure 7: **Life-cycle employment behavior among NLSY79 men without college: "always-marrieds" versus "always-singles."**



Sample: NLSY79 non-Hispanic men with high-school education or less. Sample is divided into two groups, as described in the figure. For group 2, "single" means neither married nor cohabiting with an unmarried partner. Non-marital cohabitations were identified using the method of Oppenheimer (2003). For each group, age profiles of labor-force participation and employment rates are plotted. Each point records a 2-year average of group behavior: for example, the point at age 21 records average behavior over ages 21 and 22. 659 men are in group 1 and 289 are in group 2.

Figure 8: **Comparative static: reduction in noncollege male wage offers.**



This figure graphs the equilibrium effects of a reduction in noncollege men's wage offers: some combination of a reduction in initial wages $w_{NC,0}$ and a reduction in the returns to experience $\hat{r}$. The population employment rate in period 0 is depicted by the vertical dot-dash line. The initial "labor market effect" of the shock shifts the population marginal benefit curve downward. The subsequent "marriage market effect" occurs as the marriage market adjusts to the erosion in noncollege men's earnings prospects, resulting in fewer noncollege men marrying at a lower surplus share. Such a change is captured by a downward shift of the orange locus in the bottom graph. This result in a further downward shift of the population marginal benefit curve in the top graph.

Table 1: **Strong association between initial employment behavior and subsequent marriage propensity: NLSY79 men without college**

Outcome:	% weeks in LF, ages 21-31				% weeks employed, ages 21-31			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Effect of 0-to-1 increase in marriage, ages 32-40	7.3***	6.7***	8.2***	7.6***	11.9***	10.8***	12.4***	11.3***
	(0.9)	(0.9)	(1.0)	(1.0)	(1.4)	(1.4)	(1.5)	(1.5)
Mean outcome, never-marrieds	85.8	85.8	85.8	85.8	73.5	73.5	73.5	73.5
N	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Controls								
% married	✓	✓	✓	✓	✓	✓	✓	✓
% non-marital cohab.			✓	✓			✓	✓
initial wage offer		✓		✓		✓		✓

NLSY79 data. Sample consists of men with at most one year of completed college and who are not currently enrolled in school. Top row reports estimated marginal effects of a 0-to-1 increase in the share of time spent married over ages 32-40 on the share of time spent employed while ages 21-31. Even-numbered columns control for the log of the individual's hourly wage, averaged over the first 3 years since the individual left school. Hourly wage data are processed in a manner described in Appendix B. Non-marital cohabitations are constructed using the method of Oppenheimer (2003). Regressions are weighted by NLSY79 sampling weights multiplied by the number of employment observations in the reference period. Triple asterisks denote statistical significance at the 1% level.

Table 2: **Effects of marriage market interventions on noncollege men's marriage propensities.**

	Currently married: all men					
	(1)	(2)	(3)	(4)	(5)	(6)
	Intervention 1: mutual consent → unilateral divorce					
Effect of legal change	-1.7^{***}	-2.4^{***}	-1.3^{**}	-1.8^{***}	-2.0^{***}	-2.1^{***}
	(0.6)	(0.8)	(0.6)	(0.6)	(0.6)	(0.7)
100−control mean	28.2	28.2	28.2	28.2	28.2	28.2
Pre-trends p-val	0.62	0.44	0.16	0.03	0.19	0.39
N (thousands)	2,151	2,151	2,151	2,151	2,151	2,151
	Intervention 2: increased demand for female employment					
Effect of 10 $p.p.$ Bartik shock	-1.7^{***}	-1.1^{**}	-2.5^{***}	-1.5^{***}	-2.4^{***}	-1.6^{***}
	(0.5)	(0.5)	(0.4)	(0.5)	(0.4)	(0.5)
100−control mean	31.2	31.2	31.2	31.2	31.2	31.2
N	2,888	2,888	2,888	2,888	2,888	2,888
Controls						
Baseline	✓	✓	✓	✓	✓	✓
Demos×linear trend		✓		✓		✓
Region effects			✓	✓		
State/division effects					✓	✓

Intervention 1: OLS models based on individual data from 1960-1990 U.S. Census samples. See text for detail on baseline and additional controls. Robust standard errors are clustered on state. Regressions are weighted by Census person weights. Pre-trends p-values are p-values from an F-test of the hypothesis that the effect of unilateral divorce is 0 before the passage of unilateral divorce. Specifically, event-time is grouped into 5-year bins (due to the decadal frequency of Census data) and event-study coefficients are estimated relative to the bin containing 5-to-1 years before law passage. The F-test is whether the coefficients corresponding to "10-to-6" and "at least 11" years before law passage are jointly zero.

Intervention 2: OLS models based on commuting-zone-average data at 4 time points: 1980, 1990, 2000 (U.S. Censuses) and 2015 (2014-2017 American Community Surveys). Bartik instruments are constructed using samples of men and women with 0-20 years potential experience, not enrolled in school, and with at most one year of college education. See text for detail on baseline and additional controls. Robust standard errors are clustered on commuting zone. Regressions are weighted by 1980 sample population shares for each commuting zone. Pre-trend tests forthcoming.

Overall: Sample is single men with 5-20 years of potential experience, not enrolled in school, at least 16 years old, and with at most one year of college education. "100−control mean" reports the percentage of individuals not currently married in a mutual consent regime (Intervention 1) or in 1980 (Intervention 2). Standard statistical significance legend used.

Table 3: **Effects of marriage market interventions on noncollege men's labor-force participation.**

	In the labor force: single men					
	(1)	(2)	(3)	(4)	(5)	(6)
	Intervention 1: mutual consent → unilateral divorce					
Effect of legal change	-1.0^{*}	-1.4^{*}	-0.9^{*}	-1.3^{**}	-1.9^{***}	-1.9^{**}
	(0.6)	(0.8)	(0.5)	(0.5)	(0.6)	(0.9)
100−control mean	14.3	14.3	14.3	14.3	14.3	14.3
Pre-trends p-val	0.39	0.62	0.22	0.06	0.84	0.99
N (thousands)	859	859	859	859	859	859
	Intervention 2: increased demand for female employment					
Effect of 10 $p.p.$ Bartik shock	-0.8	-0.8	-1.4^{***}	-1.3^{**}	-1.5^{***}	-1.3^{**}
	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)
100−control mean	12.9	12.9	12.9	12.9	12.9	12.9
N	2,888	2,888	2,888	2,888	2,888	2,888
Controls						
Baseline	✓	✓	✓	✓	✓	✓
Demos×linear trend		✓		✓		✓
Region effects			✓	✓		
State/division effects					✓	✓

See above table. Everything is the same except that the sample is currently single men with 0-15 years of potential experience. "100−control mean" reports the percentage of individuals not in the labor force in a mutual consent regime (Intervention 1) or in 1980 (Intervention 2). Standard statistical significance legend used.

Table 4: **Small effects of marriage market interventions on non-college male wages.**

	Log weekly wage$/100$: single men					
	(1)	(2)	(3)	(4)	(5)	(6)
Intervention 1: mutual consent $\rightarrow$ unilateral divorce						
Effect of	-0.7	-0.7	0.5	0.5	-2.4	-2.2
legal change	(2.0)	(2.4)	(1.4)	(1.4)	(2.9)	(3.2)
N (thousands)	685	685	685	685	685	685
Intervention 2: increased demand for female employment						
Effect of 10 $p.p.$	1.1	-1.6	1.9	-1.0	1.7	-1.2
Bartik shock	(1.3)	(1.1)	(1.2)	(1.2)	(1.1)	(1.1)
N	$2,888$	$2,888$	$2,888$	$2,888$	$2,888$	$2,888$
Controls						
Baseline	✓	✓	✓	✓	✓	✓
Demos$\times$linear trend		✓		✓		✓
Region effects			✓	✓		
State/division effects					✓	✓

Sample and regression specifications are the same as in the above table. See Appendix B for information on computation of log weekly wages. Standard statistical significance legend used.

Table 5: **Contributions of marriage market interventions to secular decline in noncollege male LFP.**

Intervention:	*Unilateral divorce*	$10p.p.$ *female employment shock*
Time period:	1965-1980	1980-2015
Average effect of intervention $(p.p.)$	-0.65	-1.35
Average exposure to intervention	0.54	1.40
Predicted LFP response $(p.p.)$	-0.35	-1.89
Observed LFP response $(p.p.)$	-1.5	-6.3
$\%$ explained by intervention	$\mathbf{23}\%$	$\mathbf{30}\%$

Computations based on U.S. Census data and labor-force participation regression results. Sample is men not enrolled in school, at least 16 years old, with at most one year of completed college, and with 0-15 years potential experience. The first row reports the estimated effect of the intervention on the labor-force participation rate of this sample, averaged across the 6 specifications (see Appendix A for regression results). The second row reports the increase in national exposure to this intervention over the specified period. The predicted change in LFP resulting from the intervention is the product of the first two rows. The contribution of the intervention to the observed decline is reported in the last row.

Table 6: **Baseline structural estimation results.**

Panel A: Parameter Estimates

Parameter Description	Symbol	Estimated Value
Disutility of participation	λ	2.08
Substitution parameter	γ	1.14
Marital value scalar, NC women	α_{NC}	1.81
Marital value scalar, C women	α_C	1.70
Signal value of working hard, NC men	μ	0.124
Aversion to opposite education type	ξ	1.08
Marital taste scale	σ_ϵ	0.181

Panel B: Model Fit

Moment Description	1980s U.S. data	Model
Period-0 LFP rate, to-be-singles	0.842	0.842
Period-0 LFP rate, to-be-marrieds	0.932	0.932
Uncompensated supply elasticity	0.100	0.100
Share NC women married	0.768	0.768
Share C women married	0.783	0.783
Share NC men married	0.764	0.764
Share C men married	0.790	0.790
Correlation of marrieds' C statuses	0.46	0.46

Parameters estimated by the Method of Simulated Moments. Period-0 labor-force participation for always-single and always-married groups are computed from NLSY79 data on noncollege individuals aged 21-31, with wages fixed at the non-college sample average. See Table 1 and Section 2.3 for further detail. Baseline marriage propensities are computed on individuals aged 35-39 and born in 1942-48 from the March CPS. See Figure 3 notes for further detail. College is defined as at least 2 years completed college. The uncompensated supply elasticity of 0.1 is a baseline calibration discussed in the main text. The assortative matching (correlation) parameter comes from Greenwood et al. (2016) and is based on 1980 U.S. Census data.

Table 7: **Simulation of the effect of a 10% reduction in earning potential on noncollege men's outcomes.**

Group:	Singles	Married to: NC woman	Married to: C woman	All
Panel A: Baseline equilibrium				
Population share	0.238	0.631	0.132	1.000
Marr. surplus share	*N/A*	0.520	0.316	*N/A*
Period-0 LFP rate	0.842	0.932	0.932	0.911
Normalized welfare	1.504	1.681	1.504	1.615
Panel B: Changes induced by labor market shock				
Δ Pop share	$.039$	$-.033$	$-.006$	$.000$
Δ Surplus share	*N/A*	$-.013$	$-.088$	*N/A*
Δ LFP rate	$-.013$	$-.022$	$-.022$	$-.023$
Δ Welfare	$-.165$	$-.203$	$-.200$	$-.198$
Marriage market multipliers:				
LFP				1.77
Welfare				1.20

Panel A records baseline equilibrium statistics. Panel B describes how much these equilibrium statistics change after noncollege men's wage offers are negatively shocked by 10 percent. See Section 5 of text for discussion. Marriage market multipliers are the ratios of the "All" response to the "Singles" response, for each of labor-force participation and welfare, and measure the extent to which endogenous marriage market responses amplify the direct effects of the labor market shock.

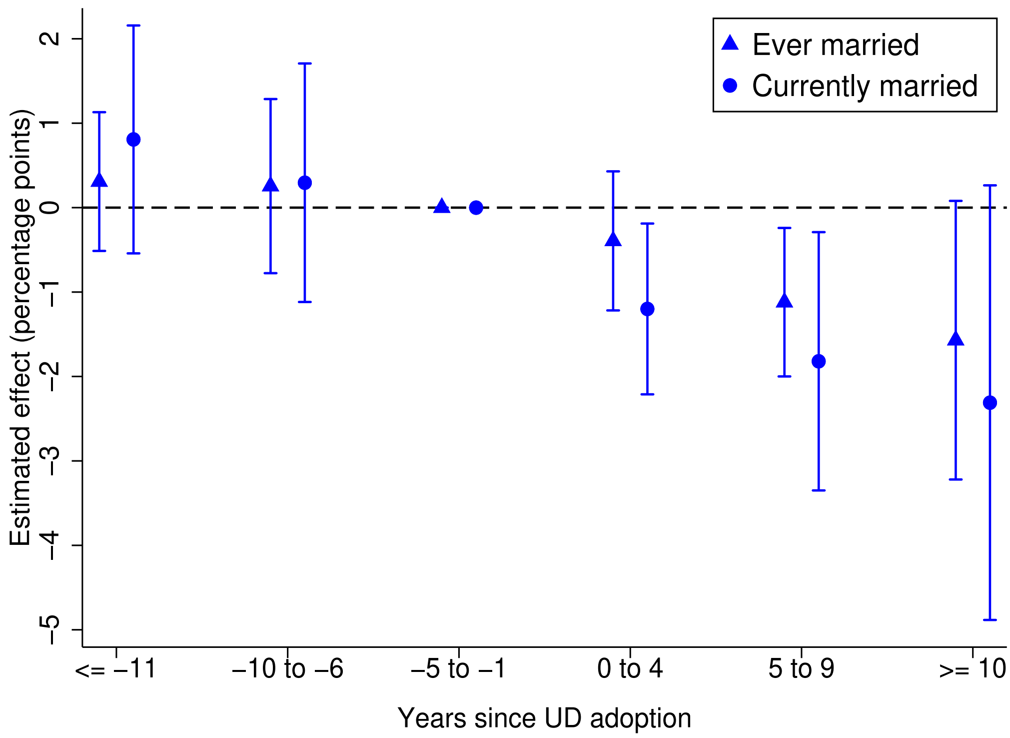
Table 8: **Shocks to young men's labor market opportunities: comparison of modeled responses to those estimated by Autor et al. (2019).**

Empirical setting:	*Male trade shock identified by Autor et al. (2019).*	*Reduction in wages simulated by the model.*
Effect of:	1-unit trade shock	-10% wage shock
$\%\Delta$ observed wages	-8.5%	-10.0%
Δ LFP rate	$-1.97p.p.$	$-2.30p.p.$
Δ marriage propensity	$-3.57p.p.$	$-3.93p.p.$

Male-specific labor market shocks driven by rising import competition from China were identified by Autor et al. (2019) for the population of men aged 18-39. See Section 5 of the main text for further detail. Modeled responses apply to the population of noncollege men at least 18 years old and with 0-15 years of potential labor market experience. Autor et al. (2019) found the China shock to disproportionately affect low-earning men who are likeliest to be noncollege-educated.

A. Omitted figures and tables

Figure A.1: **The effect of unilateral divorce on marriage propensities was long-lasting, not temporary.**



Event-study regression estimates from 1960-1990 U.S. Census data. Sample consists of less-educated men at least 18 years old, no longer enrolled in school, and with 6-21 years of potential labor market experience. Markers display point estimates (in percentage points) for associated outcome; whiskers display 95 percent confidence intervals. Standard errors are clustered on state. Event studies are estimated in 5-year bins because Census data exist only once every ten years.

Table A.1: **Probabilities of transitioning back to yearly labor-force participation (P) for current-year nonparticipants (N): men with high school education only, 1978-2011.**

		$N \to P$ transition probabilities			
Group	Race	1 year	2 years	5 years	10 years
Experienced a $P \to N$ transition in first 15 years observed	Whites	0.50	0.66	0.83	0.89
	Blacks	0.40	0.57	0.76	0.83
Non-participant in first year observed	Whites	0.43	0.54	0.72	0.81
	Blacks	0.34	0.47	0.63	0.74

Taken from Binder and Bound (2019). Data source: Social Security Administration earnings records (1978-2011) linked to all Survey of Income and Program Participation panels from 1984-2008. Sample consists of men with exactly a high school degree, at least 19 years old, and with 0-15 years of potential labor market experience in the first year observed. Non-participation is defined as having total administrative earnings for the year less than a minimum threshold of 0.5 times the federal minimum wage times 40 hours times 13 weeks. Two groups of initial non-participants are considered: men who experienced a transition to yearly non-participation within the first 15 years of observation, and men who were yearly non-participants in the first year observed. Columns report the share of each group that had transitioned back to yearly participation by the given number of years—1, 2, 5 or 10—after the initial experience of non-participation.

Table A.2: **1980 variation across commuting zones in extent of female specialization in service sectors.**

	All Workers			*Noncollege Workers*		
Service sector →	Business^{-}	Business	All	Business^{-}	Business	All
Percentile	*Panel A: Share of total female workers employed in given sector group*					
10th	.17	.33	.67	.18	.35	.61
25th	.19	.36	.76	.21	.38	.71
50th	.21	.39	.81	.23	.42	.77
75th	.23	.42	.86	.26	.46	.83
90th	.25	.46	.88	.28	.51	.85
Percentile	*Panel B: Share of total female workers − share of total male workers employed in given sector group*					
10th	.09	.21	.34	.13	.26	.39
25th	.10	.25	.39	.14	.30	.48
50th	.12	.27	.46	.17	.33	.53
75th	.14	.30	.51	.19	.37	.60
90th	.17	.33	.55	.22	.41	.64

Source: 1980 U.S. Census data. See Section 4 of main text for definition of commuting zones (of which 722 exist in the mainland U.S.). Sample consists of workers at least 18 years old and with 0-18 years potential experience. Noncollege workers are those with at most one year of completed college. Sector groups are constructed using occupation groups defined below in Appendix Table B.2. Business^{-} consists of groups 9-11; Business consists of Business^{-} plus administrative support, which is group 12; All services consist of groups 1, 3-5, 7-16. There are 24 total occupation groups.

Table A.3: **Effects of the marriage market interventions on ever-married propensities.**

Outcome:	Propensity to be ever-married					
	(1)	(2)	(3)	(4)	(5)	(6)
Intervention 1: mutual consent → unilateral divorce						
Effect of legal change	-1.2^{*}	-1.9^{**}	-0.9	-1.5^{**}	-1.3^{***}	-1.4^{***}
	(0.6)	(0.9)	(0.6)	(0.7)	(0.4)	(0.5)
100−control mean	21.0	21.0	21.0	21.0	21.0	21.0
Pre-trends p-val	0.40	0.69	0.11	0.03	0.10	0.45
N (thousands)	2,151	2,151	2,151	2,151	2,151	2,151
Intervention 2: increased demand for female employment						
Effect of 10 $p.p.$ Bartik shock	-1.2^{***}	-1.1^{**}	-1.7^{***}	-1.4^{***}	-1.7^{***}	-1.2^{**}
	(0.4)	(0.5)	(0.4)	(0.5)	(0.4)	(0.5)
100−control mean	23.0	23.0	23.0	23.0	23.0	23.0
N	2,888	2,888	2,888	2,888	2,888	2,888
Controls						
Baseline	✓	✓	✓	✓	✓	✓
Demos×linear trend		✓		✓		✓
Region effects			✓	✓		
State/division effects					✓	✓

U.S. Census and ACS data. Sample consists of men with at most one year of completed college, at least 18 years old, and with 5-20 years potential labor market experience. See Table 4 of main text for further detail.

Table A.4: **Effects of the marriage market interventions on labor-force participation: all young men.**

Outcome:	Propensity to be in the labor force					
	(1)	(2)	(3)	(4)	(5)	(6)
Intervention 1: mutual consent → unilateral divorce						
Effect of legal change	-0.4	-0.8^{*}	-0.3	-0.6^{**}	-0.8^{**}	-1.0^{*}
	(0.3)	(0.4)	(0.3)	(0.3)	(0.4)	(0.6)
$100-$control mean	6.8	6.8	6.8	6.8	6.8	6.8
Pre-trends p-val	0.50	0.46	0.33	0.06	0.80	0.94
N (thousands)	$2,151$	$2,151$	$2,151$	$2,151$	$2,151$	$2,151$
Intervention 2: increased demand for female employment						
Effect of 10 $p.p.$ Bartik shock	-0.8^{*}	-1.1^{**}	-1.5^{***}	-1.6^{***}	-1.6^{***}	-1.6^{***}
	(0.4)	(0.5)	(0.4)	(0.5)	(0.5)	(0.5)
$100-$control mean	7.5	7.5	7.5	7.5	7.5	7.5
N	$2,888$	$2,888$	$2,888$	$2,888$	$2,888$	$2,888$
Controls						
Baseline	✓	✓	✓	✓	✓	✓
Demos$\times$linear trend		✓		✓		✓
Region effects			✓	✓		
State/division effects					✓	✓

U.S. Census and ACS data. Sample consists of men with at most one year of completed college, at least 18 years old, and with 0-15 years potential labor market experience. See Table 4 of main text for further detail.

Table A.5: **Preset parameters in the structural estimation.**

Parameter Description	Symbol	Value	Source
Importance of period 1 relative to period 0	β	1.33	See notes.
Period-1 weekly wage, college men	w_1^C	$\exp(6.98)$	Binder and Bound (2019), Braga (2018)
Period-0 weekly wage offer, noncollege men	w_0^{NC}	$\exp(6.25)$	Binder and Bound (2019), Braga (2018)
Share women college-educated	c^F	0.36	Autor and Wasserman (2013)
Share men college-educated	c^M	0.42	Autor and Wasserman (2013)
Wage depreciation	δ	0.253	Braga (2018)
Returns to experience	$\hat{r}$	0.636	Braga (2018)
Non-labor income's share in period-0 full income	$\hat{y}$	0.24	Binder and Bound (2019)

External parameters in the model. The calibration of $\beta = 1.33$ is driven by the following assumptions: there are 6 years in period 0, there are 24 years in period 1, and the annual discount factor is 0.92. This leads the male agent, at the beginning of his life, to value period 1 by 1.33 times more than period 0. The wage depreciation and returns to experience parameters are cumulative over the 6 years of period 0. Appendix E contains further detail on the choices of these parameters.

Table A.6: **Downward shift of the wage profile versus flattening of the wage profile: equilibrium employment and welfare responses to different 10% wage shocks for noncollege men.**

	(1)	(2)	(3)	(4)	(5)
Δ *PDV lifetime wages*	-10%	-10%	-10%	-10%	-10%
$\Delta \ln \left(w_0^{NC}\right)$ (downward shift of wage profile)	$-.100$	$-.075$	$-.050$	$-.025$	0.00
$\Delta\hat{r}$ (flattening of wage profile)	0.00	$-.044$	$-.088$	$-.131$	$-.173$
LFP responses					
$\Delta n_0^{singles}$	$-.008$	$-.025$	$-.042$	$-.059$	$-.074$
Δn_0^{all}	$-.016$	$-.041$	$-.065$	$-.088$	$-.109$
Marr mkt multiplier	1.93	1.62	1.55	1.50	1.47
Welfare responses					
$\Delta\text{welfare}^{singles}$	$-.225$	$-.236$	$-.247$	$-.257$	$-.264$
$\Delta\text{welfare}^{all}$	$-.263$	$-.285$	$-.305$	$-.323$	$-.336$
Marr mkt multiplier	1.17	1.21	1.23	1.26	1.27

Results are computed using the empirical model developed in Section 5 of the main text. For each simulation, the baseline wage processes for noncollege men are changed by the amount specified in the table, and the new equilibrium is computed. Each simulation imposes a -10% shock to noncollege men's present-discounted lifetime earning potential, but varies the degree to which the shock is generated by a *downward shift* of the wage profile (caused by lowering w_0^{NC}) versus a *flattening* of the wage profile (caused by lowering $\hat{r}$). The marriage market multiplier is defined as the ratio of the total response to the response for the always-single men. See Section 5 of the main text for details.

B. Data details

This section describes the processing of the various sources of data used throughout the paper.

B.1. Census and March CPS data samples.

The main samples used throughout this paper consist of civilian, non-institutionalized men at least 18 years old, with at most one year of completed college education, and with non-missing race, ethnicity, nativity, and employment information (i.e. current labor force status along with weeks spent employed in the reference year).[A] Samples for Figures 1 and 2 stratify on age (25-34 for labor-force participation series; 35-39 for marriage series), while samples used in regressions stratified on years of potential experience (0-15 for labor-force participation; 5-20 for marriage). Individuals with imputed values for any of these demographic were excluded from all samples. Individuals with imputed labor force variables were excluded from labor-force samples, while individuals with imputed marital status were excluded from marriage sample. When constructing hourly wages, I additionally excluded individuals with imputed weekly hours worked information (subject to such information being reported in the given survey year). After verifying that wage results were not sensitive to whether I excluded individuals with imputed wage incomes, I elected to keep such individuals in all samples.

For the gender-specific, shift-share demand shock analysis of Section 4, I adapted David Dorn's code to construct 1990-defined commuting zones for 1980-2015 Census data. His code is available here: `https://www.ddorn.net/data.htm`. To calculate the gender-specific shifts and shares that go into the shift-share instruments, I used the noncollege population of women (or of men) with 0-20 years of potential experience. See Section 4 of the main text for the formula used to construct these instruments.

B.2. Construction of hourly wage series appearing in Figure 1.

Constructing hourly wages in the March CPS (shown in Panel A) involved several steps. First, I adjusted observed wage-and-salary incomes for topcoding. Before the 1995 survey, these incomes were top-coded at a common value. I replaced these cases with the top-code multiplied by 1.5. From 1996-2010, wage incomes above top-code thresholds were replaced by means of incomes above the top-code, conditional on certain observed characteristics. After 2010, wage incomes above the state-specific threshold were systematically swapped with other reported values within a bounded interval. I elected not to implement any top-coding adjustments after 1995.

[A]Hispanic ethnicity was not tracked by the CPS until 1976 and nativity was not tracked until 1994. Thus, only individuals with missing values for these variables after these years were excluded from the CPS samples.

Second, I used the Personal Consumption Expenditures Deflator to convert nominal values into 2017 dollars. Third, I computed annual hours worked. After the 1976 survey, this simply involved multiplying weeks worked by usual hours worked per week. Before 1976, weeks worked information is available only in the form of intervals, and usual hours worked per week is not available. However, hours worked last week is available. Thus, before 1976, I separately imputed weeks worked and usual hours worked per week using observed demographic information interacted with the observed weeks worked bin and with hours worked last week. I used 1976-1981 data to condition these imputation regressions.

Fourth, I divided real annual earnings by annual hours worked to compute real hourly wages. I trimmed calculated wage observations of below $\$2.50$ or above $\$175$ from the sample. (Trimming wage outliers did not much affect the overall wage trends reported in the figure.) Finally, I computed the average wage in a given year by applying the exponential function to the average log hourly wage. I divided the result by the average wage in 1973. Thus, the series reported in Panel A can be interpreted as the ratio of the geometric average hourly wage in the given year to that in 1973. (A value of 0.9 in year t then indicates that the geometric average hourly wage fell by 10% between 1973 and t.)

I experimented with one important adjustment to the above series, which reports geometric average hourly earnings for those employed in the reference year. Conceptually, we might prefer the geometric average hourly wage a man might expect (that is, including those who ended up not employed the whole year). Inspired by the procedure developed in Juhn et al. (1991), I imputed wage offers to these full-year non-workers. This involved regressing observed wages on demographic variables, *limiting the sample to men who were employed 13 weeks or less in the reference year*, and then using the regression output to predict average wage offers for the non-working population. I performed this imputation procedure in 6-year bins across time. Panel A of Figure 1 includes these imputations, which mildly affects the wage series but does not alter the broad pattern across time.

The construction of geometric average weekly wages in the U.S. Census data (shown in Panel B) proceeded similarly. I adjusted wage-and-salary income data for top-coding by replacing top-coded values with the top-code multiplied by 1.5 for 1940-2000 data. Thereafter, I did not implement any top-coding adjustments. Weeks worked information is available only in the form of intervals for survey years 1960, 1970, and 2008 onward. For 1960 and 1970, I used the same imputation procedure as above on 1950 and 1980 data to impute weeks worked. For 2014-2016 data, I used the same imputation procedure as above on 2005-2007 data to impute weeks worked. Because usual hours worked per week information is not available for 1940-1970, I decided to proceed with weekly wages as my concept of interest. I computed them by dividing real annual wage income by total weeks worked. Given the long time coverage of the data and the dramatic wage structure changes that took place during this time, I elected not to trim weekly wage outliers from the sample.

Because the 1950 earnings data are particularly sparse, adjusting the wage series to include the wage offers of full-year non-workers was not feasible.[B] However, due to large changes in wage-and-salary versus self-employment that transpired during this time (especially before 1980—Ruggles, 2015), I found it important to experiment with including business income in the annual earnings concept. This presented an additional challenge, since non-wage income is not tracked in 1940: only an indicator for whether the individual had over $\$50$ in non-wage income is reported. Using 1950 data on total business-and-farm income, I constructed a similar indicator (adjusting for inflation) for 1950 respondents. Then, using demographic information in interaction with this indicator, I imputed business-and-farm income for 1940 respondents based on 1950 data. Ultimately, inclusion of business-and-farm income exerted surprisingly little impact on the resultant series. For this reason, and to preserve consistency with the March CPS series, the reported series in Panel B just consider wage-and-salary income.

B.3. Construction of predicted marriage values appearing in Figure 2.

This figure reports marriage propensities for men aged 35-39, based on birth cohort group. Because the last cohort group, 1982-84, had not yet completed its 30s as of 2017 (the last year of data), this statistic is not yet observable. Instead, the figure reports predicted marriage propensities during ages 35-39 based on observed marriage propensities during ages 30-33. I estimated

$$\text{marrPropensity}^c_{35-39} = C_1 \text{marrPropensity}^c_{30-33} + C_2 t + \text{error}^c$$

using observed data from the 1952-58, 62-68 and 72-78 cohort groups—where t is the average birth year of the cohort group (1955, 1965 or 1975). Using the resultant estimates of C_1 and C_2 and the observed marriage propensity during ages 30-33 for the 1982-84 birth cohort, I then predicted the marriage propensity for ages 35-39. I repeated this procedure for each of ever-married and currently-married propensities.

B.4. NLSY79 sample.

I used data on noncollege men from the 1979 cohort of the National Longitduinal Surveys of Youth in Figure 7 and in Table 1. The NLSY79 contains weekly labor market histories and annual information on family structure for a population-representative sample of individuals that were 14-22 years old when first surveyed in 1979. I constructed a sample of noncollege men, aged 16-40, according to the same specifications as those used for the Census and

[B]Excluding 1950, the weekly wage series were largely not sensitive to the inclusion of imputed wages for full-year non-workers.

March CPS. I used these data to compare the employment behavior during the ages of 21-31 of "always-married" to "always-single" men. The always-married group always reported being married during the ages of 32 to 40, while the always-single group never reported being married or cohabiting with an unmarried partner during these ages. I identified non-marital cohabitation in the NLSY using a method employed by Oppenheimer (2003).

Table 1 required the measurement of real hourly wages. Because annual earnings and annual hours worked are reported each year, calculating hourly wages was straightforward relative to the Census and March CPS. However, I implemented some adjustments for missing wage data. The regressions reported in Table 1 require $\ln(\text{initial wage}_i)$ for each individual i, defined as the log of average hourly wages observed over the first 3 years after i left school. Many individuals for whom initial wage information was missing had wage information later in their career cycles. I imputed initial wages for these individuals based on later-in-life wages and other variables. Specifically, I took the sample of individuals with complete wage data and regressed initial wages on later-in-life wages (defined as the log of average hourly wages during ages 30-31), education and race dummies, and education dummies interacted with a quadratic in share of weeks spent employed between the ages 21 and 31. I then predicted initial wages based on this regression.

A few individuals had chronically missing wages due to very low attachment to the labor force. I imputed initial wage offers for these individuals by applying a variant of the Juhn et al. (1991) procedure. Specifically, after applying the above adjustments, I assigned these individuals the average observed wage of individuals in the *bottom quartile* of the employment distribution, conditional on race and education. (The employment distribution is the distribution across individuals of the share of time spent employed between the ages of 21-31.)

After making the above adjustments, I estimated regression specification (9) and generated Table 1. When estimating the regression, I weighted the individual data by NLSY79 sampling weights multiplied by the number of employment observations observed in the 11-year reference period (i.e. ages 21-31).

B.5. Coding of divorce legislation dates.

I adopted the coding presented in Appendix Table 8 of Voena (2015). See her paper and the literature she cites for more information on coding of these laws. The recent literature has, more or less, followed the original coding of Friedberg (1998), with almost no discrepancies between papers.

B.6. Industry and occupation groups used in Bartik shock analysis.

Table B.1: Crosswalk between sector groupings used to construct male Bartik shocks and Census industry codes

Group #	Description	*ind1990* codes
1	agriculture	10-32
2	mining	40-50
3	construction	60
4	low-tech manufacturing	100-152, 230-262, 220-222
5	basic manufacturing	270-351, 360-370, 390-392, 160-172, 210-212
6	high-tech manufacturing	352, 371-381, 189-201
7	transportation	400-432
8	telecommunications	433-442
9	utilities	450-472
10	wholesale trade	500-571
11	retail trade	580-691
12	finance, insurance, real estate	700-712
13	business services	721-760
14	personal services	761-791
15	recreation services	800-810
16	health services	812-840
17	other prof. services	841-893
18	public administration	900-932

The *ind1990* variable, which captures consistently-coded industries across time, comes from IPUMS.

Table B.2: Crosswalk between sector groupings used to construct female Bartik shocks and Census occupation codes

Group #	Description	*occ1990* codes
1	managerial	3-22, 26-34
2	scientists	43-79
3	medical	80-106
4	teachers	113-163, 187
5	law & social science	164-179, 234
6	artists	183-199
7	medical support	203-208, 445-447
8	science technicians	213-233, 235
9	finance, insurance, real estate	23-25, 243-256
10	sales	258-283
11	financial clerks	337-344, 375-383, 386
12	other admin support	37, residual 300s codes
13	housekeepers, child care	405, 468
14	protective services	415-427
15	food prep and service	434-444, 686-688
16	other personal services	448-465, 469
17	agriculture	473-498
18	mechanics	503-549, 36
19	construction	558-599, 35
20	mining	614-617
21	precision production	634-684
22	system operators	693-699, 796-799, 628
23	assembly workers	703-789
24	transportation	803-889

The *occ1990* variable, which captures consistently-coded occupations across time, comes from IPUMS.

B.7. Details on administrative earnings data used to construct participation transition probabilities

Table A.1 is based data from the SIPP Synthetic data product produced by the U.S. Census Bureau. See Benedetto, Stinson, and Abowd (2013) for further information. The data contain 4 administrative sources of earnings: total nondeferred earnings from FICA-covered jobs; total deferred earnings from FICA-covered jobs; total non-deferred earnings from jobs not covered by the FICA tax; and total deferred earnings from jobs not covered by the FICA tax. I sum all 4 sources together to come up with a measure of total yearly earnings. I computed yearly labor-force participation statuses based on whether total earnings for the year were above a certain minimum threshold. Following Coglianese (2018), I used a threshold of one-half of the federal minimum wage times 40 hours per week times 13 weeks per year.

C. Mathematics omitted from Section 3.

C.1. Proof of equilibrium existence and uniqueness.

Forthcoming.

C.2. Proof that noncollege men's surplus share declines when gains from specialization decline.

Forthcoming.

C.3. Derivation of population employment equation (8).

Forthcoming.

D. Demonstration: the effect of unilateral divorce on labor-force participation in the population of single men is not driven by selection.

I require 4 numbers for this demonstration. The first 3 numbers are drawn from Section 3.3 of the main text. First, I estimate that unilateral divorce reduced labor-force participation by noncollege single men by 1.4 percentage points. Second, the pre-reform rate of non-participation for less-educated men is listed at 14.3 percent. Third, the pre-reform rate of singlehood for less-educated men is 28.2 percent. Finally, unilateral divorce increased the rate of singlehood by roughly 1.4 percentage points (Appendix Table A.YY).

Suppose now that the entire 1.4 percentage-point estimate owes to the fact that unilateral divorce changed the composition of whom is single. Using these numbers, we can solve for the rate of non-participation n required for this to be the case. Specifically,

$$\begin{aligned}
1.4 &= \text{new nonparticipation rate} - \text{old nonparticipation rate} \\
&= \text{new rate} - 14.3 \\
&= \frac{14.3 \cdot 28.2 + n \cdot 1.4}{28.2} - 14.3 \\
&= (n - 14.3) \cdot \frac{1.4}{28.2}.
\end{aligned}$$

This yields $n = 14.3 + 1.4 \cdot 28.2/1.4 = 42.5$. Thus, the previously-married individuals induced to become single as a result of unilateral divorce require a very large non-participation rate—42.5 percent—for changing selection to be responsible for the estimated effect of unilateral divorce on the labor-force participation of singles.

E. Section 5 details

E.1. Derivation of single men's indirect utility.

Note that the utility function in period 1 is equivalent to

$$U(c_{m1}, n_{m1}; \emptyset) = \ln(w_{m1}) + \ln(n_{m1}) - \lambda \cdot \frac{n_{m1}^{1+\gamma}}{1+\gamma},$$

since $c_{m1} = w_{m1}n_{m1}$. I assume single men do not have access to non-labor income in period 1. The allowance for non-labor income in period 1, such as disability benefits, would make the algebra not reduce as nicely but would not qualitatively change the analysis.

This separability implies that the period-1 wage offer does not affect period-1 employment: the first-order condition for period-1 employment is simply

$$\frac{1}{n_{m1}} - \lambda n_{m1}^{\gamma} = 0.$$

That is, men with the same work preferences λ, γ work the same amount in period 1 and suffer the same amount of work-induced disutility, regardless of wage offer. Now, define $\underline{w} = \exp(\ln(w_0^{NC}) - \delta)$. This is the wage offer in period 1 realized by a man who does not work at all in period 0. Normalizing the utility of his hypothetical man to 0, the normalized indirect utility function in period 1, $\tilde{V}(w_{m1})$, reduces to:

$$\begin{aligned} \tilde{V}(w_{m1}) &= V(w_{m1}) - V(\underline{w}) \\ &= \ln(w_{m1}) - \ln(\underline{w}) \\ &= \hat{r}n_{m0}. \end{aligned} \tag{E.1}$$

Thus, the period-1 marginal benefit of period-0 employment for a single man is simply $\beta\hat{r}$, where β is the discount factor.

E.2. Calibration of preset parameters in the model

As reported in Appendix Table A.5, I preset 8 of the empirical model's parameters outside of the estimation. The notes to that table describe the calibration of the discount factor β. Here I describe how I calibrated the other 7 parameters.

I start with the wage parameters: the model requires an initial (period-0) wage offer of noncollege men (w_0^{NC}), a period-1 wage offer of college men (w_1^C), and wage growth ($\hat{r}$) and depreciation (δ) processes for noncollege men. According to Figure 1 of Binder and Bound (2019), the geometric average wage of college graduates aged 25-54 in the early 1980s was roughly $\$26.75$ (expressed in 2017 US dollars). Assuming a 40-hour work week returns the weekly wage reported in the table. The wage growth and depreciation processes are calibrated based on Table 11 of Braga (2018). This table reports Mincerian male wage regressions by education status, including estimates of the effect of an additional year spent unemployed and an additional year spent out of the labor force on wages. To calibrate the wage depreciation parameter for noncollege men, I average these two estimates within education group. Then, I take a $3/4$ to $1/4$ weighted average of the estimate for high school graduates and the estimate for high school dropouts. Finally, I multiply the resultant number by 6, as there are 6 years in period 0. The result is δ. Table 11 of Braga (2018) also reports log wage returns to a cubic in cumulative years of prior work experience. Once again, I take a $3/4$ to $1/4$ weighted average of the high school graduate and high school dropout estimates. Using these coefficients, I then predict the log wage change that occurs when work experience increases by 6 years. Finally, I add the resulting prediction to the δ. The result is $\hat{r}$.

3 of the 4 wage parameters have now been calibrated: we still require a value for w_0^{NC}. I calibrate this value as follows. Figure 1 of Binder and Bound (2019) reports a geometric average hourly wage among high school graduates aged 25-54 of roughly $\$19.00$ in the early 1980s. This implies a college wage premium of $26.75/19 = 1.41$. This yields the following equation for w_0^{NC}:

$$w_0^{NC} = \frac{w_1^C}{1.41 \cdot \exp(\hat{r} - \delta)}.$$

I calibrate the education distribution—the shares of men (c^M) and women (c^F) with college education—based on statistics reported by Autor and Wasserman (2013). Using U.S. Census data, they report the shares of adults with some completed college and with a 4-year college degree by birth cohort. I set c^G, for each gender G, equal to a $3/4$ to $1/4$ weighted average of the "some college" and "college degree" attainment rates in the 1945 birth cohort.

Finally, I calibrate the amount of nonlabor income that noncollege men have access to in period 0 using statistics reported in Table 2 of Binder and Bound (2019). This table uses 1992-2017 March CPS data to determine an average breakdown of income sources in households containing a noncollege man who worked less than 13 weeks in the reference year. I consider men aged 25-34. Taking a $3/4$ to $1/4$ weighted average across high school graduate and high school dropout statuses, followed by a $6/7$ to $1/7$ weighted average across whites and blacks, I calculate that the average man in the sample received roughly $\$4,300$ in benefits. It is likely that such men also received transfers from household members: for example, 25-34-year-old white high school graduates received $\$4,700$ in own benefits, but an additional $\$38,300$ of income was received by other household members. In absence of specific data on intra-family transfers, I decided to double the own-benefit figure and use this number—$\$8,600$—as the the average noncollege man's total non-labor income. Dividing this number by the noncollege man's full income (i.e. non-labor income plus income from full-time work) yields the figure

$\hat{y}$ reported in the table. Implicit in this calibration is the assumption that non-labor income is exogenous: noncollege men are guaranteed $\hat{y}$ of their full income in transfers/benefits in period 0, regardless of how much they work.

E.3. Setting up the comparison of the simulation results to those estimated by Autor et al. (2019)

In Section 5.3 of the main text I compare the effects of the 10% reduction in noncollege men's wages, simulated by the model, to the effects of a China trade shock to men's labor market opportunities (holding female opportunities constant), estimated by Autor et al. (2019) (ADH).

To do this comparison, it is necessary to determine the effect of the trade shock on men's hourly wages—a response that is not reported by ADH. However, the authors do report effects on annual earnings: according to Table A3 of their study, the median-earning man in their sample lost $\$3,737$ in earnings, on a base of $\$26,000$, as a result of a 1-unit trade shock. This amounts to a 14.3% loss. In Table A3 they also report that a 1-unit trade shock caused a $3.06p.p.$ decline in male employment. A similar study found that a contemporary Bartik shock to the male manufacturing sector caused a $4.6p.p.$ decline in employment and a 7.9% decline in hours worked of noncollege men. These numbers suggest that a 1-unit trade shock caused a

$$3.06p.p.\text{ employment decline} \cdot \frac{7.9\%\text{ hours decline}}{4.6p.p.\text{ employment decline}} = 5.3\%\text{ hours decline.}$$

To first-order approximation, the percent change in hourly wages caused by the trade shock is simply the percent loss in earnings net of the percent loss in hours, or $14.3 - 5.3 = 9.0\%$.

This number, combined with ADH's estimated effects of the trade shock on male labor-force participation (reported in Table A3) and marriage (reported in Table 3), underlies the comparison undertaken in Table 7 of the main text.

F. A richer equilibrium model of labor supply, marriage, child investment and divorce

Here I specify and characterize the solution to a male employment and marriage problem with uncertainty, the possibility of divorce, and imperfectly transferable utility. This section lays out the model, while the next section derives comparative static results on the young male labor supply effects of i) a shift in the divorce regime from mutual consent to unilateral, and ii) an incremental improvement in women's labor market opportunities. This model provides further motivation for the reduced-form test undertaken in Section 4 of the main text—especially the unilateral divorce test, since the stylized model of Section 3 abstracts from divorce.

As argued in the main text, for a young man, working full-time today plausibly yields not only higher future labor market returns, but also higher marital surpluses. Competition over mates in a frictionless, competitive marriage market determines marital assignments (who marries and who remains single), intra-household division of resources, and as a byproduct, the marriage market return to male human capital investment. This return, combined with the known profile of market wages, guides males' decisions to invest and to marry. These dynamics give rise to a rational-expectations equilibrium, as in the schooling-and-marriage framework of Chiappori et al. (2009).

F.1. Preliminaries

The starting point for the model is an economy populated by an equal number of males m and females f. Agents live for 3 periods: $t = 0$, $t = 1$ and $t = 2$. Life is structured as follows. In period 0, men decide whether to invest in their labor market skills. Investment implies working full-time and potentially losing out on utility from leisure, while not investing implies working part-time.[C] Investment in period 0 raises one's wage in subsequent periods.

At the beginning of period 1, males and females match in a competitive marriage market. Singlehood is an absorbing state: individuals who choose to remain single make unitary labor supply and consumption decisions over $t = 1, 2$. Married couples decide on a child investment strategy in $t = 1$ (described below), which returns a payoff of child welfare in $t = 2$. The model does not rule out the production and raising of children by unmarried mothers, but it does impose that child welfare is higher on average when children are raised in married households.

Marriage quality is subject to shocks. At the beginning of period 2, a match quality shock is realized that causes couples to evaluate whether to remain married. If they do so, they make joint labor supply and consumption decisions as a couple in $t = 2$. If they divorce, they behave as singles in period 2 and additionally enjoy a modified amount of child welfare.

Each male is endowed with either of two labor market skill levels: $s_{m,0} \in \{L, H\}$. We

[C] I abstract from benefit or other non-labor income receipt. Allowing for non-labor income weakens incentives to supply labor and plausibly strengthens all subsequent results.

can think of these as low or high education statuses. Investing men improve their skill levels, resulting in four possible male skill levels in the marriage market: $s_{m,1} \in \{L, L_+, H, H_+\}$. Females are homogeneous in labor market skill.[D] Individuals also vary in fixed tastes for marriage: each individual i has marital taste θ_i, where θ_i is distributed with bounded support $[0, \theta^{max}]$ and mean $\theta/2$ according to an atomless distribution function $G(\theta)$. Marital tastes are independently and identically distributed across gender and skill level.

Marital taste is additive separable from the "material" payoff to marriage. For a given individual i who has married an individual j, utility in marriage in period 2 is of the form

$$u_i(j) = \text{material utility}_i(j) + \theta_i + \psi_{ij}. \tag{F.1}$$

The variable ψ_{ij} is a random match quality shock that arrives at the beginning of period 2 and takes the value 0 with probability $1/2$ and $-\theta$ with probability $1/2$, where $\theta \leq \theta^{max}$.[E] As in Chiappori et al. (2009), this specification imposes a structure in which interactions between agents in the marriage market depend on their skill levels only: total marital surplus for any given marriage is simply additive in individual bliss payoffs.

The life-cycle is depicted in Figure F.1.

F.2. The marriage market and household planning problem

Individuals are utility price-takers in a frictionless, competitive, heterosexual marriage market. In the marriage market, prospective couples commit to a feasible, incentive-compatible, ψ-contingent plan that includes child investment, labor supply, consumption and divorce decisions and delivers each individual his or her utility price in expectation. This is akin to the frameworks of Chiappori et al. (2017); Reynoso (2017); Chiappori et al. (2018).

For two individuals i and j of opposite genders, denote the expected material payoff of i given j's utility price (material utility + marital bliss) as $\mathsf{v}_i(j; \mathsf{V}_j)$. Equilibrium in the marriage market consists of an assignment matrix A and material price vector V that yields a *stable matching*.

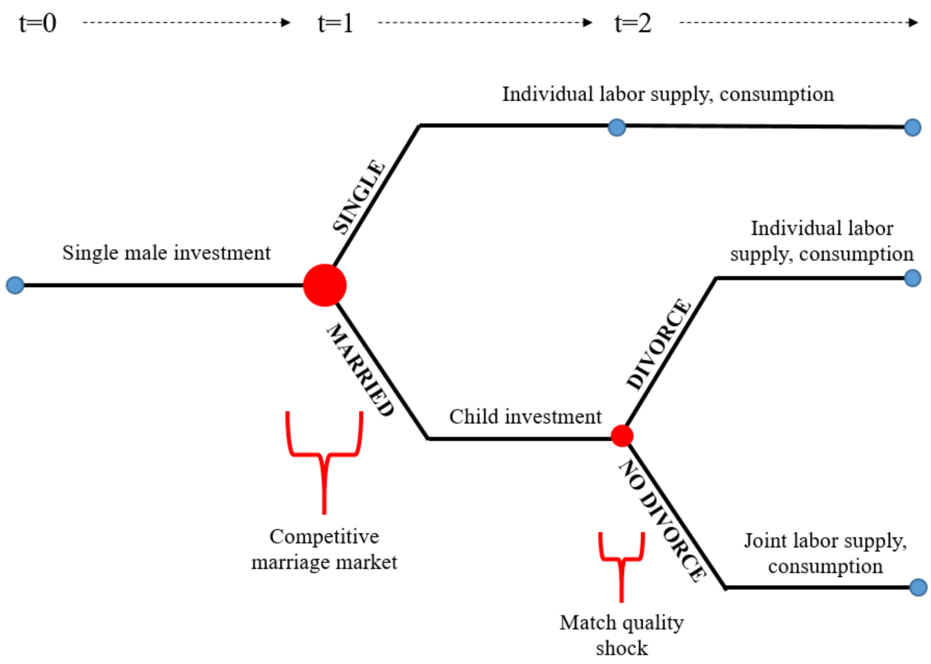
Definition 1. *A* stable matching $\{\mathsf{A}, \mathsf{V}\}$ *satisfies the following conditions:*

$$\mathsf{v}_i(\mathsf{A}(i), \mathsf{V}_{\mathsf{A}(i)}) = \mathsf{V}_i \ \forall\, i \tag{F.2}$$

[D] All insights generalize to a situation in which females are heterogeneous in labor market skill, although the analysis becomes more complicated. While this assumption means the model is not suited to understand changes in assortative matching on skill, it will deliver relevant theoretical predictions on male marriage and participation rates by skill. The structural modeling analysis, presented in Sections 4 and 5 of the main text, involves multiple types of females.

[E] Thus, *ex-ante* marital bliss follows a mean-0 distribution; that is, the average individual does not systematically prefer married life to unmarried life in an *ex-ante* sense.

Figure F.1: **Male life-cycle in the model.**



and no (i, j) *pairing exists in which*

$$\begin{aligned} & \mathsf{A}(i) \neq j \\ \textit{with} \quad & \mathsf{v}_i(j, \mathsf{V}_j) \geq \mathsf{V}_i \\ \textit{and} \quad & \mathsf{v}_j(i, \mathsf{V}_i) \geq \mathsf{V}_j, \end{aligned} \tag{F.3}$$

and in which at least one of the inequalities is strict.

Condition (F.2) links assignments to prices by stipulating that the assignments guarantee each individual his or her expected utility price in equilibrium. Condition (F.3) requires that the assignment A is a *core* allocation (Shapley and Shubik, 1971; Roth and Sotomayor, 1992). That is, in equilibrium, there does not exist a set of individuals who would be better off dissolving their assigned matches and matching with each other.

Let $\mathsf{A}(i) = \emptyset$ correspond to a situation in which individual i remains single. Note that $\mathsf{V}_\emptyset = 0$; that is, each individual matched to "single" pays "single" a utility price of 0 and retains the total output from remaining single. Thus, by setting $j = \emptyset$ in (F.3), we see that stability also requires the equilibrium assignment to deliver everyone who marries a (weakly) larger expected utility price than that from remaining single.

I now describe household behavior and its relationship with marriage-market utility prices. Single individuals derive material utility from consumption of two commodities: a market-purchased commodity c and a home-produced commodity, which is formed by combining monetary inputs x with time inputs L. Divorcees have the same structure of material utility as singles. In married couples, the home-produced commodity is a public good, creating consumption economies relative to divorced and single households.

Assumptions 1: child welfare. *Without loss of generality, normalize the utility from being single in period* 1 *to* 0*. In period* 1*, married couples invest in their children. Child investment requires at least* 0.5 *units of time from the mother and returns the additive separable value* $\alpha w_M + k$ *in period 2 (where* w_M *is the father's wage). Child welfare is produced according to the following cost function:*

$$\chi(w_M, L_{F,1}) = \begin{cases} 0 & L_{F,1} = 1 \\ \alpha w_M & L_{F,1} = 0.5 \end{cases} \tag{F.4}$$

Net child welfare, denoted as $\omega(w_M, L_{F,1}) = \alpha w_M + k - \chi(w_M, L_{F,1})$*, is a public good in both married households. Divorced wives continue to enjoy* ω*, while divorced husbands only enjoy* $(1-d)\omega$*.*[F]*. I do not assume any loss of child welfare on divorce; only that the ex-husband has less access to the child. However, all results generalize to a situation in which overall child welfare decreases on divorce, as suggested by (Gruber, 2004).*

For a couple (m, f) that decides to marry, I represent a potential household plan as follows (m, f arguments dropped after the first line for convenience):

$$\begin{aligned} \rho(\psi; m, f) &= \{\ \rho_1(m,f),\ \rho_2(\psi; \rho_1(m,f), m, f)\ \} \\ &= \{\ L_{f,1},\ \{\mathsf{D}(\psi, L_{f,1}), L_{m,2}(\mathsf{D}), L_{f,2}(\mathsf{D}), c_{m,2}(\mathsf{D}), c_{f,2}(\mathsf{D})\}\ \} \\ &\in \{\ \{0.5, 1\} \times \{\{0,1\} \times [0,1]^2 \times R_+^2\}\ \}. \end{aligned}$$

That is, a married couple in period 1 chooses whether the wife f should stay home full-time while raising the child. In period 2 the couple chooses whether or not to divorce, conditional on the realization of ψ and the child investment strategy from period 1. Conditional on the divorce decision, labor supply and consumption choices occur.

An individual i deciding to remain single simply chooses labor supply and consumption in period 2. I represent such a plan as follows:

$$\begin{aligned} \sigma(i) &= \{\ L_{i,2}, c_{i,2}\ \} \\ &\in \{\ [0,1] \times R_+\ \}. \end{aligned}$$

Cooperation in period 2—I make no assumption about bargaining over the material surplus: as in Chiappori (1988, 1992) and myriad subsequent work, I only require Pareto efficiency. Given a wife's labor supply decision from period 1 and her associated utility price, this

[F]The parameter d is a "distance" parameter reflecting a standard custodial arrangement (Chiappori et al., 2015) property admits a general expression of the husband's expected payoff in marriage. For a male m marrying a female f,

$$\begin{aligned}
\mathsf{v}_m(f;L_{f,1},\widetilde{\mathsf{V}}_f(L_{f,1};m)) &= \max_{\rho_2(\psi;m,f)} E_\psi[u_m(\rho_2(\psi;L_{f,1},m,f))] \quad \text{(F.5)}\\
\text{s.t.} \quad & [\text{ICC}] \;\; E_\psi[u_f(\rho_2(\cdot))] \geq \widetilde{\mathsf{V}}_f\\
& [\text{F}_{\text{LS}}] \;\; L_{f,2}, L_{m,2} \in [0,1]\\
& [\text{F}_{\text{BC}^\text{M}}] \;\; c_{m,2}+c_{f,2}+x_2 = w_m(1-L_{m,2})+w_f(1-L_{f,2})\\
& \quad \text{if } \mathsf{D}(\cdot)=0\\
& [\text{F}_{\text{BC}^\text{D}}] \;\; c_{m,2}+x_{m,2}+c_{f,2}+x_{f,2} = w_m(1-L_{m,2})+w_f(1-L_{f,2})\\
& \quad \text{if } \mathsf{D}(\cdot)=1
\end{aligned}$$

where $u_i(\rho_2(\cdot))$ denotes a given individual i's total period-2 payoff (material utility + possible marital bliss) from following plan ρ_2. The first constraint is an incentive compatibility constraint, guaranteeing that female f is paid her utility price $\widetilde{\mathsf{V}}_f$ from participating in a marriage with m—conditional on her labor supply choice in period 1. The last 3 constraints are feasibility constraints of time and consumption allocations in period 2.

If an individual i chooses to remain single, he or she receives

$$\begin{aligned}
\mathsf{v}_i(\emptyset) &= \max_{\sigma(i)} u_i(\sigma(i)) \quad \text{(F.6)}\\
\text{s.t.} \quad & [\text{F}_{\text{LS}}] \;\; L_{i,2}\in[0,1]\\
& [\text{F}_{\text{BC}}] \;\; c_{i,2}+x_{i,2} = w_i(1-L_{i,2})
\end{aligned}$$

in period 2.

Possibility of non-cooperation in period 1—When expected utility is transferable between spouses at a one-for-one rate, the wife and husband will always agree on the child investment strategy in period 1 that maximizes joint material output in period 2. If contracting between spouses is imperfect, however, spouses may not agree on how the wife spends her time.

Assumption 2. *The wife retains control over how she spends her time in period* 1.

Thus, when married to male m, female f's labor supply decision solves the following program

$$\max_{L_{f,1}\in\{0.5,1\}} \widetilde{\mathsf{V}}_f(L_{f,1};m). \quad \text{(F.7)}$$

By assumption 1, splitting time between working in the market and in the home lowers child welfare by αw_m in period 2. Despite this loss, the wife may decide to work part-time in the market if doing so appreciably raises the marital surplus from other goods, or raises the share of the marital surplus she can claim in period 2. Disagreement between wife and husband over the wife's time allocation arises when $\mathsf{v}_m(f, 1, \widetilde{\mathsf{V}}_f(1; m)) > \mathsf{v}_m(f, 0.5, \widetilde{\mathsf{V}}_f(0.5; m))$ but $\widetilde{\mathsf{V}}_f(1; m) < \widetilde{\mathsf{V}}_f(0.5; m)$. This will become relevant when the divorce regime is unilateral.

It is instructive to characterize each individual's marriage decision at equilibrium prices. I operate from the perspective of males making proposals to females, although an equilibrium stable matching can be constructed with either side as the proposer. For a given male m, the marriage decision simply involves choosing the assignment—including possibly remaining single—that maximizes his expected payoff. That is:

$$\mathsf{V}_m = \max_f \mathsf{v}_m(f; L^*_{f,1}, \widetilde{\mathsf{V}}_f(L^*_{f,1}; m)) \tag{F.8}$$

where $L^*_{f,1}$ is the wife's solution to program (F.7) given a marriage to m. Thus, males take prospective wives' period-1 labor supply decision rules as given when deciding whether and whom to marry.

Given equilibrium prices, each female f remains single if no male desires her, or chooses whether to marry the given male m who wishes to match with her. Thus:

$$\mathsf{V}_f = \begin{cases} \mathsf{v}_f(\emptyset) & \text{if no proposer} \\ \max\left\{ \mathsf{v}_f(\emptyset),\ \widetilde{\mathsf{V}}_f(L^*_{f,1}; m) \right\} & \text{otherwise.} \end{cases} \tag{F.9}$$

In this way, the assignment problem in the marriage market is *decentralized*, with each individual choosing the mate—including possibly remaining single—that yields him or her the highest payoff, subject to being desired by the corresponding mate.

F.3. Male investment decisions

We are now in a position to describe male investment behavior in period $t = 0$. In a rational-expectations equilibrium, each male is aware of the marriage market price vector $\mathsf{V}_M\ \forall M$. This knowledge, together with the known costs of investing, is sufficient to pin down equilibrium investment behavior.

For a given male of type M, represent the investment decision as I_M. The period-0 "effort" cost of investing is

$$(u_{M,0}|I_M = 0) - (u_{M,0}|I_M = 1) = e_M.$$

Male M will invest in period 0 if the effort cost of doing so is expected to be returned in the marriage market. Thus,

$$I_M = \mathbf{1}\{V_{M^+} - V_M \geq e_M\} \tag{F.10}$$

for $M \in \{L, H\} \times \{0, 1\}$.

Definitions 2. *The* labor market return *to investing is the period-*2 *return enjoyed by a single male. Thus, for a given male* M*:*

$$\lambda_M = \mathsf{v}_{M^+}(\emptyset) - \mathsf{v}_M(\emptyset).$$

The marriage market return *to investing is the additional expected return in period* 2 *received from participating in the marriage market:*

$$\mu_M = \mathsf{V}_{M^+} - \mathsf{V}_M - \lambda_M.$$

Thus, for males M *who choose to remain single,* $\mu_M = 0$.

With these definitions, we can conveniently re-express the decision to invest as occurring exactly when the sum of the labor market and marriage market returns exceeds the period-0 cost:[G]

$$I_M = \mathbf{1}\{\lambda_M + \mu_M \geq e_M\}. \tag{F.11}$$

F.4. Equilibrium

Definition 3. *A rational-expectations equilibrium consists of a set of investment strategies, marital assignments, and ex-ante and ex-post utilities—*$\{I, \{\mathsf{A}, \mathsf{V}\}, \mathsf{v}, u\}$*—satisfying the following properties:*

1. *Period-*0 *male investment decisions* I *maximize expected utility, as given by (F.11).*
2. *The marital assignment* A *is stable, as given by (F.2) and (F.3). Decentralized marital choices satisfy (F.8) and (F.9). Moreover, the utility prices* V *clear the market.*
3. *The ex-ante utilities* v *and ex-post period utilities* u *result from solutions to the problems described by (F.5), (F.6) and (F.7).*

As noted by Chiappori et al. (2009), the rational-expectations structure of the model transforms male investment and marriage decisions into a multinomial discrete choice problem. That is, given the investment cost structure and the marriage market utility prices, each male makes the choice in equilibrium yielding the highest expected utility from the given

[G]It is worth noting that this specification of investment behavior generally holds, regardless of the utility specifications underlying the marriage market prices. The only implicit assumption is that each agent i acts to maximize V_i, which is itself an expected utility outcome. This is equivalent to assuming agents obey *von-Neumann-Morgenstern rationality*: ex-post utility is separable across states of the world and expected utility is a probability-weighted linear combination of ex-post utilities. Equivalently, the happiness an individual expects to obtain when married is not contingent on the actions he might take were he to remain single.

choice set: $\{\{\text{invest}, \text{marry}\}, \{\text{invest}, \text{single}\}, \{\text{no invest}, \text{marry}\}, \{\text{no invest}, \text{single}\}\}$. Section H of this Appendix provides explicit utility and human capital specifications. With these, I prove 2 propositions that conveniently shrink the set of possible equilibria.

Proposition 1. *Highly skilled men $(s_{M,0} = H)$ always invest. Less-skilled men $(s_{M,0} = L)$ only invest if they also expect to marry.*

Proof. *See Appendix section H.* $\square$

Proposition 2. *All men who choose to marry are better off investing.*

Proof. *Denote the cost of investing for less-skilled men, net of the labor market return, as $\hat{e}_L = e_L - \lambda_L$. The proof, contained in Appendix section H, shows that the marriage market return to investing exceeds $\hat{e}_L$.* $\square$

Though these propositions are not necessary, they facilitate the claim that a rational-expectations equilibrium exists. This is proved in section H of this Appendix as Proposition 3. The proof relies on the adaptation of the salary-adjustment algorithm (Crawford and Knoer, 1981; Kelso and Crawford, 1982) to the case of a one-to-one matching market with a finite set of types, suggested by Reynoso (2017). This algorithm guarantees the construction of a market-clearing stable matching. It is shown that the equilibrium is characterized by a triple of threshold marital taste values $(\underline{\theta}_L, \underline{\theta}_H, \underline{\theta}_F)$, with each individual i of type I (less-skilled male, highly skilled male, female) marrying exactly when $\theta_i \geq \underline{\theta}_I$. It is shown that these threshold values solve the following system of equations:

$$\begin{aligned} \underline{U}_{L^+} - \mathsf{V}_{\underline{F}} + \underline{\theta}_L &= \mathsf{v}_L(\emptyset) \\ \underline{U}_{H^+} - \mathsf{V}_{\underline{F}} + \underline{\theta}_H &= \mathsf{v}_H(\emptyset) \\ \mathsf{V}_{\underline{F}} &\geq \mathsf{v}_F(\emptyset) \\ 1 - \frac{1}{2}\left(G(\underline{\theta}_L) + G(\underline{\theta}_H)\right) &= 1 - G(\underline{\theta}_F). \end{aligned} \tag{F.12}$$

$\underline{F}$ represents the female with marital taste $\underline{\theta}_F$ and $\underline{U}_M$ $(M \in \{L^+, H^+\})$ is the level of joint marital output, exclusive of the husband's marital taste, that is produced in a marriage involving female $\underline{F}$. Thus, in equilibrium, it is exactly the males with marital taste above the threshold value who would prefer to marry the threshold-taste female. The last equation is the market-clearing condition: in an equilibrium stable matching, the number of males who marry must equal the number of females who marry.

Even though the marriage market is competitive, the sequential nature of male investment and marriage decisions generally raises the possibility of multiple equilibria (Nöldeke and Samuelson, 2015). For example, we could have a possible equilibrium in which the marriage market return to investing is low and males do not invest, and another possible equilibrium in which the marriage market return is high and males invest. The structure of the current model rules out this multiplicity problem (as proven in propositions 1 and 2).

G. Equilibria under different divorce regimes and gender gaps

In this section, I analyze equilibria that arise under different divorce law regimes and women's relative labor market opportunities. I start from a baseline equilibrium in which the divorce regime is mutual consent and there is a significant gender gap in incentives to work in the labor market. I show that a switch to unilateral divorce, under plausible conditions, leads to a new equilibrium with lower marriage and participation rates for less-skilled males. Furthermore, I show that regardless of the prevailing divorce regime, an increase in females' labor market opportunities also produces an equilibrium decline in marriage and male labor-force participation.

G.1. Base case: mutual consent divorce

Constructing the ex-ante *Pareto frontier.*—To begin, I make the following simplifying assumption.

Assumption 3: Divorce allocations. *The Pareto frontier in divorce does not depend on the wife's labor supply decision in period* 1.

If the wife works in the first period, she prevents her own human capital depreciation and thus increases the pool of resources to be shared on divorce. But at the same time, this action decreases child welfare, lowering total resources in divorce. For convenience, we assume that these effects cancel, and thus that there is one stable Pareto frontier in divorce.[H] This facilitates, although is not necessary, for the following result.

Proposition 4. *When the divorce regime is mutual consent, spouses will always agree on the efficient child investment strategy, which is to have the wife stay home full-time in period* 1.

Proof. *See next section of this Appendix.* □

A consequence of proposition 4 is that to construct the ex-ante Pareto frontier we need only consider the Pareto frontier in divorce and the ex-post Pareto frontiers in marriage conditional on the wife staying at home in period 1. In a mutual consent divorce, an allocation must be found that makes both spouses better off than in the current allocation in marriage. For purposes of exposition, we consider a possible marriage involving a less-skilled male who has invested, and in which spouses have sufficiently low marital taste that divorce is sometimes a possibility. It is straightforward to show that the *ex-post* Pareto frontier in marriage is the

[H]Leveraging some calculations in the next section, one can show that this assumption is equivalent to assuming $(2-d)\alpha w_m = \frac{\beta\delta w_F}{4} + \frac{\beta(\underline{y}^2 - \overline{y}^2(1+\delta))}{4w_F(1+\delta)}$.

following hyperplane:

$$\mathsf{V}_m + \mathsf{V}_f = \overline{\mathsf{V}}_{mf} + \psi_{mf} \tag{G.1}$$

where $\overline{\mathsf{V}}_{mf} = \beta w_{L^+} + 2\omega + \theta_m + \theta_f + \psi_{mf}$ and $\omega = \alpha w_{L^+} + k$. As a consequence of the TU property, total resources to be shared do not depend on how they are shared. This hyperplane defines a straight line with slope -1 in the $(\mathsf{V}_m, \mathsf{V}_f)$ Euclidean space.

The Pareto frontier in divorce is defined by the following equation:

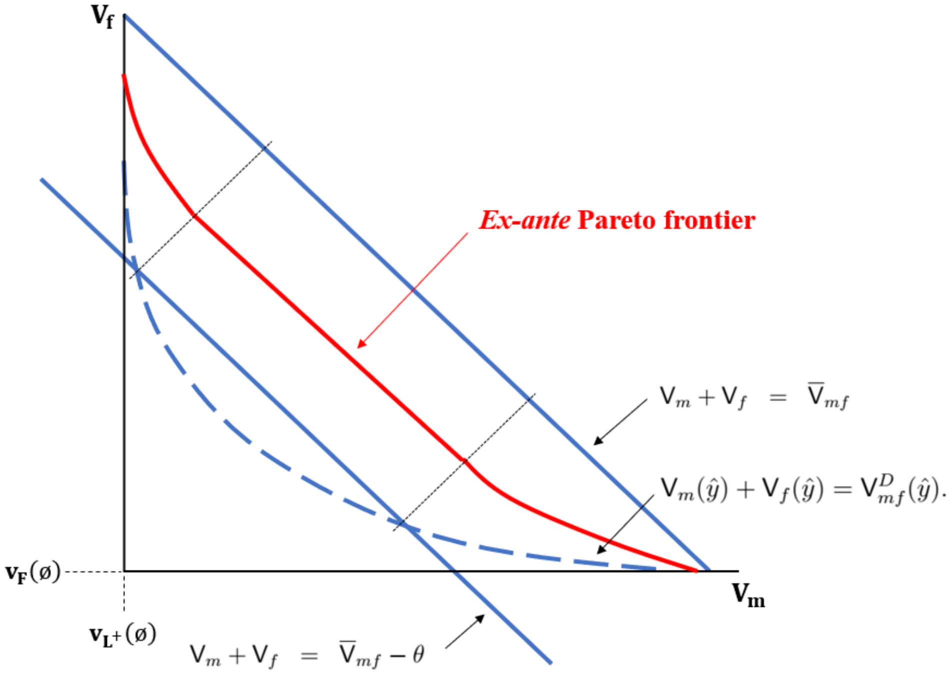
$$\mathsf{V}_m(\hat{y}) + \mathsf{V}_f(\hat{y}) = \mathsf{V}^D_{mf}(\hat{y}) \tag{G.2}$$

where $\mathsf{V}^D_{mf} = \beta\left(\frac{w_{L^+}+w_F}{4} + \frac{\hat{y}^2}{4w_{L^+}} + \frac{\hat{y}^2}{4w_F}\right) + (2-d)\omega$ (see Appendix calculations). Because the home-produced commodity becomes private in divorce, utility is not transferable in the same manner in divorce as it is in marriage. In particular, the total level of resources to be shared now does depend on the monetary transfer $\hat{y}$. This equation defines a downward-sloping, convex line in the $(\mathsf{V}_m, \mathsf{V}_f)$ Euclidean space. Moreover, whenever $\theta_m + \theta_f + \psi_{mf} \geq -d\omega$, this frontier is completely contained within the marriage frontier.

Figure G.1 depicts the construction of the *ex-ante* Pareto frontier when the divorce regime is mutual consent. First, note that each spouse must receive a preferred allocation (in expectation) to the allocation from remaining single—otherwise the marriage would not form. The single allocations are given by the axes of the graph. The straight lines correspond to the *ex-post* Pareto frontiers in marriage, conditional on each possible realization of the taste shock ψ_{mf}. The convex line is the Pareto frontier in divorce. Next, note that the bad taste shock happens with a 50 percent probability. Thus, in the region of the Euclidean space where both straight lines lie to the northeast of the convex line, the *ex-ante* Pareto frontier traces out the locus of mid-way points of 45 degree lines drawn between the two straight lines. Essentially, this is the "average" of the two straight lines.

In the regions of the Euclidean space where the convex line lies to the northeast of the inner straight line, the *ex-ante* Pareto frontier traces out the locus of mid-way points of 45 degree lines drawn between the outer straight line and the convex line (by assumption 3). Essentially, this is the "average" of the outer straight line and the convex line. The result is the 3-segment, thick red line shown in the figure.

Figure G.1: **Construction of Pareto frontier under a mutual consent divorce regime.**

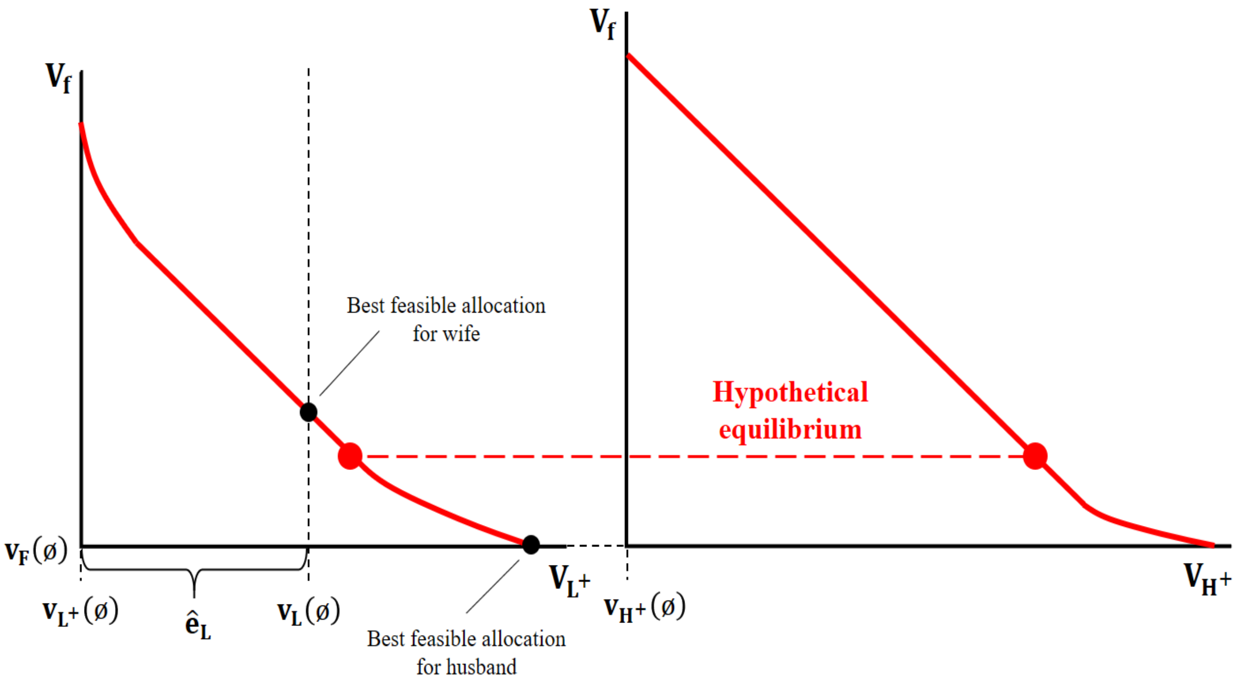


As described above. The figure considers a hypothetical marriage involving a less-skilled male, and in which the two partners have low enough joint marital taste that divorce is a possibility for some allocations.

Baseline equilibrium.—Figure G.2 depicts allocations in a baseline equilibrium for a given set of individuals with relatively low marital taste. The left-hand Pareto diagram considers a marriage involving a less-skilled man and the right-hand diagram considers one involving a highly-skilled man.

Let us unpack Figure G.2. First, less-skilled men require at least $\hat{e}_L$ of the ex-ante marital surplus to participate in the marriage—otherwise, their investment cost is not covered and they would prefer not to marry (and not to invest). This constraint is represented by the vertical dotted line. Thus, the segment of the Pareto frontier between the two small black dots describes the range of feasible and incentive-compatible expected utility outcomes at the moment of marriage for these individuals. The large red dots denote potential equilibrium allocations resulting from the salary-adjustment algorithm. So long as at least one male of both skill types desires to marry in equilibrium, reciprocating female partners must be indifferent about who they marry. Otherwise, the market would not clear: prices would adjust until indifference was established or until one type no longer desired marriage. This condition is represented by the horizontal dotted line connecting the two red dots.

Figure G.2: **Hypothetical couple in baseline equilibrium.**



Depiction of equilibrium allocations in the baseline scenario (mutual consent divorce, gender gap in labor market opportunities) for a given set of individuals (less-skilled male, highly-skilled male, female). Each individual has marital taste above the threshold required for marriage but distinctly below the maximum taste value.

G.2. Introducing unilateral divorce

I now introduce the first of two novel theoretical results: in the absence of perfect contracting technology in marriage, laws governing the terms of divorce may change the *ex-ante* gains from marriage enough to impact less-skilled males' pre-marital labor supply decisions.

Proposition 5. *When the divorce regime changes from mutual consent to unilateral, and:*

- *the returns to female experience ($\beta w_F \delta$) are sufficiently high relative to the loss of child welfare from the wife working in the market (αw_M);*
- *the marital taste shock θ is sufficiently large;*
- *and the ex-husband's access to child welfare $(1-d)$ is sufficiently small,*

spouses in relatively-low-taste marriages will disagree on the child investment strategy. As a consequence, such marriages no longer form in equilibrium, and the less-skilled men who no longer marry also no longer invest in period 0.

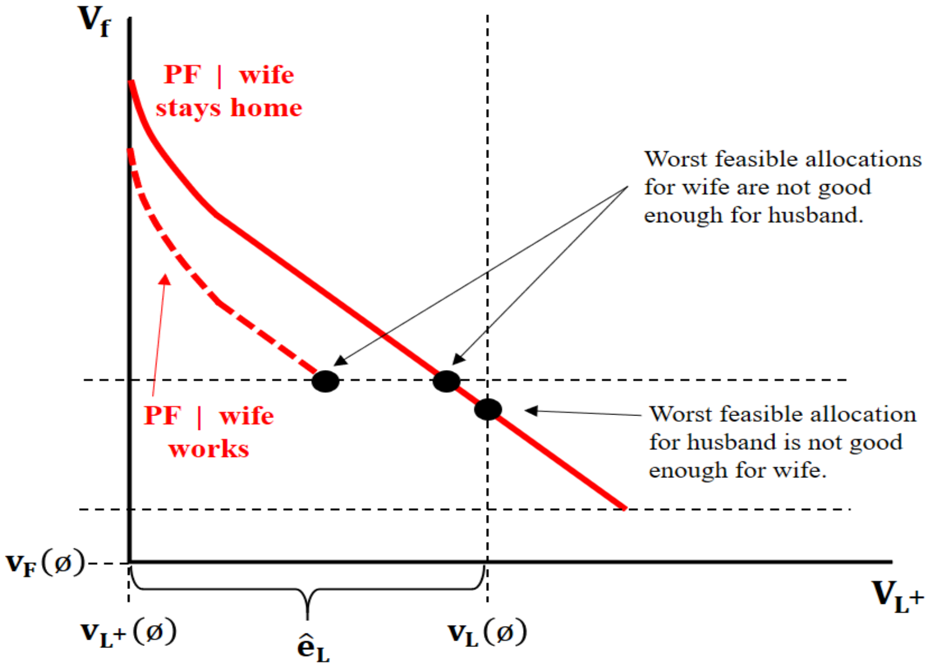
The last claim of the proposition follows from propositions 1 and 2: less-skilled males who no longer marry will also no longer invest. Thus, the claim to establish is that unilateral divorce reduces formation of certain marriages involving less-skilled males. The proof of this claim is contained in Figure G.3.

The conditions stated in the proposition give rise to a situation where the maximum allocation the husband can guarantee the wife within marriage while still respecting his participation constraint (point A) is inferior to her autarky value (i.e. her value in divorce in the absence of a divorce settlement) from working in period 1 (point B). Thus, if the two marry, the wife will work in period 1 regardless of the planned allocation of resources—which, in turn, violates the husband's *ex-ante* participation constraint. (The best he can do in this situation is represented by point C). Therefore, such a marriage—which was incentive-compatible in a mutual consent divorce regime—no longer forms in a unilateral divorce regime.

This result depends on the incomplete-contracts nature of marriage. As shown in Figure G.3, there exist feasible *ex-ante* allocations in marriage that make both spouses better off compared with being single. However, to attain such an allocation, the wife would have to forego the opportunity to increase her bargaining position in the marriage (by working in period 1). In the absence of binding agreements that can be made in the marriage market (e.g. costlessly enforceable prenuptial contracts), there is nothing to prevent the wife from entering the workforce in period 1. This is an example of Pareto inefficiencies that may arise in bargaining models of marriage (Lundberg and Pollak, 1994, 2003). While these models originally conceived of Pareto inefficient allocations arising *within* marriage, I show that bargaining after marriage can lead to an inefficient number of marriages forming.[I]

In sum, by strengthening a woman's property right over her earning potential in the labor market, unilateral divorce reduces the share of the gains from specialization within marriage that husbands can claim. This makes preparing for marriage by sinking human capital investment no longer worth it for men with low initial labor market skill and relatively low taste for marriage. While such men reap enough material benefits from specialization gains in a mutual consent environment to coordinate on a path of investment and marriage, unilateral divorce lowers the marriage market returns to their investment enough to discourage this path.

Figure G.3: **Hypothetical marriage no longer forms under unilateral divorce.**



As described in the text. The upper horizontal dotted line is the wife's autarky value conditional on working in period 1. She requires this value in marriage not to divorce. The vertical dotted line denotes the less-skilled husband's participation constraint. He requires this value to invest and marry. The figure considers the same individuals as represented in the left-hand graph of Figure G.2.

[I]This is consistent with the recent observations of Pollak (2019).

G.3. Improving women's relative labor market opportunities

I now introduce the second novel result.

Proposition 6. *Regardless of prevailing divorce regime, when women's labor market opportunities improve relative to those of men—that is, w_F increases and/or α falls—less-skilled male labor-force participation decreases.*

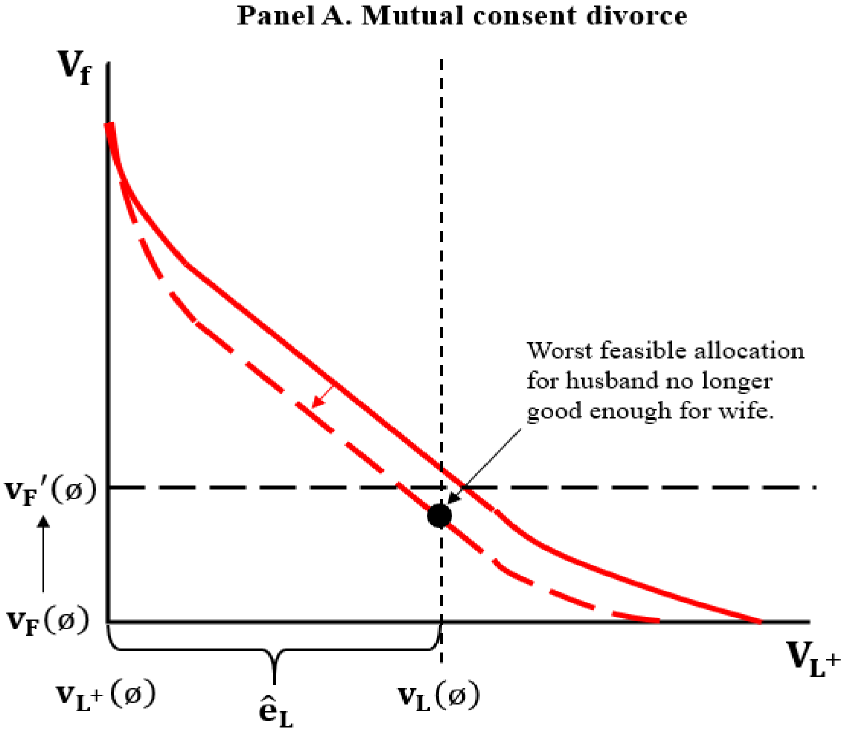
The proof of this proposition is contained in Figure G.4. We consider a scenario in which women's initial wage offers rise from their starting level of w_F to a level less than or equal to w_{L^+}—the wage of less-skilled husbands. Additionally, the value of the mother's time at home in the production of child welfare (α) declines. So long as $\alpha \geq 0$ and $w_F \leq w_{L^+}$, it remains efficient for wives to stay home in period 1 and continue to specialize in home production in period 2. Thus, wives generally do not access their increased earning potential in marriage. The only effect of an increase in wives' labor market opportunities relative to husbands' is a reduction in gains from specialization in period 1. This is represented as an inward shift of the *ex-ante* Pareto frontiers in Figure G.4.

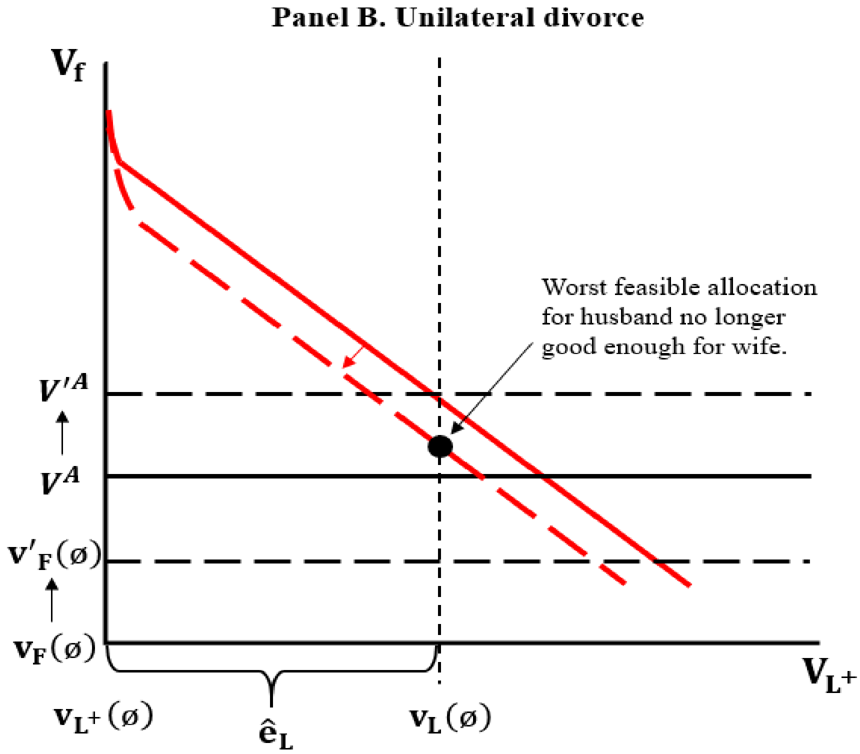
On the other hand, an improvement in women's wages raises the value of single life, since single women participate in the labor force.[J] It also raises wives' autarky value from participating in the labor force in period 1, since a unilateral divorce regime grants a wife property right over her earning potential. Thus, regardless of divorce regime, the level of utility a prospective wife must be guaranteed to participate in a marriage rises while the total marital surplus falls. As a result, certain marriages that were incentive-compatible under a large gender gap in labor market opportunities become incompatible as women's opportunities rise. This effect spills over and impacts the pre-marital labor supply behavior of less-educated men.

It is important to note that this result depends on the assumption that marriage is driven primarily by gains from task specialization in the production of household public goods. If consumption complementarities are more important than task specialization—which happens in the model when each partner has a wage above β—an increase in women's labor market opportunities *raises* the gains from marriage and wives' corresponding demand for husbands' earning potential. In the main text I empirically estimate the effect of an improvement in women's labor market opportunities on less-educated male labor supply, using 1980-2015 U.S. data, and find the effect to be negative.

[J] Refer to the optimal labor supply decisions calculated in the Appendix.

Figure G.4: **Improvements in women's relative labor market opportunities reduce marriage formation and less-educated male labor supply.**





As described in the text. These panels consider a combination of an improvement in women's relative wages and a decline in the non-pecuniary returns to the wife staying at home while raising the child in period 1.

H. Omitted calculations and proofs

H.1. Utility and wage specifications

Singles' utility $(t = 0, 2)$—Single men (women) have the following utility function for periods 0 and 2 (period 2 only):

$$u(x, L, c) = (x + \beta L) \cdot c. \tag{H.1}$$

Marrieds' utility $(t = 2)$—Married couple (m, f) has the following *material* utility functions for period 2. Utility is conditional on period-2 allocations as well as the child investment strategy from period 1:

$$\begin{aligned} &u_m(x, L_m, L_f, c_m, w_m, L_{f,1}) \\ &\quad = (x + \beta \cdot [L_m + L_f]) \cdot c_m + \alpha \cdot w_m \mathbf{1}\{L_{f,1} = 1\} + k \\ &\quad = (x + \beta \cdot [L_m + L_f]) \cdot c_m + \omega \\ &u_f(x, L_m, L_f, c_f, w_m, L_{f,1}) \\ &\quad = (x + \beta \cdot [L_m + L_f]) \cdot c_f + \alpha \cdot w_m \mathbf{1}\{L_{f,1} = 1\} + k. \\ &\quad = (x + \beta \cdot [L_m + L_f]) \cdot c_f + \omega \end{aligned} \tag{H.2}$$

where $\omega = \omega(w_m, L_{f,1})$ is defined by (F.4). These utilities belong to the quasi-linear class described by Bergstrom and Cornes (1983), and thus satisfy the property of transferable utility in the presence of public goods. Married spouses in period 2 thus allocate time and consumption to maximize total material utility, and then use private consumptions c_m and c_f to transfer to each spouse his and her requisite shares of the pie.

Divorcees' utility $(t = 2)$—Divorced couple (m, f) has the following utility functions for period 2:

$$\begin{aligned} u_m(x_m, L_m, c_m, \omega) &= (x_m + \beta L_m) \cdot c_m + (1 - d)\omega \\ u_f(x_f, L_f, c_f, \omega) &= (x_f + \beta L_f) \cdot c_f + \omega. \end{aligned} \tag{H.3}$$

Thus, there are two sources of material utility loss on divorce: less enjoyment of child welfare and a loss of efficiency in home commodity production and consumption (because the home commodity is no longer public). These losses are weighed against the innovation in marital bliss (the match quality shock ψ) in the decision to divorce.

The wage structure—Initial wages satisfy the following inequalities:

$$w_{F,1} < w_{L^+} < \beta \leq w_H.$$

Next-period wages increase by a factor of $R > 0$ if the individual works full-time in the current period, stay the same if the individual works half-time and depreciate by a factor of δ if the individual does not work at all in the market. That is:

$$\begin{aligned} w_{L^+} &= w_L(1+R) \\ w_{F,2} &= \begin{cases} w_{F,1}(1-\delta) & L_{F,1}=0 \\ w_{F,1} & L_{F,1}=0.5 \end{cases} \end{aligned}$$

Optimal labor supplies in $t = 2$—Given these specifications, it is straightforward to show the following (full derivations in the next subsection):

- Married couples in $t = 2$ fully specialize, with the wife staying at home and the husband working full-time. Couples involving a less-skilled husband achieve a joint material utility of $\beta w_{L,2} + 2\omega$, while couples involving a highly-skilled husband achieve a joint utility of $(\beta + w_{H,2})^2/4 + 2\omega$.[K]
- Divorced wives and less-skilled husbands, in the absence of a divorce settlement, work half-time in $t = 2$, while divorced highly-skilled husbands continue to work full-time. In divorces without settlements, less-skilled ex-husbands obtain $\beta w_{L,2}/4 + (1-d)\omega$; highly-skilled ex-husbands obtain $w_{H,2}^2/4 + (1-d)\omega$; and ex-wives obtain $\beta w_{F,2}/4 + \omega$.
- Single individuals choose the same labor supplies in $t = 2$ as divorced individuals who do not negotiate a settlement. Thus, single and divorced less-skilled males generally work less than less-skilled husbands.

H.2. Solutions to static labor supply problems in period 2

Married couples—Because utility within marriage is transferable, married couples in period 2 behave as a unitary decision-maker in choosing efficient time and aggregate resource allocations (Mazzocco, 2007; Chiappori et al., 2018). Thus, a married couple (M, F) in period 2 solves

$$\begin{aligned} &\max_{x,L_M,L_F,C} (x + \beta[L_M + L_F]) \cdot C \\ &\text{s.t. } w_M(1-L_M) + w_F(1-L_F) = x + C \end{aligned}$$

and feasibility constraints on time allocation decisions (L_M, L_F).

By assumption 4, the wife has a lower market wage than the husband and so has a comparative advantage in home production. Therefore, she supplies $L_F = 1$. The couple then

[K]Recall that the husband's wage in period 2 depends on his investment decision from period 0.

solves

$$\max_{x,L_M,C} (x+\beta[L_M+1])\cdot C \qquad \text{s.t. } w_M(1-L_M)=x+C. \tag{H.4}$$

Notice that the marginal utility of x is C, while the marginal utility of C is $x+\beta[L_M+1]$. Hence, optimization dictates spending the first $\beta[L_M+1]$ of income on C and then equating marginal spending on C and x thereafter. Recall that for a less-skilled husband M, full-income w_M is below β. Therefore, regardless of the less-skilled husband's time allocation decision, the efficient demand for x is 0. These considerations imply the following problem

$$\max_{L_M} \beta(L_M+1)w_M(1-L_M)$$
$$=\max_{L_M} \beta w_M(1-L_M^2)$$

which is clearly solved by setting $L_M=0$. Thus, total joint from consumption in a marriage with a less-skilled husband is βw_M and private consumptions satisfy $c_M+c_F=C=w_M$.

For marriages involving a highly-skilled husband M, full specialization prevails as well, although the spending allocations differ. Because the highly-skilled husband's wage exceeds β, some money will be spent on x. Specifically, the first order conditions to program (H.4) dictate the spending of $(w_M-\beta)/2$ on x and allocating the rest to C. Total joint utility from consumption is thus $(\beta+w_M)^2/4$ and individual private consumptions satisfy $c_M+c_F=C=(\beta+w_M)/2$.

Divorcees with a settlement—I start by considering a divorce involving a less-skilled husband. In addition to the indirect utilities from consumption derived below, divorcees also enjoy child welfare. Ex-husbands enjoy $(1-d)\omega$ on top of consumption utility and ex-wives enjoy ω.

Suppose a court orders, or the ex-couple agrees, for the ex-husband to pay the ex-wife a transfer of $\hat{y}$ (which can be negative). The ex-husband, then, solves

$$\max_{x_M,L_M,c_M} (x_M+\beta L_M)c_M$$
$$\text{s.t. } w_M(1-L_M)=c_M+x_M+\hat{y}.$$

Because a less-skilled husband's wage does not exceed β, the marginal utility of time at home exceeds the marginal utility of x. Accordingly, he will not work full-time and will devote all monetary resources toward c. Thus the above problem is equivalent to

$$\max_{L_M} \beta L_M(w_M(1-L_M)-\hat{y})$$

subject to the time constraint on L_M. For ease of exposition, suppose that the space of possible transfers $\hat{y}$ is such that an interior time allocation always prevails for less-skilled ex-husbands and ex-wives. (This will imply $|\hat{y}| \leq w_F$.) This problem has first-order condition

$$\beta(w_M(1-L_M)-\hat{y})+\beta L_M(-w_M)$$

and second order condition

$$-2\beta w_M < 0.$$

Setting the first order condition to 0 and solving for L_M returns the Marshallian leisure demand

$$L_M(w_M,\hat{y}) = \frac{w_M-\hat{y}}{2w_M}$$

and indirect utility

$$\begin{aligned} U_M(w_M,\hat{y}) &= \beta L_M(w_M,\hat{y})\cdot(w_M(1-L_M(w_M,\hat{y}))-\hat{y}) \\ &= \beta\frac{w_M-\hat{y}}{2w_M}\left(\frac{w_M+\hat{y}}{2}-\hat{y}\right) \\ &= \beta\frac{(w_M-\hat{y})^2}{4w_M}. \end{aligned} \tag{H.5}$$

Running through an analogous set of derivations for the wife returns a Marshallian leisure demand of

$$L_F(w_F,\hat{y}) = \frac{w_F+\hat{y}}{2w_F}$$

and indirect utility of

$$\begin{aligned} U_F(w_F,\hat{y}) &= \beta L_F(w_F,\hat{y})\cdot(w_F(1-L_F(w_F,\hat{y}))+\hat{y}) \\ &= \beta\frac{w_F+\hat{y}}{2w_F}\left(\frac{w_F-\hat{y}}{2}+\hat{y}\right) \\ &= \beta\frac{(w_F+\hat{y})^2}{4w_F}. \end{aligned} \tag{H.6}$$

Highly-skilled ex-husbands have a wage exceeding β. Thus, the marginal utility of x exceeds the marginal utility of time at home, and so these individuals work full-time regardless of the divorce settlement. Standard optimization dictates that these men equally divide total income, $w_M-\hat{y}$, between x and c, reaching an indirect utility of

$$U_M(w_M,\hat{y}) = \frac{(w_M-\hat{y})^2}{4}. \tag{H.7}$$

Singles, divorcees without a settlement—Divorces without settlements are equivalent to divorces with settlements in which $\hat{y}=0$. In these "autarky allocations," less-skilled ex-husbands and ex-wives each work half-time and obtain consumption utilities of $\beta w_M/4$ and $\beta w_F/4$, while highly-skilled ex-husbands continue to work full-time and obtain a consumption utility of $w_M^2/4$. By definition, singles in period 2 behave the same way as divorcees who do not negotiate a settlement. The only difference between singles and divorcees without a settlement is that the latter group enjoys additional utility from child welfare.

Hence, less-skilled single and divorced men generally do not work full-time, but less-skilled husbands do.

H.3. Omitted proofs

Proof of Proposition 1. The first claim is that highly skilled men always invest in period 0. Recall the investment decision rule:

$$I_M = \mathbf{1}\{\lambda_M + \mu_M \geq e_M\}$$

First, note that the marriage market return to investing, μ_M, is weakly positive for all men M. This is because men always have the option of remaining single and simply enjoying the labor market returns to investment. Because the wage return to investing, R, is strictly positive, the labor market return to investing is strictly positive. From the above calculations, we can show that the effort cost of investing for skilled men

$$\begin{aligned} e_H &= u_{H,0}(I_H = 0) - u_{H,0}(I_H = 1) \\ &= \left(\frac{\beta + w_H}{2}\right)^2 - \left(\frac{w_H}{2}\right)^2, \end{aligned}$$

is weakly negative, since $w_H \geq \beta$. Thus, $\lambda_H + \mu_H > e_H$, so highly skilled men always invest.

The second claim is that less-skilled men who do not marry choose not to invest. This would happen if $\lambda_L < e_L$. To prove this claim, we introduce the following assumption.

Assumption 4. $R < \frac{\beta - w_L}{\beta}$.

From the above calculation,

$$\begin{aligned} e_L &= u_{L,0}(I_L = 0) - u_{L,0}(I_L = 1) \\ &= \frac{\beta w_L}{4} - \frac{w_L^2}{4} \\ &= \frac{w_L}{4}(\beta - w_L) \end{aligned}$$

and

$$\begin{aligned}\lambda_L &= \frac{\beta w_L(1+R)}{4} - \frac{\beta w_L}{4} \\ &= \frac{w_L}{4} R\beta\end{aligned}$$

By assumption 4, $R < \frac{\beta - w_L}{\beta}$ and so $\lambda_L < e_L$. Therefore, less-skilled men who choose to remain single also do not invest. $\square$

Proof of Proposition 2. The claim is that all men who choose to marry are better off investing. To prove this, it is convenient to introduce the following assumption and lemma.

Assumption 5. $w_L > \beta\left(1 - \frac{7-\xi}{2}R\right)$, *where* $\xi = \frac{(w_F/w_L)^2}{1+R}$.

Lemma 1. *No marriage forms simply as a route to divorce.*

Proof of lemma. Consider a marriage involving a less-skilled man. According to the above derivations, total utility in marriage in period 2, exclusive of marital bliss, is $\beta w_M + 2\omega$. By summing up the indirect utilities derived above, total consumption utility in divorce is

$$\begin{aligned}&\beta\frac{(w_M - \hat{y})^2}{4w_M} + \beta\frac{(w_F + \hat{y})^2}{4w_F} \\ &= \left(\frac{\beta w_M}{4} - \frac{\beta \hat{y}}{2} + \frac{\beta \hat{y}^2}{4w_M}\right) + \left(\frac{\beta w_F}{4} + \frac{\beta \hat{y}}{2} + \frac{\beta \hat{y}^2}{4w_F}\right) \\ &= \frac{\beta w_M}{4} + \frac{\beta w_F}{4} + \frac{\beta \hat{y}^2}{4w_M} + \frac{\beta \hat{y}^2}{4w_F} \\ &< \frac{\beta w_M}{2} + \frac{\beta w_F}{2}\end{aligned}$$

given the feasible set of transfers $|\hat{y}| \leq w_F$. Notice that this quantity, in turn, is strictly less than total consumption utility in marriage (βw_M). Moreover, total child welfare in divorce $(2-d)\omega$ is less than that in marriage (2ω), so total material utility is strictly lower in divorce. Because utility in marriage is transferable, it is possible to guarantee each spouse a higher material utility in marriage than in divorce, for any given feasible divorce allocation. Thus, regardless of the divorce regime, it is better for the marriage to continue when the match quality shock $\psi = 0$; only when $\psi = -\theta$ is divorce a possibility.

As a consequence, any marriage that forms in period 1 involving a less-skilled man dissolves in period 2 with probability at most $1/2$—the chance of drawing a bad match quality.

The same logic holds for marriages involving a highly-skilled man. SHOW IT.

$\square$

Proof of proposition. Denote the cost of a less-skilled man investing, net of the labor market return, as $\hat{e}_L = e_L - \lambda_L$. What we must show is that this net cost is more than returned in the marriage market; that is, that $\mu_L \geq \hat{e}_L$. From the proof to proposition 1, we have

$$\begin{aligned}
\hat{e}_L &= e_L - \lambda_L \\
&= \frac{w_L}{4}(\beta - w_L) - \frac{w_L}{4}R\beta \\
&= \frac{w_L}{4}(\beta(1-R) - w_L).
\end{aligned}$$

By the lemma, a less-skilled husband divorces with probability at most $1/2$. Suppose for the moment that the couple has zero marital taste and that $\alpha = 0$, so child welfare does not depend on the husband's wage. This yields

$$\begin{aligned}
\mu_L &= \mathsf{V}_{L^+} - \mathsf{V}_L \\
&= (\mathsf{V}_{L^+} + \mathsf{V}_F) - (\mathsf{V}_L + \mathsf{V}_F) \\
&\geq \frac{1}{2}\left((U_{L^+,2} + U_{F,2}) - (U_{L,2} + U_{F,2}) \mid \text{stay married}\right) \\
&\quad + \frac{1}{2}\left((U_{L^+,2} + U_{F,2}) - (U_{L,2} + U_{F,2}) \mid \text{divorce}\right) \\
&= \frac{1}{2}(\beta w_L(1+R) - \beta w_L) \\
&\quad + \frac{1}{2}\left(\frac{\beta w_L(1+R)}{4} + \frac{\beta\hat{y}^2}{4w_L(1+R)} - \frac{\beta w_L}{4} - \frac{\beta\hat{y}^2}{4w_L}\right) \\
&= \frac{1}{2}R\beta w_L + \frac{1}{2}R\beta\left(\frac{w_L}{4} - \frac{\hat{y}^2}{4w_L(1+R)}\right) \\
&\geq \frac{1}{2}R\beta w_L\left(1 + \frac{1-\xi}{4}\right) \\
&= \frac{1}{8}R\beta w_L(5-\xi) \qquad \text{(H.8)}
\end{aligned}$$

where the second-last line is derived from factoring a w_L out of the last term and then applying the definition of ξ under the assumption that $\hat{y} = w_F$. By this assumption, the equality in the second-last line becomes an inequality, since the feasible set of transfers $|\hat{y}| \leq w_F$.

Given these calculations, observe that the expression $\mu_L \geq \hat{e}_L$ is equivalent to

$$\begin{aligned}
\frac{1}{8}R\beta w_L(5-\xi) - \frac{w_L}{4}(\beta(1-R) - w_L) &\geq 0 \\
\frac{w_L}{4}\left(\frac{1}{2}R\beta(5-\xi)\right) - \frac{w_L}{4}(\beta(1-R) - w_L) &\geq 0 \\
\frac{1}{2}R\beta(5-\xi) - \beta(1-R) + w_L &\geq 0 \\
w_L &\geq \beta\left(1 - \frac{7-\xi}{2}R\right),
\end{aligned}$$

which is true by assumption 5.

Notice that the above scenario is a "worst case." In reality, $\alpha \geq 0$, the divorce probability is weakly decreasing in the male's wage (since the material marital surplus rises in the male's wage), the marital taste may be positive, and the divorce settlement $|\hat{y}| \leq w_F$. It is easy to show that each of these possibilities raises the expected marriage market returns to investing further.[L] Thus, if investment conditional on marriage is profitable in this worst case scenario, it is profitable always. $\square$

Notice that assumption 5, then, is sufficient but not necessary for this proposition to hold.

Proof of Proposition 3. The claim is that a rational-expectations equilibrium exists. To begin, it is convenient to introduce the following lemma.

Lemma 2. *Take two individuals of the same skill type, i and j, with $\theta_i > \theta_j$. No equilibria exist in which j marries while i remains single.*

Proof of lemma. Suppose such a marriage market allocation arose in equilibrium. Suppose that j preferred to be single at the given price vector. Then, by definition, such an allocation is not an equilibrium. Suppose instead j was indeed best off marrying and promising his/her partner her equilibrium marriage market price of P. Then i would prefer to be married as well, and can promise j's partner a price of $\mathsf{P} + \theta_i - \theta_j - \epsilon$, where $\epsilon \in (0, \theta_i - \theta_j)$. Both i and j's initial partner will be better off in the new allocation. Therefore, the initial allocation is not an equilibrium. $\square$

Proof of proposition. [TO BE COMPLETED] Describe the algorithm. By the lemma, the algorithm converges toward a triple of marital taste threshold values $(\underline{\theta}_L, \underline{\theta}_H, \underline{\theta}_F)$. For the market to clear, we require $1 - G(\underline{\theta}_F) = 1 - \frac{1}{2}\left(G(\underline{\theta}_L) + G(\underline{\theta}_H)\right)$.

Then, define conditions on the $\underline{\theta}$ values. Link the output of the algorithm to male investment strategy. Skilled males always invest. Less-skilled males invest only if they can get at least $\hat{e}_L$ of the marital surplus from marrying.

Investing when expected marital gain is less than $\hat{e}_L$ is not rational. Not investing and marrying is ruled out by proposition 2. Hence this investment rule and associated stable matching is an equilibrium. $\square$

Proof of Proposition 4. The claim is that in a mutual consent divorce regime, and where the initial female wage is less than β, spouses will always agree on the efficient child investment strategy, which is to have the wife stay home full-time in period 1.

At the initial wage structure, regardless of the wife's labor supply decision in period 1, a married household will fully specialize in period 2—with the wife staying at home full-time (see above calculations). Thus, the only impact in marriage of the wife working in the market in period 1 is to decrease total enjoyment of child welfare. Because utility within marriage is transferable, this implies that for any marital allocation in which the wife works in the first period, there exists an allocation in which the wife does not work that both partners prefer. That

[L] Calculations available upon request.

is, the *ex-post* Pareto frontier in marriage conditional on the wife staying at home is dominated by the *ex-post* frontier conditional on her working.

By assumption 3, the Pareto frontier in divorce is unaffected by the wife's labor supply choice. Moreover, by Lemma 1, no marriage forms simply as a route to divorce: regardless of male and female types, any marriage that forms has at most a 50 percent chance of dissolving in period 2: i.e., the probability of drawing a bad match quality shock. Thus the *ex-ante* Pareto frontier is a convex combination of the *ex-post* frontiers in marriage and the frontier in divorce. As a consequence, the *ex-ante* Pareto frontier conditional on the wife staying at home dominates the frontier conditional on the wife working. That is, given any *ex-ante* allocation in which the wife works in the first period, there exists a feasible *ex-ante* allocation in which the wife stays home that both partners weakly prefer. □